

**School of Humanities (Education)**  
**Digital Tools and Engagement: An Evaluation of Whether**  
**Collaborative and Generic Tools can Positively Affect**  
**Classroom Culture, Agency and Engagement in Junior**  
**Science in a New Zealand Boys' High School**

**Peter James Van den Broek**

**0000-0003-4128-150X**

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## Declaration

**Name of candidate:** James Van den Broek

This Thesis, entitled: Digital Tools and Engagement: An Evaluation of Whether Collaborative and Generic Tools can Positively Affect Classroom Culture, Agency and Engagement in Junior Science in a New Zealand Boys' High School is submitted in partial fulfilment for the requirements for the Curtin University degree of Master of Philosophy in Education.

### CANDIDATE'S DECLARATION

I confirm that:

- This Thesis represents my own work.
- The contribution of supervisors and others to this work was consistent with Curtin University's Regulations and Policies.
- Research for this work has been conducted in accordance with Curtin University's Research Ethics Committee Policy and Procedures and has fulfilled any requirements set for this project by the Curtin University Research Ethics Committee.

Research Ethics Committee Approval Number: HRE2019-0679

Candidate Signature:

Date: 10/04/2021

Student number: 19581523

## Abstract

Engagement is a well-researched complex meta construct. More recent constructs include institutional, social, and agentic engagement, highlighting the importance of relationships between key stakeholders in education. Key stakeholders are specifically students and teachers but also include wider communities. These newer aspects also call attention to the concept of belonging, or relatedness, which provide the foundation for a reframing of engagement that this study took. Engagement in the classroom can be viewed as a mutualistic relationship between classroom culture and learning activities. Engagement can be positively impacted through improved classroom culture, in which agency plays an important role, as well as by changing pedagogies, such as implementing digital tools into learning activities. This study researched whether the implementation of Padlet and Flipgrid – two generic collaborative digital tools – into learning activities affected engagement along with classroom culture and agency in line with the proposed reframing of engagement. Such tools may make education more relevant to students who are more technologically immersed than previous generations, as well as meeting initiatives and government policies aimed at promoting inclusive democratic education founded on digital technologies. Research was carried out, using a multi case study approach, in two general science classes in a Boys' High School in New Zealand. As the tools were generic, potential positive implications across curriculum areas could be deduced from the results. Data, from the perspective of the teachers and students in each case study, was collected through interviews and online surveys, before and after the digital tools were implemented, as well as from a lesson observation at each phase. This data was analysed using a mixed methods approach. Interview and online survey responses were qualitatively coded whereas the online survey Likert Scale scores and lesson observations were quantitatively coded. Results from both case studies highlight that engagement in general science was positively affected by implementing Padlet and Flipgrid. However, the results from the effects on classroom culture and agency were more ambiguous in nature, with classroom culture and agency being more difficult and abstract than engagement to determine. In the case of classroom culture, which is built on relational development, there are many other factors extraneous to the implementation of digital tools into learning activities affecting it. It also takes more time to develop and change classroom culture and agency. Although changes in engagement were apparent in this study, it is not clear that such changes will be embedded long term, due to the short timeframe of this study. To overcome this limitation a long-term longitudinal study is recommended, as is more directed and ongoing professional development and support for teachers. In this way future implementation of digital tools can be more immersed in well-developed technological, pedagogical, and content knowledge and done in a more collaborative manner, considering greater student input.

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## Glossary

<b>Term</b>	<b>Definition</b>
Agency	In simple terms the development of the capacity of learners to make positive choices.
Axiology / Axiological	Relates to values and what is of importance in the research.
Classroom culture	The critical features in a learning environment around the meaning and beliefs around learning, teaching, knowledge, technology, student and teacher roles, power, and responsibilities.
Co-construction	An approach to teaching and learning that builds on collaboration and cooperation.
Cognition / cognitive	Process of knowledge acquisition through thoughts, experiences, and processes.
Digital tools	Technological applications that can be used in learning activities.
Ecosystem	A biological interdependent community.
E-Learning	Use of electronic resources in learning activities, primarily in formal educational settings,
Engagement	A complex multidimensional construct that measures the degree of investment in learning activities that learners exhibit.
Experiential	In learning based on practical experiences.
Interpretivist	Use of subjective analysis in research.
Flipgrid	Collaborative online video sharing platform used in education.
Key Stakeholders	In the context of this study these are specifically the teachers and students, although families and wider communities are also key.
Likert Scale	A five (or seven) scale that allows respondents to rate their agreement or disagreement with a statement / question.
Mutualistic	A relationship in which groups work together and gain benefit.
Padlet	A collaborative digital notice board in which ideas and thoughts can be shared.

Pedagogy	The approach to and practice of teaching built on educational theories.
Relational	Concerning how two or more people, or groups, are connected and develop relationships.
Relatedness	Being connected in relationships through building of empathy and trust.
Second Level Education	Post primary or high school education. Approximate age range is 13-18.
Situated Learning	Learning that takes place in context and has relevance and can lead to CoP.
Te Kotahitanga	A PL programme built on research that aims to improve educational outcomes for Māori students through supporting teachers to provide culturally contextual learning.

## List of Abbreviations

<b>Abbreviation</b>	<b>Definition</b>
<i>A/L</i>	Assessment for Learning
AR	Augmented Reality
BECTA	British Educational Communications and Technology Agency
BERA	British Educational Research Association
CK	Content Knowledge
ERO	Education Review Office
ES	Effect Size
GCSE	General Certificate School Education
ICT	Information Communications Technology
MOE / MOE (NZ)	Ministry of Education / Ministry of Education (New Zealand)
OECD	Organisation of Economic Cooperation and Development
PCK	Pedagogical Content Knowledge
PK	Pedagogical Knowledge
PL / PLD	Professional Learning / Professional Learning and Development
SDT	Self Determination Theory
SOI	Statements of Intent
TEL	Technology Enhanced Learning
TK	Technological Knowledge
TPACK	Technological Pedagogical and Content Knowledge
TPASK	Technological Pedagogical Science Knowledge
VR	Virtual Reality
XK	Contextual Knowledge

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## Chapter 1: Introduction

*“We learn more by looking for the answer to a question and not finding it than we do from learning the answer itself.”*

*Lloyd Alexander*

### 1.1 Preface

This chapter lays out the structure and purpose of this thesis and identifies the problem and rationale for the research. This thesis explored whether student engagement in general science is positively affected by implementing two digital tools - Padlet and Flipgrid - into learning activities, with potential transferability across other curriculum areas, drawing on the perspectives of students, classroom teachers and myself, a teacher researcher. The research was carried out in one year 9 and one year 10 science class in a boys' high school in New Zealand, which are the first two years of second level education.

### 1.2 Identified Problem.

In this research context - a decile 1-3 boys' high school (years 9 - 13) on the East Coast of New Zealand's (NZ) North Island - there is a lack of engagement for many students in science and other curriculum areas. According to the Ministry of Education (NZ) ([education.govt.nz](http://education.govt.nz), 2019) decile ratings, which range from 1-10, are used to allocate funds, with lower deciles receiving more funding. They indicate the proportion of students from low socio-economic communities in a school catchment. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities and decile 10 schools are the 10% of schools with the lowest proportion of these students ([education.govt.nz](http://education.govt.nz), 2019).

A lack of engagement is apparent when overhearing common staffroom conversations such as...”he’s not prepared for class”...”if he turned up more he would do better”...”if he made the effort to engage more in science he would do better.” These discourses are replicated in other curriculum areas, indicating a more widespread issue. In science further evidence can be inferred from results at junior level, which for a significant number of students are poor, along with a lack of retention into senior science. In response the question arose whether student engagement could be improved through an intervention. Fredricks et al. (2004) argue that engagement is responsive to interventions. In this case changes in teachers' pedagogical practice to implement two generic digital tools – Padlet and Flipgrid – was the intervention. This intervention occurred in two general science classes, one at year 9 and one at year 10.

### 1.3 Rationale and Background

As Bryson and Hand (2007, p. 352) argue “if only students were more engaged, we could achieve more.” Teachers equate engagement - a psychological investment made to increase comprehension and mastery in

academic skills (Newmann et al. 1992) - with educational success. Engagement is linked to improved student outcomes (Appleton et al., 2008; Klem & Connell, 2004; Lee, 2014; Voelkl, 1995; Wang & Fredricks, 2014). Engagement is a prerequisite for academic attainment, showing quality of effort and involvement in productive learning activities (Kuh, 2009). Thus, student engagement can be viewed as critical to enhancing educational outcomes. To paraphrase Skinner et al. (2009) engagement is a meta construct where behavioural and emotional engagement strongly correlate and affect academic engagement and outcomes.

This study views engagement as a mutualistic relationship between classroom culture, including relationships, and involvement in learning activities. This is measurable from indirect indicators (Appleton et al., 2006), using student voice, observations, interviews, and teacher perceptions. As Reeve and Tseng (2011) argue, agency is a key aspect of engagement. By increasing agency, classroom cultures and relationships are positively impacted, leading to increased engagement. The obverse, disengagement, including risk factors like “inertia, apathy, disillusionment or engagement in other pursuits,” (Krause, 2005, p. 4) can preclude success in school (Finn & Zimmer, 2012). This can lead to significant numbers of students feeling disengaged. Hancock and Zubrick (2015) argue that 20% of students in Australian schools are consistently disengaged.

Research shows that school and teacher practices can positively impact engagement (Finn & Zimmer, 2012; Uden et al., 2013) through positive relationships, student autonomy, assessment for learning, high expectations and challenging, contextual, tasks (Fredricks et al., 2016). This study explored whether engagement is improved by changing teacher practice to implement Padlet and Flipgrid into learning activities, based on constructivist approaches, that make learning more real. This can facilitate collaborative learning environments that build classroom cultures through relational development. Padlet and Flipgrid were the two digital tools chosen for this study. This was due to their simplicity and genericity of use, along with their collaborative aspects, which is a key MOE (NZ) goal. The teachers in this study have less well-developed efficacies in implementation and use of technology and digital tools. As there was a lack of time to implement an ongoing supportive PL programme during this study, it was necessary to use digital tools that were easy for teachers to implement into learning activities. Additionally, the use of such generic tools allowed for the potential transferability across other curriculum areas to be deduced more easily.

Technology’s use in learning environments, mirroring societal changes, is proliferating. This provides a rationale for evaluating whether engagement increases when using simple and generic digital tools as part of teacher practice. Sinclair (2009) argues technology use should align with educational goals and objectives. In this context this includes collaboration, empowering students through co-construction and student voice, and further development of digital skills (MOE, 2014, 2016). By evaluating whether engagement is improved through implementing digital tools into teaching and learning a contemporary, relevant education system (Pacansky-Brock, 2017) compatible with “a curriculum fit for purpose in an international and digital era” (ERO, 2016) can also be developed. By using technology, teachers’ perspectives can change, helping develop student cognitive processes (Levin & Schrum, 2013). This demonstrates the positive link between effective pedagogical implementation of technology and student engagement and outcomes (Donaldson et al., 2017). As well as highlighting the significance

of this research, due to a lack of engagement and use of technology, it also aligns with Ministry of Education (MOE) NZ goals.

Most of the work into studying links between engagement and using Padlet and Flipgrid has been at tertiary level (DeBerg, 2016; Ellis, 2015; Fuchs, 2014; Kompar, 2018) providing scope to add further to research around engagement and technology at secondary level. This is relevant in the context of this research, where engagement, or disengagement, in general science is a serious issue. This disengagement is also multidimensional and complex, with many potential reasons, and is outside the scope of this study to research. Contributory reasons may include the structure of NZ schooling with intermediate school programmes, the more generic skills and training of primary teachers and the shortage of science trained high school teachers. This last point is particularly relevant in this context with no science trained teacher being appointed between 2016-2018, leading to teachers from other curriculum areas, with no science knowledge, teaching junior science. Learning activities involved students with workbooks and teachers having the answers as a teaching resource, which was often allied with a reluctance to implement digital tools, due to lack of confidence, familiarity, and self-efficacy.

Such factors highlight the significance of studying whether the implementation of these two simple generic digital tools can help raise student engagement, as well as making it easier for teachers to make changes that positively affect student engagement. It is hoped that this study will also aid teachers in seeing the benefits of, and increase confidence in, using digital tools leading to more widespread implementation, and increase positive discourse with colleagues, and students, around potential use of digital tools in pedagogical practice. Finally, it is envisaged that the findings may signpost effective yet manageable professional learning to underpin teacher strategies around technological implementation.

## **1.4 Research Questions**

The following overarching research question guided this study: can student engagement in general science be positively affected by implementing generic digital tools into learning activities? In order to examine this more fully the following research questions were used:

1. Does the implementation of Padlet and Flipgrid have any effect on student engagement?
2. Does the implementation of Padlet and Flipgrid have any effect on classroom cultures and relationships in the context of this research?
3. Does the implementation of Padlet and Flipgrid have any effect on student agency in the context of this research?

After carrying out the research and analysis of the data the idea of educational implications, such as transferability across curriculum areas in this context, is discussed.

## **1.5 Chapter Introductions and Layout of Thesis**

The following section gives a brief overview of the remaining chapters of this thesis.

***Chapter 2: Student Engagement***

This chapter examines the literature around student engagement leading to a reframing of engagement into a theoretical framework germane to the context of this research. It finishes with a summary of how student engagement has been measured and how this will relate to this research.

***Chapter 3: Digital tools and technology in education***

This chapter examines why technology should be used in education, and more specifically its potential effects on student engagement, in general science and beyond. A rationale is given as to why Padlet and Flipgrid have been chosen in this research.

***Chapter 4: Research paradigm and methodology***

This chapter expounds on the research design and methodologies used to carry out this research.

***Chapter 5: Results Year 9 Case Study***

This chapter analyses the data collected from for the year 9 case study.

***Chapter 6: Results Year 10 Case Study***

This chapter analyses the data collected for the year 10 case study.

***Chapter 7: Results Cross Case Analysis***

This chapter examines the two case studies for comparisons and similarities in order to lead to better understanding and conclusions.

***Chapter 8: Discussion, Conclusions, limitations, and Recommendations***

This chapter discusses the findings in relation to previous literature and draws overall conclusions from the study. Any limitations and future recommendations, both in the context of this study and for future research, arising from the discussion and conclusions are outlined. It finishes with personal reflections around the study.

## Chapter 2: Student Engagement

*"You have power over your mind—not outside events. Realise this, and you will find strength."*

*Marcus Aurelius*

### 2.1 Preface

This chapter reviews the literature around student engagement which is complex and multidimensional (Fredricks et al., 2004) and frames engagement in the context of this research. Within this complex construct there are several key stakeholder perspectives, namely those of the teachers and students interacting in classrooms. This is a key tenet of this study and leads to the genesis of a theoretical model and definition of engagement centered around the development of positive classroom cultures through relational evolution built on stakeholder interactions. These interactions and relationships develop in the classroom, both between students and teachers and across the student body leading to the promotion of student agency.

### 2.2 Engagement - Stakeholders' Perspectives

Engagement in secondary school classrooms is multidimensional. Dimensions include behaviour, motivation, participation, attachment, belonging as well as cognition. Within this, the perspectives of key stakeholders, namely teachers, students, and their supporting families, are key constructs. Teachers and students interact daily in teaching and learning environments. Learning also takes place outside of the classroom, with supports that students receive at home and from their wider social contexts helping shape and impact engagement. As Darling-Hammond et al. (2019, p. 97) argue when synthesising research around Science of Learning and Development (SoLD) "children's development and learning are shaped by interactions among the environmental factors, relationships, and learning opportunities they experience, both in and out of school."

#### 2.2.1 Teachers' Perspectives

Through teachers' lenses, engagement can, at times, be viewed in a deficit theorising manner, where the "greatest impediments to student engagement were pupils' poor attitudes" (Harris, 2011, p. 378). Zyngier (2008) argues such deficit discourses are common in classrooms and more widely in society. Responses such as "pupils didn't care" (Cothran & Ennis, 2000, p. 110) highlight this non-agentic position (Ravet, 2007; Vibert & Shields, 2003), where barriers, external to the school, impact engagement (Cothran & Ennis, 2000; Harris, 2011). Through this prism teachers are more likely to attribute pupil disengagement to personal deficits in attitude, personality, or ability (Ravet, 2007).

Due to the structure of secondary school education teachers don't have the same level of interaction with students as primary teachers, making it harder to form relationships. Hargreaves (2000) argues there is less emotional connection between secondary school teachers and students, leading to negative emotions and teachers often feeling negatively stereotyped, misunderstood, and unacknowledged. This is important as "emotional

engagement and understanding in schools (as elsewhere) require strong, continuous relationships between teachers and students” (Hargreaves, 2000, p. 815). This can feed into an internal mental model built on social interactions with students, leading to teacher actions manifesting in response to actual and perceived student behaviours (Split et al., 2011). This can potentially exacerbate any preconceived biases leading to over stating negative behaviours. As Split et al. (2011) argue perceptions of misbehavior can influence mental representations of teacher–student relationships, potentially furthering deficit theorising.

Negative deficit theorising is a significant cyclical issue, with a causal link between perceptions of student misbehavior, actual student behaviour and lack of engagement (Doumen et al., 2008). Van Uden et al. (2013) argue there is also a causal link between teachers’ viewpoints and perceptions, as well as school leaders and other stakeholders, and student engagement. According to van Uden et al. (2014) if teachers believe they can improve student behaviour they will increase efforts to do so. This underlines the importance of teachers not viewing engagement in terms of deficit theorising affecting students only (Zyngier, 2008), due to the reciprocal nature of this link.

### *2.2.2 Students’ Perspectives*

Students’ viewpoints can differ, with teachers being responsible for student engagement. According to Hargreaves (200) classroom experiences can elicit negative emotions for students. Teachers need to care. This caring can be shown by making the curriculum more relevant through provision of comfortably challenging activities and increasing student ownership through empowerment (Pianta et al., 2012; Zyngier, 2008). In many instances “teachers didn’t recognise or understand their perspectives” (Harris 2011, p. 378). As Crosnoe (2000) argues social and task-related disengagement and alienation are linked to classroom experiences that are disconnected from youths’ developmental needs and motivations. This also fits in with research showing students’ attitudes and interests in academic engagement decline with progression through secondary school (Gonzales et al., 2008).

In some instances, a change is needed to recognise students’ perspectives thereby facilitating moves toward more positive emotional environments (Hargreaves, 2000). When teachers promote supportive environments, motivation is increased at the start of the school year, with engagement and peer relationships improving throughout the school year (Ruzek et al., 2016). By allowing students to bring prior experiences and social contexts into class a concomitant shift to a more agentic position within engagement, founded in positive relationships and classroom culture, can occur. Research has shown that students with more positive views and relations with their teachers are more engaged and achieve more highly (Crosnoe, et al., 2004; Fredricks et al., 2004; Shernoff et al., 2016). According to the attachment framework theory teachers are significant persons in students’ lives and vice versa (Milatz et al., 2015). By building on this dynamic there can be a shift away from reciprocal and cyclical deficit theorising positions to one where the reciprocal dynamic is more positive (Spilt et al., 2011).

### *2.2.3 Others' Perspectives*

Although outside the scope of this study, it is important to acknowledge the key influences that other stakeholders, including parents, not directly involved in classroom interactions, have in shaping and affecting school cultures, student engagement and outcomes. There is considerable evidence highlighting the link between parental involvement with student engagement and outcomes, through 'at home good parenting' (Desforges & Abouchar, 2003; Emerson et al., 2012; Fan & Williams, 2010). Emerson et al. (2012) suggest that the relative influence of the home on student achievement is 60-80%.

However, parental involvement is not a straightforward concept in improving student engagement and outcomes with differing viewpoints and perspectives. According to Harris and Goodall (2008) simple involvement in school activities, including attending functions, coaching, and managing groups has little effect on engagement. There needs to be an explicit link to supporting learning both in school and at home. Contrastingly, Fan and Williams (2010) link student engagement with parental involvement with school activities and functions. However, this link does not differentiate what school activities are, indicating the multidimensional aspects of parental involvement and the concomitant effects on student engagement. In a similar vein, perspectives on parental engagement differ between the different stakeholders. Parents tend to view it in terms of student support; teachers often have a propensity to view it as a means to improve behaviours, and students are more inclined to view it in terms of 'moral support' and interest in their progress (Harris & Goodall, 2008).

This highlights the need, and the move to place parental involvement and engagement within frameworks and policies in partnership with schools. Examples include the No Child Left Behind Act in the US (Fan & Williams, 2010); The Children's Plan in the UK (Harris & Goodall, 2008); the Family-School Partnerships Framework set up in 2004, and The Family-School & Community Partnerships Bureau established in 2008, both in Australia (Emerson et al., 2012). Although it is acknowledged and understood that parents and other key actors, such as school leaders, legislators, and external educational agents (the wider school community) implicitly support student engagement, their roles are outside the scope of this study. For the purpose of this study the perspective of others, identified as the wider school community is an implicit understanding in supporting engagement in the classroom.

### *2.2.4 Key Stakeholders' Perspectives in Relation to this Study*

Although literature indicates the importance of other stakeholders the two primary stakeholders involved in teaching and learning activities affecting engagement at the micro level are the teachers and students interacting in the classroom. For this reason, this study's primary focus is the teachers and students, identified as the key stakeholders, and examines engagement at the micro level of the classroom. By evaluating whether student engagement can be positively affected in science classrooms due to implementing Padlet and Flipgrid (the intervention), this study concentrates on the interactions and relationships formed within classrooms. Data was

collected from the perspective of students and the classroom teachers directly involved in the classroom environment and the learning activities.

## **2.3 Engagement - a Complex Paradigm**

The differing stakeholder viewpoints help highlight and reinforce the multidimensional aspects of engagement (Appleton et al., 2008) coalescing around several constructs, including academic, cognitive, intellectual, institutional, emotional, behavioural, social, and psychological engagement (Appleton et al., 2006; Taylor & Parsons, 2011). This meta-construct (Fredricks et al., 2004) has been viewed as comprising three or four constructs, although additional constructs have been identified and added to the lexicon. In three-construct models, constructs are generally identified as behavioural, cognitive, and emotional / affective (Fredricks et al., 2004; Jimerson et al., 2003). In four-construct models academic engagement can be viewed as a separate, and additional construct (Reschly & Christenson, 2012). Alternatively, the four constructs can be viewed as academic, behavioral, cognitive, and psychological (Appleton et al., 2006). Due to identification of the varying number of constructs that comprise engagement and how they are viewed through different lenses there has been a lack of clarity and generalisation in defining engagement (Appleton et al., 2006).

### ***2.3.1 Engagement – a Meta Construct***

#### **2.3.1.1 Academic, Emotional, Cognitive, Behavioural, Psychological Engagement and Motivation**

Trying to complete set work in class and at home; being prepared for school, alongside regular attendance, all indicate a student's engagement with academic work, for which they must exhibit a degree of concentration and motivation. According to Singh et al. (2002) there is a reciprocal relationship between academic engagement and motivation. Academic engagement can be viewed as a “student's psychological investment in, and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote” (Newmann et al., 1992, p. 12). In general, motivation can be viewed as intrinsic or extrinsic. According to Niemiec and Ryan (2009) intrinsic motivation, based on self-determination theory (SDT) lies at one end of a motivation continuum, with amotivation lying at the opposite end, passing through different stages of extrinsic motivation. Intrinsic motivation is inherent but can and needs to be developed. People are endowed with a natural tendency to learn and develop as they engage with external environments as well as their inner world encompassing drive, needs and experiences. According to Niemiec and Ryan (2009) intrinsically motivated activities are enjoyable and satisfy deep psychological needs to feel competence and autonomy.

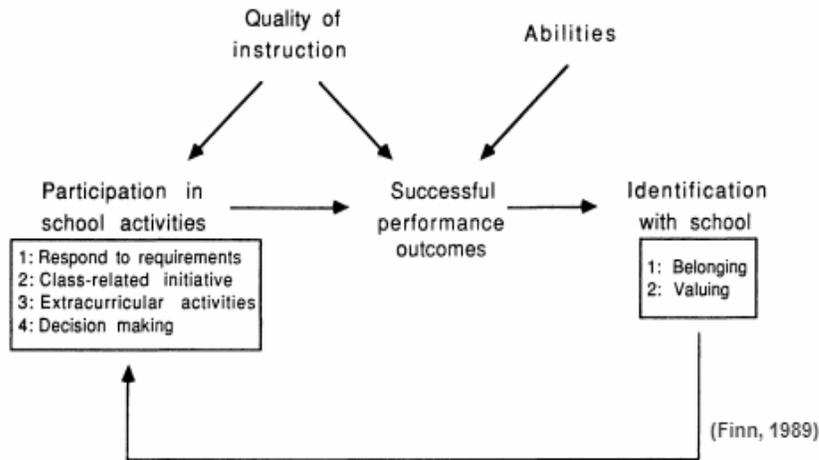
Motivation has been labelled as a force that energises and directs behaviour (Reeve, 2009). Motivation is the intent, and engagement is the resulting action (Reschly & Christenson, 2012). Thus, motivation is equated with students' psychological needs satisfaction and is a cognitive and affective force initiating, sustaining, and directing engagement (Reeve, 2012). Motivation consists of the perceptions, beliefs, and motives that drive students' feelings,

behaviours, and efforts - engagement - in learning environments (Hospel et al., 2016). As Reeve (2009) argues, motivation is the private, subjective, and unobservable, thus non-measurable, psychological cause, with engagement being the more objective and observable, thus measurable, effect. Motivation and engagement are intrinsically linked. Teachers are the key factor in motivating students to engage with learning activities within their specific educational contexts by fostering and facilitating intrinsic needs, based on autonomy, competence, and relatedness (Niemic & Ryan, 2009). With increasing autonomy and competence, the ability to make worthwhile choices pertinent to learning are enhanced. This is a key factor in learner agency, which entails the will and belief to achieve (Lindgren & McDaniel, 2012), or perceived self-efficacy (Bandura, 1982). When this does not occur, students may lack motivation or need some extrinsic motivation.

This view of motivation feeds into the psychological and cognitive aspects of engagement. Cognitive engagement is viewed by some researchers as being in the same domain as motivation (Reschly & Christenson, 2012) or inclusive of motivation (Zyngier, 2008), where self-regulation, a traditional motivation concept (Wolters & Taylor, 2012), is a key factor in cognitive engagement. Students show cognitive engagement, when using self-regulatory skills and psychologically investing time and effort into learning (Archambault et al., 2009; Fredricks et al., 2004; Patrick et al., 2007; Wang et al., 2011). This adds to the complexities and ambiguities around definitions of engagement used by different researchers. Appleton et al. (2006) reinforce this further when arguing that psychological engagement involves feelings, or emotions, around identification, belonging and relational interactions with the school, teachers, and peers. Seemingly this falls into the affective / emotional construct. Others view psychological engagement, encompassing behavioural aspects of engaging, with schoolwork, following school rules, persisting, and participating (Zyngier, 2008).

Historically, individual students' levels of academic learning are dependent on the ability of teachers to motivate academic engagement (Brophy & Good, 1986; Montalvo et al., 2007). This can be broken down to a construction of classroom behaviours, including writing, reading, completing tasks, and involvement in questioning and answering (Greenwood et al., 1984) through learning activities. Teaching and learning take place in dynamic social environments through interactions between teachers and students (Gillies, 2014, 2015; Horvath et al., 2016), which are also affected by the wider school community. As Walsh (2013) puts it, the core business of learning takes place through these interactions. How these interactions occur eliciting a range of behaviours, both self-directed actions and actions of others, whether positive, negative, or neutral, impacts both teaching and learning. Furrer and Skinner (2003) term this important interplay and interaction in dynamic learning environments relatedness. This involves the development of meaningful relationships with significant others, such as teachers and peers, through a sense of shared purpose and meaning (Painter, 2011). Johnson et al. (2001) equate relatedness with attachment, distinguishing between affective components of engagement, attachment to school, and a behavioural, or participatory component, as argued by Finn (1989), and illustrated in Finn's Participation Identification Model shown in figure 2.2.

**Figure 2. 1**  
*Participation and Identification Model*



As the model shows students with greater senses of belonging and attachment to the school participate more fully, become more engaged and make more effort than students with less belonging and attachment, leading to better outcomes (Johnson et al., 2001). This affective, or emotional, domain of engagement comprises students' affective reactions to the school, teachers, academics, and classmates (Skinner et al., 2009). Such distinct and concrete emotions include happiness and sadness, boredom, and interest, feeling included or excluded etc. Viewed through this affective / emotional prism, engagement has been defined by Fredricks et al. (2004) as a motivation-driven mental construct predictive of, and predicted by, students' perceptions of positive interpersonal relationships (relatedness) at school, in tandem with the cognitive and affective desire to initiate and sustain participation in a range of learning contexts and activities therein.

A correlation exists between emotional and behavioral engagement with “an underlying assumption that high-quality learning is the result of behaviours and emotions” (Skinner et al. 2009, p. 767). Activities that affect behavioural engagement can be viewed as lying on an engagement continuum, from high to low (Archambault et al., 2009; Hospel et al., 2016; Reschly & Christenson, 2012). These activities fall into three main categories: positive conduct; involvement in learning, and participation in school-related activities (Fredricks et al., 2004). Participation in school-related activities can be positive, negative, or neutral. More positive activities lie towards the positive, or engaged, end of the engagement continuum.

Behavioural components can be viewed as positive or negative and can be active or passive conducts. Negative actions include disruption and defiance, which are at the negative, or disengaged, end of the continuum. Behaviours that are more passive, such as making little effort, withdrawing, and not seeking help (Hospel et al., 2016), also tend towards this end of the continuum, whereas more positive active behaviours lie towards the engaged end of the continuum. These include trying hard in class, taking part in activities and discussions, attempting to complete homework, attending class, and following class rules, concentrating, avoiding distracting behaviour and

undertaking extracurricular activities (Johnson et al., 2001), alongside positive interactions with teachers and peers - the social tasks of a school (Finn & Zimmer, 2012). However, even here there is often ambiguity around whether separate and distinct continua are suitable for both engagement or disengagement (Reschly & Christenson, 2019), further adding to the lack of clarity around how engagement is seen and defined.

Further highlighting the importance of relationships, including supports put in place by teachers as part of classroom cultures and norms (Lei et al., 2018), it is salient to realise that these behaviours do not occur in a vacuum for individual students. They are part of the interplay within the learning environment affecting others in the class. As Darling-Hammond et al. (2019, p. 99) put it holistic approaches covering the interrelated aspects of dynamic educational settings and systems are needed, including those that support “self-regulation, executive function, intrapersonal awareness and interpersonal skills, a growth mindset, and a sense of agency that supports resilience and productive action.”

### **2.3.1.2 Social, Institutional, and Intellectual engagement**

The world that students are immersed has changed. It is continuing to evolve, with a concomitant shift in education to reflect this. Students are now much more immersed in the evolving digital and technical world. As UNICEF (2017) reports, youths (ages 15-24) are the most connected age group, with 71% Worldwide being connected, compared to 48 % of the total population (Keeley & Little, 2017). Students now appear to have different needs and wants; they engage with their technologically rich world in different ways than their parents. Taylor and Parsons (2011) argue they need and want more social interactions and want to connect and communicate constantly in environments that support these connections. These changes have been mirrored in a refocus around engagement. There has been a shift away from behaviour management, increasing achievement and school completion to a strategic process of lifelong learning for all. According to Taylor and Parsons (2011) it is an accountability measure. This has added to the lexicon that surrounds engagement by introducing and or refining concepts such as social, institutional, and intellectual engagement. Although, in some cases, an argument can be made that some of these terms used around engagement are interchangeable and cover other constructs. For example, social engagement which Willms et al. (2009) argue involves belonging and participating in school life, seems to encompass ideas that fall under earlier affective / emotional and /or psychological constructs.

Social engagement has a broader more important scope, in furthering understanding of engagement. Social aspect extends outside the classroom into other related settings, allowing students multiple views of the world, allowing views, beliefs, and perspectives to be deepened and extended (Pittaway, 2012). Although having roots in tertiary education, social engagement has important implications at secondary school. This can be seen in the increasing number of extra and co-curricular options and groups, whether cultural or sporting. These provide opportunities for students and teachers, as well as wider communities, to interact and build social connections and relationships, both within and without school settings in a reciprocal process (Hargreaves, 2000). Considerable

anecdotal evidence exists that if teachers and students interact in cultural and sporting groups then classroom behaviours improve due to more positive relationships and better classroom cultures, leading to increased engagement. This is a common refrain that teachers, particularly beginning and newly teachers, hear within staff rooms. Dunleavy and Milton (2009) found that open, caring, respectful relationships between learners and teachers develop and support social and psychological engagement in learning.

This social aspect of engagement is entwined with an institutional aspect, being dependent on the school, or institution, at which students are enrolled, depending on the degree of integration with the institution. As Crosnoe et al. (2004) argue social issues need to be understood at the interpersonal and institutional level, through intergenerational bonding between teachers and students. Individual behaviours are dependent on personal relationships and institutional settings, comprising structure, composition, and climate. Linnenbrink-Garcia et al. (2011) identified this link between social aspects of engagement when students collaborate whilst working in groups and how this is mediated in behavioural patterns. Although studying the effects of institutional settings are not within the scope of this study the following points are relevant. School structure can refer to how stratified a school is affecting the degree of interpersonal interactions between different year levels. School structure has relevance in the context of this study, which is a male only school. Considerable research shows that boys engage more and achieve better in single sex schools (Gibb et al., 2008; Woodward et al., 1999), with better stratification, interpersonal interactions, and school climates. Crosnoe et al. (2004) argue school climate refers to the general school atmosphere with implications for students' relational development with others in the school. In the context of this research on a micro level this equates with classroom culture.

Intellectual engagement is related to social engagement. According to Taylor and Parsons (2011) social interactions are a key factor in engaging students. Intellectual engagement involves a serious emotional and cognitive investment in learning, using higher order thinking skills (such as analysis and evaluation) to increase understanding, solve complex problems, or construct new knowledge (Willms et al., 2009). It happens through engaging with social, political, civic, moral, and ethical issues that are part of teaching and learning (University of Melbourne, 2007). Although intellectual engagement is seemingly grounded in third level educational settings, it resonates at secondary schools, where intellectual engagement refers to students' deeper connections and understanding of the knowledge they are acquiring, through developing greater interest in the material (Schussler, 2009).

With intellectual engagement and learning there is a high degree of reciprocity between teachers and learners, with expanded social interactions outside the classroom. A shift can take place towards more horizontal classrooms (Taylor & Parsons, 2011), with less of a power imbalance between teachers and students. This idea of intellectual engagement seems to be an extension of earlier ideas around academic engagement, incorporating emotional, or affective, and cognitive engagement, framed for delivering education in the twenty first century. In addition to the development of critical thinking skills, a key criterion in preparing lifelong future focused learners

(Brown, 2018), social interactions are necessary. There are also corollaries with directions in modern teaching and learning programmes and environments that incorporate digital technologies and tools as a key component.

### *2.3.2 Conclusion*

Student engagement is complex, incorporating multiple constructs, with ambiguity, lack of clarity and debate around such constructs. As Henrie et al. (2015) argue the lack of cohesion around definitions, models and operationalisation of student engagement, both in general terms as well as in TEL environments makes it difficult to both study and measure. Evaluating engagement in this study context can be classified as occurring in a TEL due to the choice of intervention.

Views around how motivation and engagement interact also differ. Reeve (2009) argues that motivation is separate, or antecedent to engagement, whereas Martin (2007) uses the terms interchangeably putting them on the same continuum. Wolters and Taylor (2012) equate motivation and cognitive engagement. More recently Filsecker and Kerres (2014) distinguish between motivation and engagement. Motivation is a volitional process maintaining psychological concentration that impels engagement, which is manifested as “energy in action,” in pursuit of chosen goals (Filsecker & Kerres, 2014, p. 452).

Although the meta-construct model of engagement is helpful for gaining an understanding of student engagement none of the constructs are discrete, with overlap, blurring and different identification of such constructs, including ideas around motivation. Studies into the individual constructs also increase challenges when studying and measuring engagement (Henrie et al., 2015). Reschly and Christenson (2012, p. 11) highlight this issue which they term jingle / jangle, “wherein the same term is used to refer to different things (jingle) and different terms are used for the same construct (jangle).” According to Reschly and Christenson (2012) what they classified as cognitive engagement was viewed as affective engagement by Finn (1989) and motivation by Wylie and Hodgen (2012). These different viewpoints and ambiguities arise from the diversity of factors that influence individual students, families, and educators, including the importance of social contexts. These contexts include relational interactions and connections, both in school and in the wider community - locally, regionally, nationally, and globally in the modern technological world - that are at play in developing students’ interests, likes and motivations and the concomitant impacts these will have on student engagement.

Relational aspects and how they are viewed by the key stakeholders along with how they develop through changes in learning activities are deemed a critical component of engagement in the context of this study. Such relational concepts are key underpinnings of classroom culture and student agency which this study views as core constructs within engagement. There seems more scope to affect the behavioural domain of engagement through pedagogical changes and positive relationship formation, highlighting the potential importance that positive classroom cultures, built on relational development and increased student agency may have in improving engagement. This leads to a reframing of engagement and a proposed theoretical model of engagement germane to

this study, outlined in the following sections, which incorporates classroom culture and agency as important constructs.

## **2.4 Engagement – Reframed**

Much of the research into engagement, focusing on the academic, behavioural, emotional, and cognitive aspects have been grounded in more traditional and didactic views around teaching and learning in which there is an imbalanced relationship between teachers, the knowledge providers, and students, the knowledge recipients. As Finn (1989) argues engagement has been viewed through a participation and identification prism, where participatory engagement incorporates student behaviors in school and identification aspects of engagement are the affective domain, incorporating emotional aspects (Zyngier, 2008). Engagement can be seen to be founded in older learning theories such as behaviourism and cognitivism, which are both teacher-centric models, driven by extrinsic motivation. In behaviourism, learning is based on the premise that responses are learnt and conditioned by external stimuli. In this model the correct or desired response (behaviour) is reinforced and more likely to happen again, as postulated by Skinner's theory of operant conditioning, put forward in 1938 (Furrer & Skinner, 2003). Like behaviorism, cognitivism presupposes that learners assimilate knowledge delivered by the teacher (Harasim, 2017).

van Uden et al. (2013, 2014) highlight the importance of teacher supports that foster positive interpersonal teacher-student relationships, creating classroom cultures involving student agency as a key component of engagement, where learning activities are autonomously directed by students. Alongside this, is the importance of giving appropriate competence-related feedback (Hattie, 2012) to students and challenging yet achievable tasks. Engagement can be improved by the facilitation of students' self-regulated academic motivation and achievement within classroom learning activities (Hattie, 2012). This is the key tenet of SDT in which all students possess intrinsic motivational resources that teachers can facilitate and nurture with appropriate teaching and learning situations in order to promote student engagement (Niemic & Ryan, 2009), through agency. Reeve (2009) argues that for student engagement to flourish supportive conditions are required, including outside of school, in the school and in individual classrooms where teachers encourage and facilitate inherent motivations and related engagement, as opposed to trying to manufacture or force motivation and engagement. Reeve (2009) also highlights the importance of the reciprocal nature of social and dynamic learning environments and how they impact engagement. By considering the importance of students' perspectives (Reschly & Christenson, 2012) alongside teachers' perspectives, more validity can be given to the concept that engagement needs student autonomy, choice, and control in learning experiences (Hagel et al., 2012). In other words, positive classroom cultures are facilitated in which agency, a key construct is developed. This is a key premise of this study and discussed in the following sections.

### *2.4.1 Classroom Culture - An Important Construct Within Engagement*

Classroom culture as an important construct within engagement. The underlying assumption is that positive classroom cultures foster engagement, and improvements in classroom culture can improve engagement. Several types of classroom cultures have been identified including collaborative communities of inquiry, individualistic grade-seeking cultures and, and a single libertarian, antiauthoritarian, political culture (Squire et al., 2003) and positivist, interpretative and critical-pluralist cultures (Levin, 2009). Although this study hasn't the scope to critically examine different cultures it is worthwhile and instructive to note the collaborative nature that is inherent in a number of these cultures.

In Levin's (2009) interpretative classroom culture built on social dialogue, social contexts and collaboration, learning is a mutual process built on the ideas of participating and becoming members of a community. The critical-pluralist classroom culture builds on this interpretative culture. It takes cognisance of the unequal power positions within classrooms, leading to enhanced co-construction through what is termed trialogue. As Levin (2009) argues, learning is a process of mutual engagement and co-construction of knowledge, considering other people's perspectives where teachers mediate student agency. This leads to strong cultures of learning built through constructing interdependency, as highlighted by Willms et al. (2009). These types of classroom cultures contain social factors, within and without the school, feeding into institutional factors. In turn these factors directly affect different aspects of engagement, including intellectual, academic, cognitive, psychological and behavioural, aspects.

Lemov (2015) defines classroom cultures where teachers' classrooms are places where students work hard, behave, model strong character, and do their best. In this view the onus is seemingly on the teacher to determine classroom culture. Tan and Subramaniam (2009) argue classroom culture arises from the critical features of classroom life that shape a classroom's educational "personality" reflecting tacit and explicit educational values, beliefs and processes involving the meaning of learning, teaching, knowledge, technology, student and teacher roles, power and responsibilities. This definition makes the role of students in developing classroom cultures more explicit. Squire et al. (2003) terms this, the division of labour within classroom culture development. Niemiec and Ryan (2009) argue that teachers play critical roles in creating classroom climate and culture in which students' basic needs for autonomy, competence and relatedness are supported or thwarted. This highlights the importance of relatedness, and supports the view that students, as well as teachers, are vital in creating positive classroom cultures conducive to learning, where relational development is a critical factor, leading to formations of collaborative cultures.

There are several key considerations that need addressing in order to effectively promulgate positive classroom cultures. One such consideration is having high expectations for all, which should be held by students and teachers. Additionally, there should be provision of relevant, contextual and interdisciplinary learning as part of learning climates, that are assessable by both students and teachers - *AfL* - and the widespread use of technology

(Dunleavy & Milton, 2009; Willms et al., 2009). This is done most effectively in collaboration with students through respectful, honest dialogue, or discourse, leading to more equity between students, as well as between students and teachers, helping to promote caring and supportive relationships, that facilitate firm yet fair disciplinary climates as part of positive classroom cultures. As Willms et al. (2009, p. 35) argue this is the single most important factor influencing relational development, with “students who describe their classroom disciplinary climate as positive being one and a half times more likely to report high levels of interest, motivation and enjoyment in learning.”

By collaborating and co-constructing with students’ classroom cultures can be constructivist and inclusive. According to the MOE (NZ) through their online education portal, Te Kete Ipurangi (TKI) such cultures recognise the contributions of all students, their families / whānau, and communities. This relates to the concept of engagement being a meaningful, respectful partnership between schools and their parents, whānau, and communities (tki.org.nz), and highlights the importance of the reciprocal nature inherent in positive classroom cultures. It is important to go beyond just peer to peer equity in which students value each other's opinions and rights in the classroom. They should include teachers in a cooperative horizontal model, thereby facilitating true democratic classroom cultures, built on learning communities, inclusion, and the social aspects of learning (Ferguson-Patrick, 2012). As Ferguson-Patrick (2012) argue by having open minds and valuing others points of views - not just peers - students will be more ready to accept diversity which will encourage civic and social engagement.

#### *2.4.2 Classroom Culture - Conclusion*

This study views classroom culture and its development through collaborative pedagogies between students and teachers as a key construct within engagement. Classroom culture can be viewed as an organic ecosystem in which students and teachers’ educational wants, needs, perspectives and prior experiences interact in a mutualistic manner built on relatedness and relational development. This study views relatedness and how it develops as a critical factor in building positive and collaborative classroom cultures, which underpin engagement. Instruments were used that collected data from the perspective of students and teachers that measured aspects of classroom culture, including relational measurements within the classroom, both between students and teachers and student peer relationships, levels of respect shown, expectations held by students and teachers and the provision of learning activities using digital tools.

By fostering positive and collaborative cultures built on the development of effective, empathetic, reciprocal, and open relationships in social contexts, engagement can be influenced. As Ellerbrock et al. (2015, p. 48) argue “through establishing caring relationships with students, teachers cultivate classroom communities that propagate care and promote academic success” Dunleavy and Milton (2009) argue this relational development promotes adaptive capacity, self-sufficiency, resilience, confidence, and knowledge of themselves as learners. In this way learners gain autonomy, becoming more independent and self-regulated in their learning, thereby gaining agency.

Equally importantly classroom cultures today need to build 21<sup>st</sup> skills (see section 3.2.3, pp. 31-34). Use of TEL helps to develop such vital skills, needed for the future workplace (Obi et al., 2016), whilst at the same time facilitating improved classroom cultures. As Wade et al. (2013, p. 164) argue “appropriate technology can be hugely helpful in providing students with tools to become productive learners and assist in creating a learning environment that permits active engagement in content that would not otherwise be readily available.” With overall increased engagement classroom cultures improve reciprocally. The implementation of Padlet and Flipgrid, as part of TEL, can facilitate the development of these 21<sup>st</sup> century skills alongside propagation of positive collaborative classroom cultures, as envisaged in this study.

#### *2.4.3 Student Agency – An Important Construct Within Engagement*

Like engagement and classroom culture, agency is an important concept with extensive research in the social psychological field. Bandura (2001) argues that people have some level of control, or self-efficacy, over their lives, with a degree of autonomy, ameliorated by outside social influences, to make choices that advance their positions. This idea of agency has entered educational research. Reeve and Tseng (2011) argue that students take up agentic positions, take ownership of their work and engage through a process of active choices when constructively contributing into the flow of the instruction they receive. They identify agentic engagement as an additional construct, alongside behavioural, emotional, and cognitive engagement that helped explained variance in academic achievement. Going further Klemencic (2017) conceptualises student agency as a process of student actions and interactions with their environment which encompasses agentic orientation (“will”), the way students relate to past, present, and future in making choices of action and interaction, and of agentic possibility (“power”), developed by individuals in social contexts.

Barton and Tan (2010) describe agency in science where students develop their personal identities, aiming to improve their personal positions making the world more just through a transformational process. Agency is developed through exposure to the subject matter and how students interact with it. Teachers’ roles are to provide classroom structures and resources that promote interest and engagement through interactions with the science contexts, thereby enhancing agency. Siry and Lang (2010) discuss agency in terms of affecting social change aligned with values and aspirations through changes in structures and resources put in place in the classroom. This is built on cogenerative dialogues between students and teachers, as equals, which collaboratively construct more relevant and local contexts with the intent of improving the learning of students (Roth & Tobin, 2001). Goulart and Roth (2010) describe agency, also in science, as a social dialectic in which participation is intrinsic to agency. This is a collective process between students and teachers, where teachers act as facilitators with less cogeneration, providing structures and resources to enable student agency. Arnold and Clarke (2014) also highlights the relational aspect of agency, in science education, where students position themselves through a discursive, social process, supported by teachers leading to construction of schema. Martin (2016) builds on this discursive social aspect of agency, where

students position themselves with conversation by negotiating meaning as social acts, where this act is a function of action.

One of the key indicators and concepts in promoting student agency is student voice. This goes further than horizontal and collaboratively constructed models to a transactional student led model. This in turn fosters supportive and motivational learning environments (Reeve, 2013) in which students gain autonomy transforming into proactive and self-regulated learners who self-observe, self-reflect, and self-react (Zimmerman & Shunk, 2011). In practice this process operates when students ask questions and enter discourses with teachers and peers and express opinions and preferences, including likes and dislikes, and suggestions on how to improve the teaching and learning (Reeve & Tseng, 2011). In this way student voice fosters student empowerment and active participation in teaching and learning, where students are part of learning communities (Rector-Aranda & Raider-Roth, 2015; Rudduck, 2007). This can lead to self-determination, improved achievement for more marginalised students, and generally elevated levels of participation and self-reflection (Toshalis & Nakkula, 2012).

#### *2.4.4 Agency – Conclusion*

Agency is an important construct that affects both classroom culture and engagement. Agency can be viewed as another mutualistic organic ecosystem affected by interaction between students and teachers, where both stakeholders make choices in how they are going to interact with each other and learning activities. This study's view of agency then, is more aligned with the OECD (2018) idea of co-agency. Instead of it being a student construct, it involves students and teachers learning and growing together as they interact and build relatedness.

Like classroom culture, agency is dependent on relational development. For agency to develop students and teachers need to participate as individuals and within groups in social contexts built on supportive, relational developments through collaborative processes, including learning activities. Again, like the classroom culture construct this study examined relationships between the key stakeholders, alongside the implementation of Padlet and Flipgrid, to determine if there was an improvement in agency. From this it can be seen that classroom culture and agency are interdependent of each other, a key paradigm of this study.

Data was collected from the perspective of the classroom teachers and the students through student voice. This concentrated on how both stakeholders viewed key choices made in classroom interactions and activities, including collaboration, relatedness and interactions with learning activities. Student voice, a component of agency, is a key determinant of engagement (Rector-Aranda & Raider Roth, 2015). Collection of student voice is an important step in facilitating formations of democratic and inclusive classroom cultures. Seemingly both classroom culture and agency have an important and concomitant relationship with student engagement, which this study examined.

## 2.5 Engagement – Theoretical Model for This Study

### 2.5.1 Theoretical Model - Introduction

By incorporating classroom culture and agency as key constructs, engagement can be founded in more relevant, up to date learning theories, based on social and experiential domains that are key contributors to learning experiences. One such theory is constructivism. According to Harasim (2017, p. 62) “constructivist theory posits that people construct their own understanding and knowledge of the world through experiencing the world and reflecting on those experiences.” Within constructivism there are two main branches: Piaget’s cognitive constructivism and Vygotsky’s social constructivism. Cognitive constructivism focuses on the individual learner whereas social constructivism emphasizes the social essence of constructing knowledge (Harasim, 2017).

This study is not intended to be a critique of learning theories but notes that it is instructive that newer learning theories, such as constructivism are more learner-centric and intrinsically motivated with a focus on “the self-direction, autonomy and growth of the individual through the learning process” (Leonard, 2002, p. 39), helping develop agency and in turn classroom culture. This in turn provides an alternative prism through which engagement can be viewed and defined, namely an examination of a more student centric (Vibert & Shields, 2003) and collaborative view of engagement, in which its’ cognitive, behavioural, and affective dimensions (Hagel et al., 2012) are incorporated. This aligns with flow theory (Csikszentmihalyi, 1990), which is a symbiotic relationship between challenges and skills. Flow occurs due to interest and enjoyment when one’s skills are neither overmatched nor underutilised to meet a given challenge (Shernoff et al., 2003). Flow can be viewed as a classroom factor that allows for understanding the connection between teaching practices and intellectual engagement (Willms et al., 2009) and is a key construct in classroom culture.

Engagement can be viewed on a continuum ranging from rational and technical approaches to more constructivist approaches reflecting a critical democratic worldview, leading to more socially grounded ideas around engagement (Vibert & Shields, 2003). This continuum needs to be viewed critically (Hagel et al., 2012) in order to ensure that definitions and concepts around engagement are not dominated by the elite - those in positions of power, including teachers, school leaders and policy makers. By doing this a more collaborative model of engagement, incorporating student as well as teacher perspectives, built on relational interactions in classrooms, classroom culture and student agency can evolve, leading to the genesis of a theoretical model and definition of engagement germane to this study. Engagement is a relational process (Pianta et al., 2012) and positive-teacher - student relationships in secondary schooling have a positive effect on student engagement (Fredricks et al., 2004; Roorda et al., 2011). In Hattie’s seminal work on visible learning and effect size on student achievement, teacher - student relationships have an effect size,  $d$  of .72 (with a hinge point of .40). This is ranked 11 of all effect sizes (Hattie, 2009). By focusing on relationships more cognisance of students’ social constructs can be considered that help inform their learning and potential engagement. As Zyngier (2008) argues linking engagement and academic success as a function of the individual ignores the contribution of gender, socio-cultural, ethnic, and economic

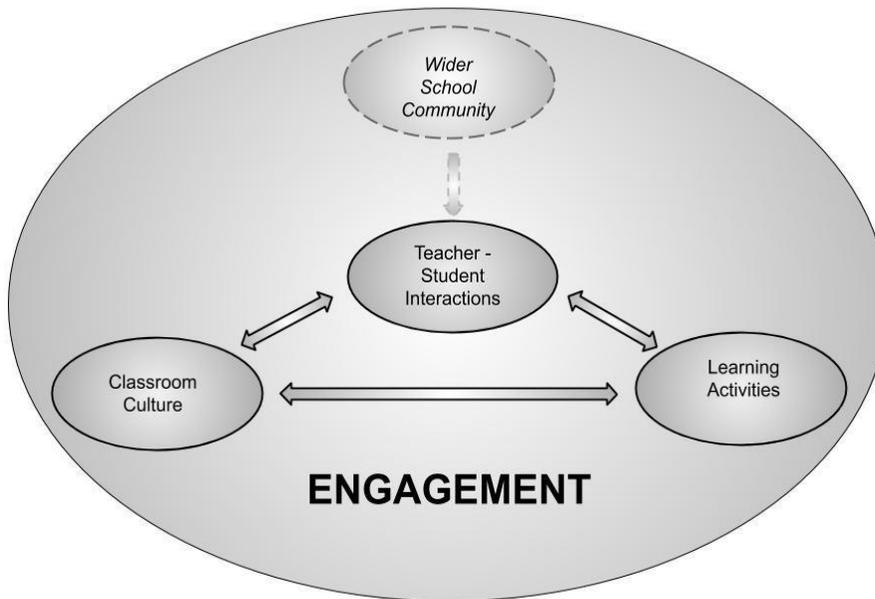
status, as well as different stakeholder perspectives, as factors affecting engagement. There is a reciprocal, collaborative, and social relationship within engagement (Patrick et al., 2007; Reeve, 2009; Reschly & Christenson, 2019; Wylie & Hodgen, 2012).

### *2.5.2 Theoretical Model - Defined*

At the start of this chapter several key stakeholders and their perspectives on student engagement - teachers, students, and the wider community - were identified. This aligns with how the MOE (NZ), through TKI, define engagement in inclusive school cultures. In precis this is dependent on relational development between all concerned stakeholders. This takes a macro level view of engagement where the wider community, much like a third leg of a stool, are vital in supporting engagement that is promulgated in classrooms, at a micro level. Without this support, akin to removing this third leg, engagement will fall. Although this support is important in determining prior beliefs and values brought into classrooms, as well as providing ongoing support, it is implied in this study.

In the context of this study engagement is being studied and defined at a micro level of the individual classroom, focusing on teachers and students as stakeholders and actors in promulgating engagement. Considering this, this study outlines a theoretical model of engagement, which builds on how Kindermann and Furrer (2009) define classroom engagement as students' active involvement in classroom learning activities. Engagement can be viewed as a mutualism between classroom culture and involvement in learning activities, as part of a cyclical and reciprocal process between teachers and students' interactions.

This process has resonance with the Te Kotahitanga educational initiative, started in NZ in 2001, aimed at improving educational outcomes of Māori students, (Bishop et al., 2003). As Bishop et al. (2009, p. 735) state this PL programme aimed at creating an effective teacher profile operationalised "Māori people's cultural aspirations for self-determination within non-dominating relations of interdependence, through developing classroom relations and interactions and in-school institutions for this purpose." This development of classroom relatedness was done through collection of student voice, building of relationships between teachers and students and placing learning activities in culturally contextual settings. This PL programme ran for a number of years in this study context, but ceased operations, due to lack of funding, before this study occurred. However, the key Te Kotahitanga constructs are cornerstones in developing positive classroom cultures and agency. These are key constructs in the model of engagement that this study proposes, which is shown in figure 2.3.

**Figure 2. 2***Theoretical Framework of Engagement*

This mutualistic relationship also has resonance with the theoretical bioecological model of student engagement put forward by Cavanagh et al. (2008). This framework, premised on the symbiotic theory of flow (Csikszentmihalyi, 1990) and built on bioecological theories of human intellectual development (Bronfenbrenner & Ceci, 1994) defines engagement as “a balance between the student’s capability for learning and the expectations of learning in a particular learning environment—both capability and expectations are context specific” (Cavanagh et al., 2008 p. 9). Learning capabilities align to Flow Theory skills and learning expectations align with Flow Theory challenges.

Human intellectual development can be viewed as evolving through the development of proximal processes - empirically assessable mechanisms - that provide opportunities for intellectual growth where both genetics and environment (distal resources) motivate intellectual growth (Bronfenbrenner & Ceci, 1994). Proximal processes can be viewed as learning activities that challenge and promote interest and cognitive development in the learning environment, at the microsystem level. Bronfenbrenner (1994, p. 1645) classified this microsystem as being “a pattern of activities, social roles, and interpersonal relations experienced by the developing person ... with particular physical, social, and symbolic features that invite, permit, or inhibit, engagement in sustained, progressively more complex interaction ... in the immediate environment.” This microsystem is nestled within a ring of expanding systems - mesosystem, exosystem and macrosystem (Bronfenbrenner & Morris, 2007). There is seemingly more scope to affect these proximal processes positively, leading to improvements in engagement, through interactions within the classroom. Even more pertinently these proximal processes occur in social settings affected by the degree

and quality of the interactions between the stakeholders in the microsystem. Where these are respectful, empathetic, and more equal in a reciprocal nature, leading to positive classroom cultures and increased student agency, there is even more scope for improved cognitive competence (Bronfenbrenner & Ceci, 1994) through increased engagement.

### *2.5.3 Theoretical Model - Conclusion*

The theoretical model of engagement that this study takes suggests that the mutualistic relationship between classroom culture and learning activities determines engagement and can be positively impacted through improved classroom culture supported by improvements in agency. This leads to a concomitant and reciprocal improvement in engagement. This is the premise of this study and its' focus of measurement through the collection of data from the perspective of the identified key stakeholders focusing on classroom culture and agency as important contributory constructs within engagement, as well as engagement as a standalone overarching construct.

As Shernoff et al. (2016) argue if engagement is due to the reciprocal interaction between learners and a learning environment, teachers can change engagement by affecting the learning environment. In this study's model the learning environment, encompassed within the classroom culture, is a complex dynamic that is made up of environmental challenges and support (Shernoff et al., 2016). Environmental challenges include opportunities for conceptual and language development; challenging, complex, and situated tasks; clear goals; importance or relevance of the activity, and expectations and assessments for mastery (Shernoff et al., 2016). Environmental supports include motivational support; supportive relationships; interactivity and transactional learning; performance feedback, and active hands-on learning (Shernoff et al., 2016). In the context of this study environmental challenges equate to the introduction of the new learning activities, facilitated through the implementation of Padlet and Flipgrid, and environmental supports equate to the relational development and relatedness and its effects on classroom culture supported by agentic choices made alongside such developments.

By building positive inclusive, collaborative, and democratic classroom cultures through supportive and respectful, discursive relationships through improvements in agency and increased social engagement, it is envisaged that more time will be willingly spent on learning activities. This will negate any behavioural issues and increasing intellectual engagement. With increasing agency and discourse students will feedback more to teachers and learning activities, in a cyclical, iterative, interactive, and mutually supportive process.

## **2.6 Engagement -Measured.**

### *2.6.1 Measurement - Introduction*

Although a critical analysis of the range of measurement tools is outside the scope of this study some understanding of how engagement has been measured is important. To determine a baseline level of engagement and subsequent levels of engagement after any intervention there needs to be a method for measuring engagement,

or parts of the meta construct. Over the last 25 or so years there has been considerable focus on measuring student engagement, both at tertiary and secondary level, with a considerable number of measurement tools available.

### *2.6.2 Measurement - Discussion*

Earlier measurement tools were developed mainly at the macro, or whole school level. For example, in 2011, twenty-one instruments, with 14 being student self-report instruments, 3 being teacher report instruments, and 4 being observation instruments, were identified (Fredricks et al., 2011). Subsequently additional instruments have been developed. Earlier examples include the National Survey of Student Engagement (NSSE) and the Community College Survey of Student Engagement (CCSSE) reported in Kuh (2009) amongst others at tertiary level. Earlier secondary level tools include the Research Assessment Package for Schools (RAPS-SM) (Wellborn & Connell, 1987), National Educational Longitudinal Survey (NELS) in 1988 and the School Engagement Instrument (SEI) developed by Appleton and Christensen 2004 (Appleton et al., 2006). According to Singh et al. (2002) these macro scale diagnostics have helped standardise and systematically improved measurement models for school engagement.

A key paradigm of the SEI was a shift away from tools that have predominantly focused on easier to measure quantitative data such as attendance, behaviour, standardised test scores, and truancy or graduation rates that have ignored levels of student engagement in learning (interest, time on task, enjoyment in learning (Appleton et al. 2006; Taylor & Parsons, 2011). Such indicators have generally been categorised under academic and emotional constructs, as put forward by Christenson (2012, p. 496) when stating that these include the “amount of participation in academic work and interest and enthusiasm exhibited by students.” The focus of the SEI was to measure cognitive and psychological aspects, including less observable, more internal indicators, such as self-regulation, relevance of schoolwork to future endeavors, value of learning, and personal goals and autonomy (Appleton et al., 2006). These types of indicators have been viewed as being harder to measure (Appleton et al., 2006), more abstract (Harris & Goodall, 2008) and needing a higher degree of inference (Fredricks & McColskey, 2012). To gain student voice a 4-point Likert scale - from strongly agree to strongly disagree - was used to assess cognitive and psychological aspects with the intention of avoiding high and perhaps erroneous inferences about the students’ personal competency beliefs, desire to persist toward goals, and sense of belonging (Appleton et al., 2006).

Although school wide measurement tools are important on a macro level, it is important to be able to observe, infer and measure engagement at the individual classroom, or micro, level to inform individual teachers and subjects. Such classroom measurement tools have been lacking with initial engagement tools (Fredricks et al., 2004). As Wang et al. (2014) state when developing the CEI (Classroom Engagement Instrument), classroom engagement tools are appropriate when investigating the effectiveness of classroom interventions; evaluating student perceptions of classroom cultures and how engagement can be improved and interrogating the link between engagement and learning in individual classes. The CEI, like other instruments measures particular aspects of

engagement, in this case the affective, behavioural, and cognitive dimensions, through a self-report tool (Wang et al., 2014).

According to Yazzie-Mintz (2006) collecting student voice through self-reporting is the most appropriate, important, and prominent methodology to do this. Reeve and Tseng (2011) used this methodology in their development of a tool to measure agentic engagement, alongside behavioural, emotional, and cognitive engagement through a 7-point Likert Scale, ranging from strongly disagree to strongly agree. However, for best practice student voice should be positioned prominently within a range of instruments, including experience sampling, teacher ratings, interviews, and observations (Fredricks & McColskey, 2012). Using multiple methodologies obviates any inherent biases in individual tools. These include lack of honesty and anonymity in student voice (Appleton et al., 2006); teachers inferring, exhibiting bias, and lacking in interviewing and observational skills (Fredricks & McColskey, 2012), and allows for a multitude of perspectives. This rationale lies behind the development of another classroom-based instrument the Teaching Through Interactions (TTI) framework by Hamre and Pianta in 2007 (Pianta et al., 2012). This is a relational based instrument designed to measure engagement through emotional support, classroom organisation and instructional support in which observations are an important component. Similarly, Shernoff et al. (2016) used both a real time student self-report tool, the Experiential Sampling Method (ESM) and video observations and instrument, the Optimal Learning Environments – Observational Log and Assessment (OLE-OLA). The ESM, developed by Csikszentmihaly and colleagues in 1977, is a psychometric real time self-measuring tool, obviating the need for remembering and reconstructing events, that can measure cognitive, emotional, motivational, and behavioural aspects of social interactions, using Likert scales and descriptive statistics (Larson & Csikszentmihalyi, 2014), including student engagement. Shernoff et al.'s (2016) use of this tool, like the SEI and other instruments are invariant, in this instance regarding grade. In this way instruments can measure across different cases, be that grade / age level, subject area, ethnicity etc.

### *2.6.3 Measurement – Conclusion*

By focusing on the mutual nature of engagement between learning activities and classroom culture, built on teacher and student interaction from the perspective of students and teachers this study took a more multidimensional model of measurement at the micro level of the classroom. This was somewhat akin to Cavanagh and Waugh's (2004) student self-report instrument, which examined the learning environment including student educational values, learning outcomes, and how these are impacted by the attitudes and behaviours of classmates, the teacher, and parents (Cavanagh, 2015), although teacher perspectives were also collected.

In the context of this study this involved interviews, online surveys, and lesson observation instruments at two different points in time, designed to collect data from the perspective of the students and teachers, focusing on perceptions around classroom culture, agency, and engagement, as outlined in chapter 4. To gather data on classroom culture, in line with the view that this study takes, stakeholder perspectives were gathered on relationships and interactions within the classroom. To gather data on agency, in line with how this study views it, perspectives

were gathered on choices that students primarily, were making with regards to how relationships and interactions, including with learning activities, manifested. To gather data on levels of engagement, perspectives on actual engagement with learning activities were obtained.

## **Chapter 3: Digital Tools and Technology in Education**

“Education is the passport to the future, for tomorrow belongs to those who prepare for it today.”

Malcom X

### **3.1 Preface**

This chapter focuses on digital technology use in teaching and learning. After discussing why digital technologies in a broader sense, are a key impetus within education, a rationale as to the choice of the two digital tools, Padlet and Flipgrid, being utilised as a pedagogical intervention in the study will be discussed.

### **3.2 Technology and Increasing Engagement - Why use Technology and Digital Tools?**

#### ***3.2.1 Background Rationale***

The world is rapidly evolving, more globalised, and interconnected, due to significant and rapid technological developments that impact daily life causing significant societal changes, locally, nationally, and internationally. Society is becoming more dependent on technology. An important indicator is the development of the world wide web and the internet. Although in its infancy, having only been developed in 1989, its reach, use and influence has proliferated exponentially. This is highlighted by figures 3-1 - 3.3 which show the rate that internet use has become widespread.

**Figure 3. 1**

*Global Internet Use In 1990*

**Share of the population using the Internet, 1990**

All individuals who have used the Internet in the last 3 months are counted as Internet users. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.



Source: World Bank

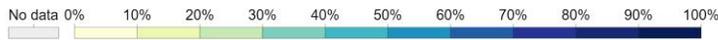
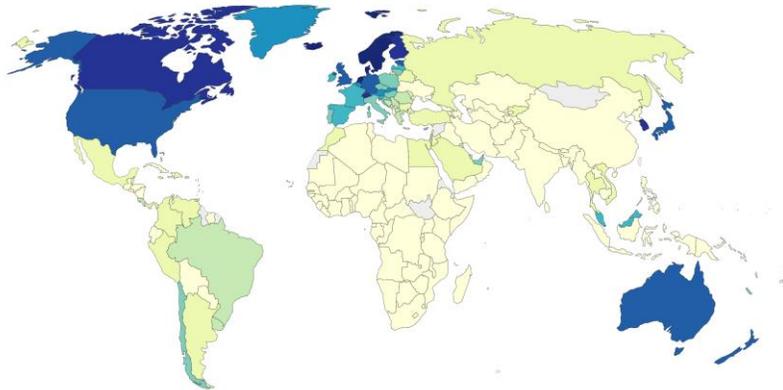
OurWorldInData.org/technology-adoption/ • CC BY

**Figure 3. 2**

*Global Internet Use In 2005*

**Share of the population using the Internet, 2005**

All individuals who have used the Internet in the last 3 months are counted as Internet users. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.



Source: World Bank

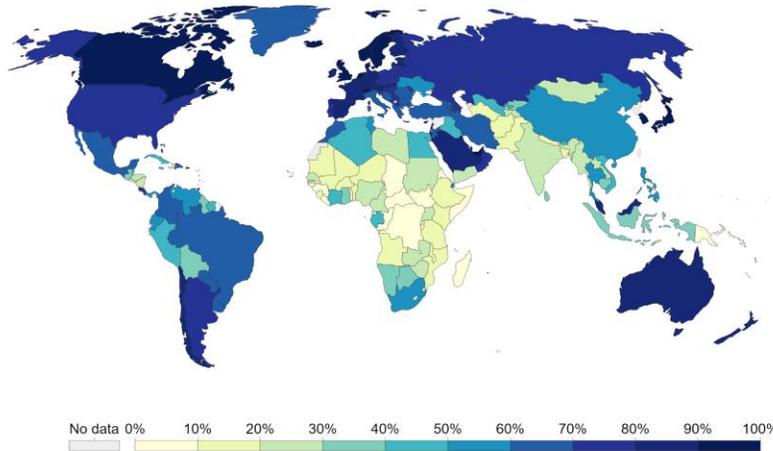
OurWorldInData.org/technology-adoption/ • CC BY

**Figure 3.3**

*Global Internet Use In 2017*

Share of the population using the Internet, 2017

All individuals who have used the Internet in the last 3 months are counted as Internet users. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.



Source: World Bank

OurWorldInData.org/technology-adoption/ • CC BY

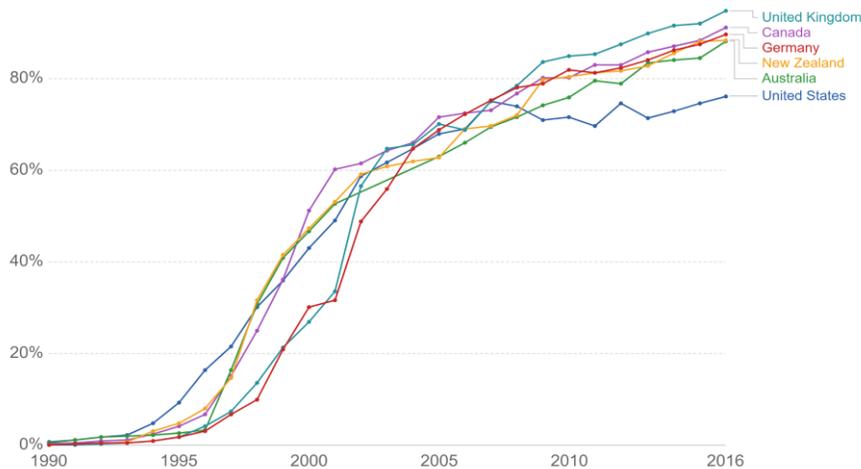
As figures 3.1-3.3 show proliferation is increasing almost everywhere in the world, with rates of usage in excess of 80% in some of the more developed countries, as shown in figure 3.4.

**Figure 3.4**

*Population Percentage Use of the Internet for Selected Developed Countries*

Share of the population using the Internet

All individuals who have used the Internet in the last 3 months are counted as Internet users. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.



Source: World Bank

OurWorldInData.org/technology-adoption/ • CC BY

The range of ever-expanding tools, platforms and apps that are continually evolving is noteworthy. Mobile phones came onto the scene in the early 1980s (EdTech Staff, 2018), followed by social media starting with

Myspace then Facebook in the early 2000's. This led to the evolution of tablets and iPads and the genesis and evolution of smarter and smarter phones from the late 2000's to 2010, to VR and AR, driverless cars, Bluetooth, remote control of household appliances, web 2.0 and the IoT (internet of things) etc. Technology will continue to evolve, changing societies and interactions. This will impact the lives of school aged children mostly, in the 21st Century, who are the most frequent users of emerging digital and online services (OECD, 2016). Access is increasing at younger ages, partly facilitated by touch screens and tablets, parental access, and ownership of smartphones (Graafland, OECD 2019). Helsper (2012) argues that access to the internet needs to be viewed in overall terms of quality, ubiquity, and mobility, which encompasses technical, social and critical skills, individual and social motivations and benefits, and ongoing and effective engagement through content creation and interaction. This impact on lives and society in general is so important and encompassing that several countries, including Estonia, Finland, France, and Spain have declared that internet access is a human right (United Nations, 2011).

Pacansky-Brock (2017) argues education must mirror societal change and become contemporary. By integrating digital tools into learning activities in classrooms education is starting to do this. This needs to be, and is, supported by theory, as well as policy (Conrads et al., 2017; Thomson, 2015) in educational practice (Brown, 2018; McKnight et al., 2016; O'Dwyer et al.; 2004; Peoples et al, 2014; Yarbrow et al., 2016). Conrads et al. (2017) reviewed policies from 43 countries, including the DER (Digital Education Revolution) in Australia, in which all European countries had formulated national policies for ICT in 2011. Thomson (2015) quoted a statement in Australia, by the Ministerial Council on Education, Employment, Training and Youth Affairs (MCEETYA) and the then Ministerial Council for Vocational and Technical Education (MCVTE) that stated, "Australia will have technology enriched learning environments that enable students to achieve high quality learning outcomes and productively contribute to our society and economy" (MCEETYA, 2008, p. 1).

In New Zealand, the provision for a digitally rich curriculum is reinforced in the MOE statements of intent and the 4-year plan, where the Digital Strategy supports innovative learning It will enable better access to and use of data and information to support evidence-based decision making, alongside access to digital learning opportunities to support 21st century practice in teaching and learning (p. 36). The MOE's SOI (Statement of Intent) #1 (2014-2018) includes "strengthening the capability of teachers and school leaders to integrate the use of digital technologies with effective teaching and leadership practices"(Ministry of Education, 2014, p. 18); and the SOI #5 includes " making online learning environments and digital technologies integral to high-quality teaching and learning to better engage children and students, and their parents, families, whānau and communities" (Ministry of Education, 2014, p. 22). This has led to the development of a new digital competencies learning area in the NZ curriculum, which is being integrated, starting in 2020 ("Technology / The New Zealand Curriculum / Kia Ora - NZ Curriculum Online", 2019).

Development and implementation of policies impelling curricula changes at the macro (school) level as well as at the micro (classroom) level are causing teachers to integrate technology, leading to educational environments

that leverage digital technologies to generate content, enhance collaboration and cultivate participatory student-centered learning activities (Pacansky-Brock, 2017). There is a transition from older didactic styles of education to more interactive, connected, relevant pedagogies, aligning with more recent educational policies and changes that involve student-centered learning, a knowledgeable, responsive, and rich curriculum, and use of assessment data to plan for individual student's inquiry learning (ERO, 2012). Such policies and changes underline the drive to implement digital tools and apps into teaching and learning, which this study is replicating. They also align with this study's premise that such changes facilitate improvements in classroom culture and agency, by focusing on collaborative and participatory interactions.

By starting conversations around the rationale for implementing technologies into teaching and learning, educators may develop greater understanding of the why, thereby alleviating some of the inherent bias exhibited by some teachers. This can be due to feeling confused, intimidated, and frustrated by technologies (King, 2002); alongside unfamiliarity, lack of skills, and infrastructure issues (Levin, 2009). There is a move from traditional non digital methods, through digital versions of more traditional didactic methods to more transformational and dialectical methods in which technology becomes part of effective learning activities. This is challenging (Cuban & Tyack, 1995), often at variance with teachers' beliefs around ICT (Levin, 2009) and aggravates time issues. As Harris et al. (2016) argue, teaching does not become easier due to the technology that is in place in the classroom. Professional development is recognised as vital for successful implementation and integration of teaching and learning activities with digital technologies (Cavanaugh et al., 2011; King, 2002). Cavanaugh et al. (2011) when evaluating the State of Florida's Leveraging Laptops: Enhancing Education Through Technology (FEETT) initiative of 2006-2007 determined professional development alongside ongoing systematic support as being vital for successful integration of technological processes in education.

### *3.2.2 Technology and Education - What Does the Evidence Say?*

Alongside understanding the rationale for implementing technologies questions around whether digital technologies work in increasing engagement and student achievement need addressing. It seems intuitive that they work but the veracity of this is still discussed by teachers, certainly in the context of this research, in part fed by the 'fear of change, which can be due to work overload and / or lack of confidence (Curtis, 2005; Genet, 2013). According to Avidov-Ungar and Forkosh-Baruch (2018) teachers need emotional, technical, and pedagogical support to help overcome issues around work overload and fear of change.

Researchers argue that technology has positive effects on student engagement, motivation, and outcomes. There is a growing body of evidence, both internationally and in New Zealand, highlighting the positive effects of technology (Wright, 2010). In 2005 the OECD stated that technology integration can lead to "more dynamic interaction between students and teachers, increasing collaboration and teamwork in problem-solving activities, stimulating creativity in both students and teachers, and helping students to control and monitor their own learning.

(OECD, 2005, p. 9).” By increasing motivation and engagement Sivin-Kachala and Bialo (2000) in a critique of 311 studies concerned with technology integration and achievement, found that TEL environments caused significant gains and achievement, along with improved attitudes towards learning and better self-esteem, for all students in all subject areas, from preschool to high school, including special needs students.

In a science context a study by BECTA from 2009 found evidence that technology rich classrooms had an average of a term’s gain in Key Stage 3 (KS 3) science, where students are aged 11-14 and a move from grade D to C equivalent to 52,484 students in GCSE science (Underwood, 2009). Other studies found evidence at primary level. For example, Wright (2010) stated that benefits have been seen to be better at primary school, as opposed to secondary school when reviewing another BECTA study in 2006. Balanskat et al. (2006) agree with this point when stating that there was more of a positive effect in primary schools, in a European study, especially in English, to a lesser extent in science with none in maths.

However, although numerous international reports have stated the benefits, there is some ambiguity in empirical evidence to support assertions that actual improvements in student achievements and outcomes have and do occur. This has been termed an international doxa of evidence, as stated by Wright (2010). Doxa is a term coined by Pierre Bourdieu and refers to something perceived as a given fact, but which may not be so. Research into the efficacy of implementing 1:1 digital tool and their effect on student academic achievement and motivation by Harris et al. (2016) further highlights this doxa, with an overall deduction that technology does not increase student academic achievement and motivation. In critical reflections on the benefits of ICT in education Livingstone (2012, p. 19) examined the ambiguous evidence supporting technology integration, stating that it is “far from proven that greater pedagogic benefits result.” Although, Livingstone (2012, p. 19) did go on to state “even if it produces only moderate improvements in basic literacy and science, while also enhancing pupil motivation and compensating for some forms of disadvantage, this would still be a valid enterprise.”

### *3.2.3 21st Century Education and Technology*

Trends in internet access and usage highlight that today’s students are far more immersed and digitally connected. They bring these experiences, likes and tools into their learning spaces, which are changing, in response. By facilitating changes within learning environments to be more collaborative and social through modern, relevant technologies, teachers have the scope to improve students’ sense of belonging within learning environments as their social contexts, language and experiences are part of the learning interactions. A sense of belonging is closely connected to the concept of relatedness. As Niemi and Hotulainen (2015) argue students’ sense of belonging in schools is built on membership and the relatedness that individual students feel with their peers and teachers and is associated with motivation and level of academic achievement. This builds on Cemalcilar’s (2010) model of belonging that students with more positive relationships in the school environment, particularly positive social

relationships, feel more of a sense of belonging. This idea of a sense of belonging encompassing relatedness and social interactions ties in with how this study views engagement.

Such findings have been documented globally, including in Australia and New Zealand. In Australia use of mobile phones, for example, in a supportive and collaborative process with teachers, allowed indigenous students in the Northern Territory to bring their cultural knowledge into learning environments (Hartnell-Young & Vetere, 2008). Bishop and Berryman (2006) reported similar results in New Zealand classrooms where Māori and Pasifika students, particularly, can experience positive classroom experiences when co-constructivist approaches were facilitated allowing students to bring their cultural experiences into the classroom. Such approaches can be enhanced through technologies, such as mobiles and tablets. When exploring the idea of making more use of mobile phones, as part of a range of digital tools and apps, Rogers and Price (2008) found that they can be leveraged to enhance creativity and collaborative inquiry learning.

It is important that such changes are implemented as part of effective teaching and learning strategies, not on an ad hoc basis. Many young people, although technologically literate regarding social networking and using mobile technologies as everyday tools may still be neophytes when it comes to understanding how to use them in purposeful educational ways (Wright, 2010). Implementation needs to be designed to increase engagement, including socially and intellectually, through classroom culture and relationships. According to Dunleavy and Milton (2009) instructional choices designed with intellectual engagement as a goal include authenticity, connections across disciplines, authentic assessments encouraging goal setting, promotion of student ownership, support of student voice and autonomy through agency, promotion of collaboration, encouragement of social aspects of education including social networking through digital technologies and building of students experiences of learning both inside and outside of the classroom facilitated by digital technologies.

Students need to be future focused and oriented to be able to be effective contributors in today's and tomorrow's Knowledge Age. This Knowledge Age, which researchers argue we are now in, in the 21<sup>st</sup> Century (akin to earlier ages, such as the Industrial Age), involves creating and using new knowledge, facilitated through education (Paavola et al., 2004), to solve problems where ideas about knowledge have emerged in the world outside education. This is driven in large part by economic, social, and political changes, often facilitated by new technologies (Bolstad et al., 2012). These newer ideas about using, creating, and sharing knowledge underpin future focused learning and teaching for 21st learners in New Zealand, for example, which is pushing this idea as part of GELP (Global Education Leader Programme). As Anthony Mackay, Co-Director, Global Education Leaders' Program says "21st century learning needs to be the game everywhere for everyone, so that all young people will thrive (Bolstad et al., 2012, p. v)."

According to the MOE (NZ) future focused education centres around personalised learning embracing diversity. It facilitates rethinking learners' and teachers' roles and forging new partnerships underpinned by innovation and new technologies (Bolstad et al., 2012), predicated by the argument that the moral purpose of

education is to produce citizens who can live and work productively in increasingly dynamically complex societies (Fullan, 2001). Such views highlight the importance of utilising a range of digital tools and apps into collaborative learning environments that allow for personalised learning pathways. This is easier to facilitate when teachers base teaching and learning on more relevant, newer theories of education, such as collaboration, constructivism and connectivism. As Levin (2009) states the connection between technology application and constructivist pedagogy implies that constructivist-minded teachers provide dynamic student-centered classrooms where technology is used and conceived as a powerful learning tool. According to Dabbagh and Kitsantas (2012) TEL environments facilitate personalised learning allowing students to proceed at their own pace. Personalised learning involves teachers addressing engagement and learning by focusing on individual student needs, preferences, values, and capabilities, thereby fostering student self-autonomy and self-reliance (Prain et al., 2013) with the capacity to produce agency, social learning, self-regulation and autonomy, and collective intelligence and distributed expertise (Prain et al., 2013).

Such concepts are generative of, and reinforce the premise of preparing, future focused lifelong learners with vital twenty first century skills (Ananiadou & Claro, 2009; Brown, 2018). Trilling and Fadel (2009) argue that students in the 21<sup>st</sup> century need a range of skills, including critical thinking, problem solving, collaboration and team working, communication and social and cross-cultural connections. These skills enable students to think logically in order to be able solve problems and become successful contributors in the 21<sup>st</sup> century. According to Trilling and Fadel (2009) these critical 21<sup>st</sup> skills fall into four key domains: core subjects and skills; learning and innovation skills; career and life skills, and digital literacy skills (Trilling & Fadel, 2009).

According to Cavanaugh et al. (2011) students develop capacities to act as problem solvers, whilst working together in more horizontal hierarchies, when immersed in technology rich environments. Knowledge becomes an active state applied to solving problems using technology. Within TEL environments individual and social capacities to construct knowledge improve (Swan et al., 2007). This social construction of knowledge has positive implications for student - teacher relationships, classroom culture and building co-agency, especially where learning environments are more horizontal and collaborative in nature.

In the Future of Education and Skills 2030 project, the OECD (2018) argued that agency is a key concept and an essential 21<sup>st</sup> Century skill. This involves taking ownership of choices helping participation in the world by positively influencing people, events, and circumstances. To develop agency learning environments need to foster collaboration and be cognisant that all learners are individuals. Although needing personalised learning they are still influenced by relationships with teachers and peers, as well as families and wider communities, which provide additional support. Learning needs to be built on solid literacy and numeracy foundations, which are vital in this era of digital transformation (OECD, 2018) as part of what the New London Group terms multiliteracies (Wright, 2010). Multiliteracies factor in cultural and linguistic diversity along with the agency of constructing meaning which are potentially enhanced through digital technologies (Wright, 2010).

Within the 21<sup>st</sup> century learner skills, multiliteracies are encompassed within the core skills domain of reading, writing, numeracy, and digital literacies, including computing literacy, information literacy, ICT literacy and media literacy. Digital technologies have a vital role in helping gain and develop these skills, as they do with collaboration, communications, and interactions, alongside all essential 21<sup>st</sup> century skills. By developing the necessary classroom cultures these 21<sup>st</sup> Century skills become part of the fabric of teaching and learning, especially when founded on technology rich learning environments. As Levin (2009) argues, when technology is used in interpretative and critical-pluralistic cultures it assists both teachers and learners to critically construct knowledge by amplifying, communicating, re-organising, reconstructing, and evaluating cognitive, social, and emotional processes in the knowledge community through more equal discourse.

### *3.2.4 Further Reasons*

A range of other beneficial factors have also been cited in support of making more use of digital technologies in education. These include the ability to focus on content rather than task (Fredricks et al., 2004); reducing the complexity of an activity and delivering it in smaller more easily manageable pieces - a modern take on scaffolding (Fredricks et al., 2004). These practices are part of situated learning, which is "the notion of learning knowledge and skills in contexts that reflect the way the knowledge will be used in real life" (Collins, 1988, p. 2). Herrington and Oliver (2000) list other elements of situated learning including authentic contexts and learning activities; provision of modelling and multiple roles and perspectives; supporting collaborative construction of knowledge; promotion of reflection and articulation, and provision of authentic assessment. Although Herrington and Oliver (2000) studied tertiary level students they found there were positive implications for using technology - in this case multimedia - within a situated learning programme, especially around reflection, articulation and scaffolding when collaborating with peers. These aspects have resonance with secondary level learning environments, further highlighting the positive implication of integrating technology within learning environments. As McKnight et al. (2016) and Yarbrow et al. (2016) argue technology integration can improve access to relevant, contextual, and current resources, assisting design of learning activities that are relevant and contextual for instance, aligning with elements of situated learning.

Additionally, integrating technology into teaching and learning can assist by making connections with teachers and peers easier; with individualised and different paced learning; providing instantaneous feedback; facilitating shifts towards learner-centric models of learning; restructuring and saving teacher time, as well as; providing the opportunity for students to interact with a larger audience in showcasing and sharing work (McKnight et al., 2016; Yarbrow, et al., 2016). Technology also provides the opportunity for students to add authenticity, leading to more pride and ownership in student work (Fredricks et al., 2004). Equally important, from a science perspective Levin and Schrum (2013) found that teachers' perspectives changed, and they became facilitators leading to development of cognitive processes in students that enhance learning. As Wright (2010) argues students become

more motivated and engaged, so do teachers, who become more student-centered and create active and interactive learning experiences connected to students' prior knowledge and experiences.

### *3.2.5 Conclusion*

Taylor and Parsons (2011) argue that most researchers believe education needs to be transformed to meet the needs of students growing up in a digital world, who are heading into technological and information rich futures. This means integrating technology into teaching and learning, which is a key impetus in the choice of using digital tools as the intervention to examine engagement levels, as is the direction that curricula and policies are taking in relation to increasing technological integration into teaching, learning and assessment, not only in NZ but worldwide. In addition, positive links between effective pedagogical implementation of technology and student engagement and outcomes and development of critical skills for future proofing students, as outlined in the preceding sections, are evident, as argued by Donaldson et al. (2017) when stating that successful online learning experiences create engaged and satisfied learners.

By integrating digital tools collaboratively, student-centered, cooperative learning and increased teacher - student interaction are enhanced (Bialo & Sivin-Kachala, 1996; Wright, 2010), thereby leading to the formation of more positive classroom cultures and increased agency; a key premise of this study. This, then is another rationale for the choice of the two digital tools as is the argument made by Livingstone (2012) that students gain confidence and motivation from using technology in class because they like using it. This study is specifically choosing tools that are collaborative and generic in nature, with potential transferability across curricula.

### **3.3 Technology and Increasing Engagement - How can Technology be Implemented?**

To facilitate implementation of technology effectively, teachers need to be versed in the digital world and skilled in the use of ICT. As a starting point critical discourses (Bryant & Bates, 2015) around shifting the focus from the technology to its use, enabling learning (Stobaugh & Tassell, 2011) through interactions within the ecology of the classroom (Pedretti et al., 1998) need to happen. This reinforces the tenet that engagement is a mutualistic relationship founded on classroom culture and interactions. Furthermore, implementation of digital tools should have cognisance of this relationship. As Waight and Abd-El Khalick (2007, p. 158) argue “the teacher, students, curriculum, pedagogical approach(es), technology, and discourse within classrooms are intricately interrelated.”

Students should be ‘taught’ that technologies are for learning purposes (Harris et al., 2016). Technological tools on their own may not be the panacea for improved achievement and motivation. They need to be implemented in support of effective teaching and learning activities that are contextual, social and collaborative in nature, based on more relevant and up to date pedagogies, including constructivism and connectivism. Implementation needs to be underpinned by teachers’ believing in the transformative role that technology can play. As Levin (2009, p. 144) states “in order to enhance teaching and learning in a technology-enriched environment, teachers’ beliefs on the meanings and roles of learning, teaching and technology have to change.” According to O’Dwyer et al. (2004, p.

15) “the strongest positive predictor of whether a teacher will use technology to deliver instruction, have their students use technology during class and have their students create products is a teacher’s belief about the positive impacts of technology integration.”

Thus, the teacher’s role in effective implementation and integration of technology into teaching and learning is critical. As Wright (2010) argues effective e-Learning opportunities do not happen without a teacher’s deliberate pedagogical actions though creation of learning spaces that promote interaction, collaboration and critical thinking using e-Learning tools in authentic ways. To do this there needs to be effective access to technology, long term planning and support, ongoing training of teachers to ensure they have the requisite skills to implement it effectively and integration into curricular objectives (Noeth & Volkov, 2004). For technology to be best used to support student learning, the environments must: embed authenticity, emphasize knowledge construction, use open-ended learning, include student cooperation and collaboration, and integrate mixed ability levels and differentiated instruction where appropriate and possible (Smeets, 2005).

Mishra and Koehler (2008), in their development of their Technological Pedagogical Content Knowledge framework (TPACK) argued that effective teaching with technology requires teachers to develop sensitivities to the dynamic, transactional relationship between all three components, technology, pedagogy & content. Although there is substantive research showing the positive effects the TPACK model can have on improving teachers’ knowledge and skills in supporting effective integration of technology into classrooms it has largely remained as a theoretical model (Jimoyiannis, 2010), due mainly to the model’s complexity and difficulty in implementation (Cox, 2008). Teachers can be lacking in confidence and self-efficacy in these components, especially technological skills, which is an issue in the context of this study. This can create barriers to effective implementation as argued by Jimoyiannis (2010) in his research around the Technological Pedagogical Science Knowledge (TPASK) framework, for science teachers’ professional development, built on the TPACK model.

These barriers have been classed as both first and second order (Ertmer et al., 2012). First order external barriers including training, support and resources are becoming less of an issue. Second order, internal barriers arise from teachers’ views on technology, their self-efficacy, and its value to teaching and learning, alongside their views on how students learn. Although teacher self-efficacy (Sinclair, 2009) alongside pedagogical and content knowledge (Mishra & Koehler, 2008) are key for successful technological implementation, teachers’ beliefs are also vitally important as to how technology is used in classrooms (Ertmer et al., 2012; Levin, 2009; Waight & Abd-El Khalick, 2007). As Waight and Abd-El Khalick (2012, pp. 2901-2902) argue “understanding the range of technological changes may help to explain how the beliefs and expectations of mature teachers are shaped over time and how these beliefs impact resistance or acceptance of new changes.”

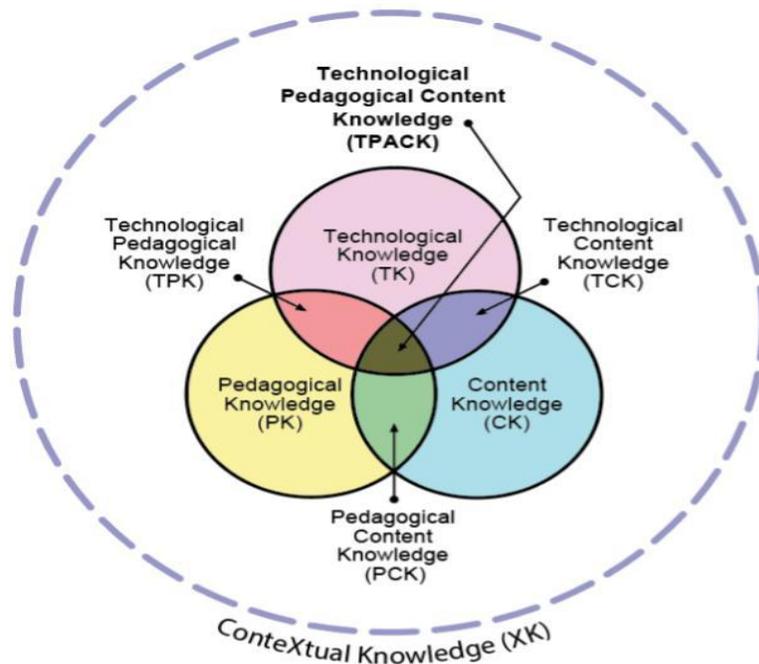
There needs to be a shift in pedagogical practice for effective use, with shifts to constructivist and collaborative paradigms being of benefit. This ties in with increasing student input and voice - agency - and leads to a position which starts to place technology into the hands of students who can start to utilise it to access knowledge

and in ways that develop real life skills in communication, collaboration and problem solving (Ertmer et al., 2012). As Ertmer et al. (2012) point out, collaborating with students in technology use can also reduce teachers' doubts about implementing tools. For example, in the Generation YES program over 50000 teachers gained assistance from students in using technology in teaching and learning. Although such discourses with students are not the focus of this study, they do signpost potential future research around technology use in practice. Notwithstanding this, it is intended to implement simple generic digital tools to assist teacher implementation (Gaffney, 2010), allowing for student input, in alignment with the school culture of collaboration and empowerment of students through co-construction.

By moving away from a narrower and more prescriptive results-based viewpoint of education to a more holistic collaborative, inclusive paradigm founded in more appropriate pedagogies, including constructivism, a greater understanding of the important role that technology can play in transforming education can develop. By implementing the generic digital tools, that require initial minimal technological knowledge, that this study has chosen it is envisaged there can be more effective implementation, with a concomitant positive impact on engagement and outcomes. In this way students can participate more fully and develop skills as lifelong learners ready for the 21<sup>st</sup> century and beyond.

### *3.3.1 A Rationale for Technology Integration in the Context of This Study*

Several issues and arguments made in the preceding section have directed the methodology and choice of generic digital tools to be implemented. This includes the confidence, knowledge and skill levels possessed by the two teachers who have volunteered to integrate the digital tools in their teaching and learning programmes as part of this study. These methodologies are laid out in Chapter 4. Mishra & Koehler's TPACK model, updated by Mishra (2018), shown in figure 3.6, can be used to provide an initial framework for integration of technologies.

**Figure 3. 5***TPACK Model*

Revised version of the TPACK image. © Punya Mishra, 2018. Reproduced with permission

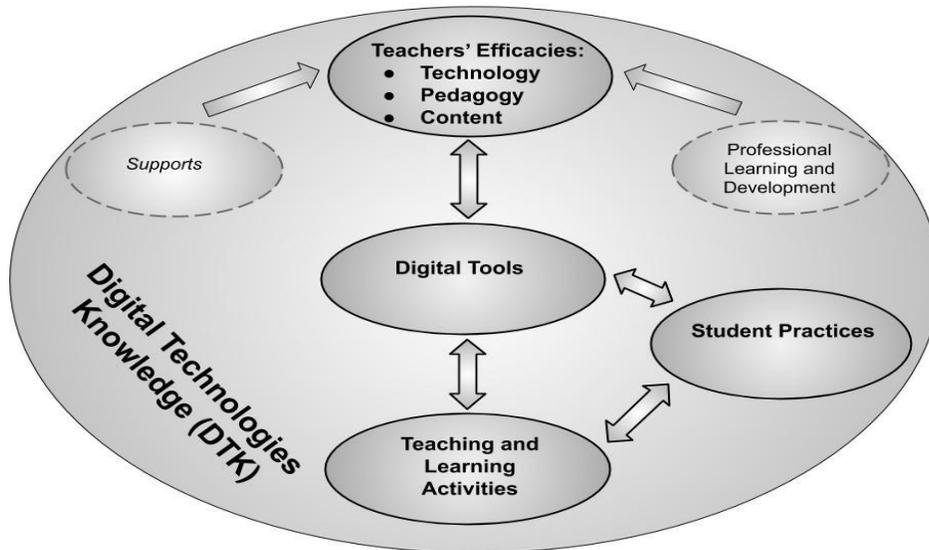
For successful integration teachers need well developed TPACK skills, which evolve through development of Technological Knowledge (TK), Content Knowledge (CK) and Pedagogical Knowledge (PK). Mishra (2018) modified this model to encompass Contextual Knowledge (CK), which includes teachers' knowledge of the types of technologies available to them, along with knowledge of their schools, the area and the policies that influence them. As Mishra (2018) argues Contextual Knowledge, which encompasses TPACK, is critical for teachers to develop, as a lack of it limits teachers' abilities to integrate technology effectively. Contextual Knowledge includes teachers' knowledge of the types of technologies available to them, along with knowledge of their schools, the area and the policies that influence them and (Mishra, 2018). This idea of Contextual Knowledge (XK) has important implications in this study, as contexts are an important consideration in this study regarding students' prior experiences and skills that can be brought into the classroom and be used to build relations and agency.

This study has chosen generic digital tools that don't require high levels of knowledge about specific tools and apps and can be implemented reasonably easily, with a small amount of collaboration and professional support from the researcher. In addition, the design has taken on board the argument made in the preceding sections around teaching students that technology is for learning, utilising their pre-existing skills (where appropriate) to assist teachers and will be seeking collaborative input from students, into the ongoing integration and use of the digital

tools, thereby enhancing collaboration, relational development and co-agency. This has led to the development of a framework for the integration of the digital tools, as shown in figure 3.7, which utilises aspects of the TPACK model (Mishra, 2018).

**Figure 3. 6**

*Theoretical Technology Integration Framework*



In this model underpinning the implementation of the digital tools the teachers' efficacies and confidence in the digital tools will be enhanced through some professional learning and development (PLD) from myself. There will be ongoing support, including general support from the school, such as infrastructure, policies, and programmes, including at department level. This PLD and support will facilitate teacher's integration of the digital tools into learning activities, which due to their genericity and ease of use which will not require a significant time cost. As the students start to engage with the learning activities, which are part of this study's engagement framework (figure 2.2, p. 21), they will start to collaborate with teachers and provide input into integrating digital tools in more effective ways. Due to this mutualistic relationship between the theoretical engagement and integration frameworks the intent of this study is to determine what effect such integration has on student engagement.

### **3.4 Technology and Increasing engagement – What?**

The two tools chosen to determine effects on engagement enhancing collaborative, connected, real time participatory, classroom based (Dembo & Bellow, 2013) active learning experiences, including feedback and assessment for learning, are: Padlet and Flipgrid. Padlet is a free, multimedia friendly wall which can be used to

encourage real-time, whole class participation and assessment (Fuchs, 2014), whereas Flipgrid is an easy-to-use video platform that facilitates modelling of skills: self, peer and teacher feedback; compilation of learning activities, and provides the opportunity to improve student voice (Kompar, 2018) through provision of online discussion forums that help foster personal connections (Green & Green, 2018). By using Padlet and Flipgrid 'neutral non-threatening spaces can be created (Fuchs, 2014) - a digital shared wall for example, in Padlet, or a video platform in Flipgrid - where students who are less vocal, or less confident in their writing skills, for example, will become more confident in sharing ideas and responses, thereby becoming more empowered. These responses can also be shared at any time and can be both individual and collaborative.

According to England (2017) Padlet has been proven to increase student interest and motivation in language learning. A further study with language courses was carried out by Gasmi and Thomas (2017) when they used Padlet as part of a flipped approach to learning, in which they found that behavioural and emotional aspects of engagement, along with collaboration and cooperation, were more positively affected than cognitive and agentic aspects. According to the Flipped Learning Network ([flippedlearning.org](http://flippedlearning.org)) flipped learning, built on Bergmann and Sams (2014) flipped classroom takes place when "direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter" (Bergmann & Sams, 2014, p. 6). This collaborative aspect of using Padlet was also highlighted by Fuchs (2014) and Md Deni and Zainal (2018) where students were able to collect and curate work (Fuchs, 2014). Md Deni and Zainal (2018) found that the ability for teachers to leave feedback, almost instantaneously, was a positive. Related to the collaborative aspects Garnham and Betts (2018) found that social relationships were enhanced through use of Padlet.

In relation to Flipgrid, Mango (2019) found Flipgrid enhances language learning and development of speaking and listening skills. Although not specific to science they are generic transferable communication skills that are important to develop. According to Dunbar (2019) the use of Flipgrid can facilitate authentic assessment, whether formative, summative or giving feedback in *A/L* activities. Although these findings were pertaining to music curricula there would seem to be transferability to science, for example in assessing practical skills. Another area that researchers have recorded positive benefits using Flipgrid is in project-based inquiry learning. This is a key focus of modern teaching and learning programmes (OECD, 2018) and according to Barrow (2006) mirrors how scientists carry out projects, which has relevance for this study's research around general science and engagement. When using such project inquiry learning Johnson et al. (2019) found that the use of Flipgrid had a range of positive impacts, including development of classroom communities, providing the opportunity for proxy assessments for more nervous students, who were nervous in carrying out presentations and speaking in front of an audience and helping to increase confidence in communication skills. Although this study was with kindergarten students these skills are transferable into secondary school students, especially at junior level.

However, several caveats and issues need to be addressed when examining the effects that Padlet and Flipgrid can have on students' practices in classrooms. One identified issue regarding Padlet is the ability for students to post inappropriate content (Fuchs, 2014). Md Deni and Zainal (2018) pointed out that there was the potential for threatening spaces if names were collected, potentially facilitating cyber bullying. These issues could also arise with the use of Flipgrid. To ameliorate this, posts can be anonymous (Md Deni & Zainal, 2018), with teacher monitoring being key. Another caveat for this research on Padlet, relevant for this study, is that most of it has been carried out at third (tertiary) level and in language curricula. Nevertheless, there are several key benefits pertinent to the intentions of this study that are apparent through integrating Padlet and Flipgrid. These include the development of communication skills, collaborative and social factors that can enhance connections and relational development. Alongside this, the lack of coherent research into the use of such digital tools in secondary school (high school) general science classes provides further impetus and significance in the choice of these two tools.

## Chapter 4: Research Paradigm and Methodology

*“I am not here to speak the Truth. I am here just to give you a method to perceive it.”*

*Jaggi Vasudev,*

### 4.1 Research Paradigm

Research paradigms, constructed from ontological, epistemological, and axiological views (Patton, 2002), inform methodology. They include the why, when, where, what and how data is collected and analysed (Scotland, 2012). By taking an interpretivist and constructivist research approach multiple realities arise (Hudson & Ozanne, 1988) and individuals can subjectively construct knowledge that can then be shared (Guba & Lincoln, 1994). Finding meaning from participants’ socially constructed realities is an inductive process, occurring through observations and interactions with participants in real situations. Subsequently situational theory is constructed with the research giving insight into behaviours (Cohen et al., 2011). However, as this research is in a complex environment, methodologies need to show pragmatism. Patton (2002), an advocate of pragmatism, argues in a paradigm of choice situationally appropriate methodologies are the most important factor in judging methodological quality. The case study, a method that tends towards pragmatism, is the chosen methodology for this study.

#### 4.1.1 Case studies

Case studies are empirical inquiries that investigate contemporary phenomena within real-life contexts and are appropriate when answering ‘what’ and ‘how’ questions (Yin, 2003), which equate to the research questions (section 1.4, p. 3). The idea whether the phenomenon has further educational implications - can it be replicated in other curriculum areas – which adds validity and reliability to the research (Cohen et al., 2011, pp. 133-149) was addressed after analysing what happened during this study. This case study can provide insights into an issue - student engagement - furthering understanding and falls into intrinsic and instrumental case studies (Stake, 1995).

According to Baxter and Jack (2008) it is important to set boundaries constraining the depth and breadth of the study (Stake, 1995). In this study the boundaries were time and activity, with the effect of the activity (the implementation of the digital tools) being measured over approximately 8 weeks. It was originally proposed to be approximately one term (10 weeks), but due to the global Covid-19 pandemic and New Zealand moving to Alert Level four, schools were shut, resulting in the timeframe for data collection being curtailed. By using two classes, one at year 9 and one at year 10 as separate cases it became a multi case study where similar results across cases can be predicted (Yin, 2003) and evidence gained is more reliable and robust (Baxter & Jack, 2008). This multi case study describes an intervention and the real-life context in which it occurred (Yin, 2003).

## 4.2 Research context

Two general science classes one in year 9 (n = 32) and one in year 10 (n=25), formed the two-case study. General science classes at junior level have been chosen for several reasons. If engagement can be increased here any increased engagement will lead to increased interest in science leading to better retention rates into senior science. Additionally, general science classes have more scope for use of generic tools, opposed to senior sciences where the curriculum is more prescriptive and loaded towards assessment. This also allows for this study to inductively check whether there is any degree of transferability. Finally, by choosing junior science classes there is less time pressure compared to more prescriptive senior classes working to national assessments, and teachers pedagogical and content efficacies, as well as technological confidences do not have to be so specialised. Classes are streamed according to ability at years 9 and 10. Due to timetabling and the teachers involved, the class at year 9 is a top streamed class whilst the year 10 class is a lower streamed class. The participating teachers have been approached due to having demonstrated a willingness to try new pedagogies, particularly digital tools. The implementation will be up to the teachers, and the teachers will get some PL in using digital tools, as indicated in the integration framework (refer to figure 3.7, page 39).

## 4.3 Ethical Considerations

*“If it is not right do not do it; if it is not true do not say it.”*

*Marcus Aurelius*

Although a permanent teacher I will be acting as an ‘external’ researcher. This was made explicit in the informed consent procedure, as mandated by the BERA (2018). The research is being carried out in the two classes of the volunteering teachers. As an external researcher and teacher, I will be acting as a supportive, collaborative colleague for the teachers involved in the study. This dichotomy - acting as an external researcher and a teacher researcher - is an important consideration ethically and professionally. Zeni (2001) summarises this dichotomy when asking whether the researcher is a participant in the setting and whether data will be collected when making changes to instruction and assessment and argues that when teachers, as opposed to external reviewers, carry out research it has the immediate goal of improving practice. Mohr (1996) argues teacher researchers are teachers first who respect and share information with colleagues, nurturing the wellbeing of colleagues and students. As Klehr (2012) puts it teaching is an intellectual, constructivist act, and classroom research is a dynamic professional process, which underlines the benefits to teachers as researchers. Research is part of the process of good teaching, or the zone of accepted practice, and happens daily.

In order to act ethically, ameliorating any potential conflicts of interest Zeni (2001) argues that teachers in research need to demonstrate responsibility to the teaching/research community; maintain reputations by showing respect to colleagues and students, and demonstrate accountability by collaborating and sharing findings. By not

knowing any of the student participants any potential conflicts of interest due to familiarity were ameliorated. I am not teaching the classes, and due to not being in school in 2019, I do not know any of the year 10 students, as 2019 was their first year in school. Likewise, I do not know any of the students in the year 9 class as 2020 is their first year in school. In addition, normal professional teacher pupil relationships remain, governed by teachers' professional conduct, as laid out by the NZ Teaching Council, mitigating risk of harm. With regards to demonstrating accountability both participant teachers will be provided with a summary of the findings, as will the wider science department and school management.

Hammersley and Traianou (2012) argue that ethical concerns in social research involve studying what ought and ought not to be done, and how this should be decided. The protection of participants from harm is the overriding goal. Ethical considerations can be broken down into the risk of harm; autonomy and informed consent, and privacy, confidentiality and anonymity (Hammersley & Traianou (2012). The Australian Research Council (2018) describes how ethical and responsible research must include honesty and rigour in devising, carrying out and reporting research; transparency in declaring conflicts of interest and reporting methodologies and findings; fairness and respect in the treatment of others involved in the research, whether participants, co-authors, or references (Australian Code for the Responsible Conduct of Research 2018). These ethical concerns must apply to direct participants in the study, according to BERA (2018) as well as to all stakeholders, sponsors and commissioners of research, schools and organisations that interact with the proposed research. In this way ethical concerns become "an actively deliberative, ongoing and iterative process of assessing and reassessing the situation and issues as they arise" (BERA, 2018, p. 2). This has formed ethical decision making in this study.

To ensure the research was ethical all potential participants only participated if agreeing through a process of written informed free consent. Full disclosure was part of this process, including the provision to withdraw without prejudice. The Informed Consent Forms and Information Letter can be accessed in Appendix 1. Informed consent was sought from the two teachers, the sampled students, and their parents / guardians, the Head of Science, as well as school leadership, who act as the institution's gatekeepers (Hamilton, 2013) and provide permission for research to enter 'private' spaces. When seeking consent, a brief written description of the proposed study was provided, along with plans for sharing the studies' findings indicating the possibility of collaboratively reviewing and checking findings (Stake, 1995), ensuring participants have some control over decisions (Hammersley & Traianou, 2012).

In ethical research participants' autonomy must be respected, and their identity should not be known by audiences who shouldn't have access to private information or cause harm by acting on such information (Hammersley & Traianou, 2012). To ensure this, respondents will be identified by codes. It was made clear that discussions about the study and participants will not occur with parties external to the study. However, due to the size of the school and more specifically the science department, teacher anonymity cannot be guaranteed. This formed part of disclosure and was discussed with concerned parties prior to consent being given and accepted. In

consultation with the teachers, and students, data collection occurred during scheduled class times. Observations and online questionnaires were undertaken as unobtrusively as possible, minimising impact on classroom practices. Teacher interviews were arranged to fit into the teacher's schedules, whilst student interviews occurred during class time, in such a way as to minimise impact on learning activities. To ensure confidentiality of data all recorded interviews, questionnaire responses, observation notes and data analysis is stored digitally and securely on a personal password protected account, and all interviews were recorded and transcribed personally.

Finally, ensuring ethicality, approval was sought and obtained from Curtin University Human Research Ethics Committee, as part of this candidacy: Ethics Approval Number: HRE2019-0679. Ethics approval can be accessed in Appendix 2.

#### **4.4 Methodologies**

Methods implemented to collect data included observations, interviews, and surveys from two key perspectives: students and teachers. Initially research was proposed to collect data in three phases:

- Phase one at the start of the case studies,
- Phase two midway through the case studies, and
- Phase three at the end of the study

Due to the research phase being shortened in response to school closure arising from COVID-19, data was collected in two phases. Phase one collected baseline data before the implementation of Padlet and Flipgrid and phase two collected data after the implementation of these digital tools. In this way it could be determined what effect Padlet and Flipgrid had on student engagement, classroom culture and agency. The implementation of Padlet and Flipgrid into learning activities was discussed with the relevant case study teachers prior to their use. The case study teachers had the freedom to plan the implementation Padlet and Flipgrid into their teaching and learning programmes, with the proviso that each tool was to be used at least once per week in learning activities. The use of Padlet and Flipgrid in learning activities was observed during the lesson observations. Further details are noted in the year 9 and year 10 case study vignettes (section 5.5.1., pp. 96-97, and section 6.5.1, pp. 146-147). Table 4.1 outlines the methodologies and aims at each phase, linked to the research questions.

**Table 4. 1**  
*Research Methodologies for the Study*

<b>Study Phase</b>	<b>Methodologies</b>	<b>Aim</b>
Phase 1 – Pre research period	Lesson observation (1 per class) Student online questionnaire (whole class) Teacher online questionnaire Interviews with class teachers and sampled students (n=6 per class)	Baseline data for student engagement, classroom culture and agency
Phase 2 – Post research period	Lesson observation (1 per class) Student online questionnaire (whole class) Teacher online questionnaire Interviews with class teachers and sampled students (n=6 per class)	Data to determine the effect on engagement, classroom cultures and agency at the end of the study
Post data analysis	Inductive inference	To determine whether there is potential to affect engagement in other curriculum areas within the research context

#### ***4.4.1 Data Collection Instrument Development***

At this stage it is instructive to discuss the development of the data collection instruments further, background to which has been given in sections 2.6.2 and 2.6.3 (pp. 23-25). A range of instruments were developed to improve validity through triangulation and follow best practice, as Fredricks & McColskey (2012) argue. These instruments can be viewed in appendices 3 and 5. Due to this study focusing on the perspectives of the key stakeholders and viewing engagement as a mutualistic ecosystem between learning activities and classroom culture in which agency is developed the data collection instruments were developed with those constructs in mind. In this regard the perspective of students was gained, in line with student self-report instruments (Cavanagh & Waugh, 2004). This was done through online surveys using Likert Scales, similar to that employed by Reeve & Tseng (2011) for the whole case study cohort, as well as a select focus group of students (n=6) through interviews. The same process was used for the case study teacher, although questions, in surveys and interviews were different.

Questions in both surveys and interviews were developed to gain insights into stakeholder perspectives about key themes, or constructs, from the definition and model of engagement (fig 2.3, p. 21) that this study took, along with the definitions around classroom culture and agency, Therefore questions focused on perceptions around: classroom environments / cultures with a focus on relatedness / relationships including respect; agency, with a focus on interactions with learning activities and choices made, collaboration and student voice, as well as; overall

perceived levels of engagement. By grouping interview questions and survey comments under key themes the process of qualitative coding had a base level of initial codes to start from, from which more detailed coding was carried out. The Likert scale survey questions also grouped under the same key themes were then combined into scales that reflected the qualitative codes.

The data collection instruments were modified between the two phases with questions developed to obtain insights after the implementation of the digital tools and their effects on classroom culture, agency and engagement, through developments in relatedness / relationships, respect, collaboration, student voice and overall perceived levels of engagement. Before the instruments were used in the study they were trialed and tested with a test group of teachers and students (n=2 in both cases) to check validity, appropriateness and relevance. This test group was not then directly involved in the research. However, they were treated as participants, with informed consent being obtained prior to this consultation. This consultation phase occurred in the weeks leading up to the research whilst waiting for consent forms from all participants. The online questionnaire and interviews at each phase showed slight amendments to reflect the intervention. The teachers suggested that some students may not understand what classroom culture and agency are, so prompts and simpler words were added to the student interviews.

Responses helped highlight levels of engagement with loci centering on participation and relationships within the classrooms and agency. From this any changes in engagement, classroom culture and agency due to the intervention were analysed interpretively by coding iteratively, alongside simple descriptive statistics, leading to a thematic analysis (Liamputtong, 2009). Coding finds explanations linking conditions, effects, and mechanisms by searching for, and integrating, patterns in conditions and processes and constructing typologies (Glaser & Laudel, 2013).

#### *4.4.2 Qualitative coding of data*

##### **4.4.2.1 Introduction**

This section outlines the methodology used when qualitatively coding the interview transcripts, along with the comments from the online questionnaires. Full details of the results can be seen in Chapters 5-7.

The focus of the qualitative coding was to provide a heuristic model to analyse levels of engagement, both before and after the implementation of the digital tools, focusing on the proposed engagement model in which engagement is built on a cyclical process of involvement in learning activities, classroom culture and relationships dependent on increasing agency. The type of coding model used was based on Glaser and Laudel's model (2013) where the raw data was analysed to identify relevant information by locating it in the narrative - the interview transcript and online comments - and structuring it into categories or codes. Glaser and Laudel (2013, p. 9) argue that codes are "descriptors of empirical information that can be either created ad hoc (based on the information in the text) or derived from theoretical considerations." In this instance the initial level one codes were ex ante, using pre-existing labels derived from theory and applied to the interview questions and comments linked to questions in

the online questionnaires. Once the data had been structured into the level one code categories patterns were identified and integrated leading to further coding levels, or sub constructs of the main level one code categories, which linked to the engagement model constructs of engagement, classroom culture and agency. Coding in this way allows more complex information to be systematically simplified, as argued by Glaser and Laudel (2013, p. 7) when stating that in “order to arrive at explanations of social situations or processes, we need to systematically reduce the complexity of the information we generated in the qualitative data collection.”

#### **4.4.2.2 Coding Methodology**

After transcribing the recorded interviews, the transcripts were read in their entirety then reread in smaller sections to determine whether the answers supplied matched the pre-identified key constructs that the interviews were built on. By reading small sections of the interview transcripts single constructs implicit in the transcripts were identified. The comments from the online questionnaires were treated the same way and were also labelled with pre-identified key constructs. This led to determining whether the blocks of texts identified matched the pre-identified key constructs, labelled level one constructs, as illustrated in table 4.2, for students, and 4.3, for teachers. To do this a spreadsheet was used, which then formed the basis of the coding plans. Using an iterative process by going through the text blocks several times certain text blocks were identified as fitting into more than one level one construct.

**Table 4. 2**  
*Student Level One Code Constructs*

<b>Phase 1</b>	<b>Phase 2</b>
SCE – Classroom Environment	SCE – Classroom Environment
SRP – Relationships with Peers	SRP – Relationships with Peers
SRT – Relationships with Teacher	SRT – Relationships with Teacher
SES – Enjoyment of Subject	SES – Enjoyment of Subject
SEN – Student Engagement	SEN – Student Engagement
SIE – Increasing Engagement	SIE – Increasing Engagement
SLB – Levels of Behaviour	SLB – Levels of Behaviour
STE – Teacher Expectations	STE – Teacher Expectations
SSE – Self Expectations	SSE – Self Expectations
SWE – Whole Class Engagement	SWE – Whole Class Engagement
SPE – Pupil Engagement	SPE – Pupil Engagement
SVO- Student Voice	SVO- Student Voice
SAE – Activities Engaging	STA – Tools Improve Activities
SCO – Student Collaboration	STC – Tools Increased Collaboration
SUT – Used Tools	SWT – Whole Class Increased Engagement with Tools
SBT – Belief in Tools	

**Table 4.3**  
*Teacher Level One Code Constructs*

<b>Phase 1</b>	<b>Phase 2</b>
TCE – Classroom Environment	TCE – Classroom Environment
TSR – Student Relationships	TSR – Student Relationships
TTE – Enjoyment of Subject	TTE – Enjoyment of Subject
TSE – Student Enjoyment of Subject	TSE – Student Enjoyment of Subject
TEN – Student Engagement	TEN – Student Engagement
TIE – Increasing Engagement	TIE – Increasing Engagement
TLB – Levels of Behaviour	TLB – Levels of Behaviour
TTR – Teacher Respect	TTR – Teacher Respect
TPR – Peer Respect	TPR – Peer Respect
TBT – Teacher Belief in Tools	TBT – Teacher Belief in Tools

Examples of text blocks coded into the initial level one constructs, along with the accompanying interview question or survey comment leading to the choice of code can be seen in tables 4.4 – 4.6.

**Table 4. 4**  
*Examples of Text Blocks and Level 1 Codes Students Phase 1*

<b>Text Block</b>	<b>Level 1 Code</b>	<b>Case Study</b>	<b>Source question</b>
Yeah, I think I get along with others.	SRP	9	How would you describe your relationships with your peers?
We barely collaborate on anything	SCO	9	Comment option after survey question asking students to rate levels of collaboration in learning activities.
Not a lot of students are excited to learn in this class	SWE	10	Comment option after survey question asking students to rate how much all students in the class are engaged with learning activities.
I can probably do well in my work if I try and focus	SSE	10	Comment option after survey question asking students whether they have high expectations of themselves.

**Table 4. 5**  
*Examples of Text Blocks and Level 1 Codes Students Phase 2*

<b>Text Block</b>	<b>Level 1 Code</b>	<b>Case Study</b>	<b>Source Question</b>
Makes is easier to understand how to do it and all that	SIE	9	Can you tell me if the teacher's use of Padlet and Flipgrid has helped with your engagement with learning activities in this class?
Students find it a lot easier doing work on devices as we are mostly accustomed to them	SWT	9	Comment option after survey question asking students whether overall engagement has improved due to using Padlet and Flipgrid.
It's been better since people started engaging more.	SCE	10	How would you describe the classroom environment in this class now?
Half the class is very rude and jokes about Corona.	SLB	10	Comment option after survey questions asking students to rate levels of behaviour.

**Table 4. 6**  
*Examples of Text Blocks and Level 1 Codes Teachers Phase 2*

<b>Text Block</b>	<b>Level 1 Code</b>	<b>Case Study</b>	<b>Source question</b>
I think they've enjoyed Padlet, and I think they quite like seeing their own answers coming up and reading other answers.	TSE	9	Do you think the students in this class enjoy this subject and the learning activities more now?
Off task behaviour is still a problem with those who think I am not paying attention to them, or during practical experiments	TLB	9	Comment option after survey question asking teachers to rate levels of behaviour shown in the classroom.
Some kids who are a walking distraction or looking to be distracted.	TCE	10	How would you describe the classroom environment in this class?
Flipgrid has real potential. I will use it again.	TIE	10	Comment option after survey question asking teachers has the implementation of Padlet and Flipgrid been difficult for you.

As tables 4.4 – 4.6 illustrate all codes assigned to blocks of text were linked to the initial interview question or the comment linked to a question in the online surveys. Some of the blocks of text were also assigned to additional level one codes if deemed appropriate. The text block “It's been better since people have started engaging more” (table 4.5, p. 52), from a student interview (phase two) was a response to the interview question ‘How would you describe the classroom environment / culture in this class now? Has it changed at all over the last few weeks?’ This led the block of text being assigned the level one code SCE (Student Classroom Environment). However, as the student specifically mentioned engagement it was also assigned to SEN (Student Engagement). Refer to Appendices 6 and 7 for coding plans and coding frequencies.

The level one coded text blocks were then classified into level two constructs, which were divided into the case study year levels (9 or 10), along with a determination of whether the text block was neutral (0), positive (1) or negative (2) in tone. Table 4.7 illustrates how some of the level one code constructs were simplified into level two code constructs.

**Table 4. 7**  
*Coding Plan: Moving from Level 1 to Level 2 Codes*

<b>Level 1 Code</b>	<b>Level 2 Code</b>	<b>Level 2a Individual Codes</b>		
<b>SWE</b>	<b>SWE-9</b>	<b>SWE-2-9</b>	<b>SWE-0-9</b>	<b>SWE-1-9</b>
Student Whole Class Engagement	Student Whole Class Engagement, year 9	Student Whole Class Engagement, negative, year 9	Student Whole Class Engagement, neutral, year 9	Student Whole Class Engagement, positive, year 9
<b>SVO</b>	<b>SVO-9</b>	<b>SVO-2-9</b>	<b>SVO-0-9</b>	<b>SVO-1-9</b>
Student Voice	Student Voice ear 9	Student Voice, negative, year 9	Student Voice, neutral, year 9	Student Voice, positive, year 9
<b>TCE</b>	<b>TCE-9</b>	<b>TCE-2-9</b>	<b>TCE-0-9</b>	<b>TCE-1-9</b>
Teacher Classroom Environment	Teacher Classroom Environment, year 9	Teacher Classroom Environment, negative, year 9	Teacher Classroom Environment, neutral, year 9	Teacher Classroom Environment, positive, year 9
<b>TSR</b>	<b>TSR-9</b>	<b>TSR-2-9</b>	<b>TSR-0-9</b>	<b>TSR-1-9</b>
Teacher Student Relationships	Teacher Student Relationships, year 9	Teacher Student Relationships, negative, year 9	Teacher Student Relationships, neutral, year 9	Teacher Student Relationships, positive year 9

\* The year 10 case study student and teacher codes were classified in the same way as the year 9 case study codes

Level two codes were further simplified into the final level three codes, which were applied to the year level case studies and a determination whether they were neutral, positive, or negative in manner. Table 4.8 shows how a sample of the level two codes were further sub-divided in the final level three code constructs. This was done in the same manner for both case studies.

**Table 4. 8***Coding Plan: Moving from Level 2 to Level 3 Codes*

<b>Level 2 Codes</b>		<b>Level 3 Codes</b>		
<b>SVO-9</b>	<b>SAY-9</b>	<b>SAY-2-9</b>	<b>SAY-0-9</b>	<b>SAY-1-9</b>
Student voice, year 9	Student Agency, Year 9	Student Agency, negative, year 9	Student Agency, neutral, year 9	Student Agency, positive, year 9
<b>SWE-9</b>	<b>SEL-9</b>	<b>SEL-2-9</b>	<b>SEL-0-9</b>	<b>SEL-1-9</b>
Student Whole Class	Student Engagement	Student Engagement	Student Engagement	Student Engagement
Engagement, year 9	Levels, Year 9	Levels, negative, year 9	Levels, neutral, year 9	Levels, positive, year 9
<b>TCE-9</b>	<b>TCC-9</b>	<b>TCC-2-9</b>	<b>TCC-0-9</b>	<b>TCC-1-9</b>
Teacher Classroom	Teacher Classroom	Teacher Classroom	Teacher Classroom	Teacher Classroom
Environment, year 9	Culture, year 9	Culture, negative, year 9	Culture, neutral, year 9	Culture, positive, year 9
<b>TBT-9</b>	<b>TAY-9</b>	<b>TAY-2-9</b>	<b>TAY-0-9</b>	<b>TAY-1-9</b>
Teacher Belief in Tools. Year 9	Teacher Belief in Tools. Year 9	Teacher Agency, negative, year 9	Teacher Agency, neutral, year 9	Teacher Agency, positive, year 9

The final level three code constructs were classified into the three same code categories, from both a teacher and a student perspective, allowing for easier analysis. Table 4.9 details all the final level three codes.

**Table 4. 9**  
*Final Level 3 Code Constructs*

Level 3 Codes	Level 3a Individual Codes		
	<b>Student Codes</b>		
SCC-9	SCC-2-9	SCC-0-9	SCC-1-9
SCC-10	SCC-2-10	SCC-0-10	SCC-1-10
SAY-9	SAY-2-9	SAY-0-9	SAY-1-9
SAY-10	SAY-2-10	SAY-0-10	SAY-1-10
SEL-9	SEL-2-9	SEL-0-9	SEL-1-9
SEL-10	SEL-2-10	SEL-0-10	SEL-1-10
	<b>Teacher Codes</b>		
TCC-9	TCC-2-9	TCC-0-9	TCC-1-9
TCC-10	TCC-2-10	TCC-0-9	TCC-1-10
TAY-9	TAY-2-9	TAY-0-9	TAY-1-9
TAY-10	TAY-2-10	TAY-0-10	TAY-1-10
TEL-9	TEL-2-9	TEL-0-9	TEL-1-9
TEL-10	TEL-2-10	TEL-0-10	TEL-1-10

In the level three codes the first letter in the code, T or S relates to either teacher or student codes; the final two letters, CC, AY or EL relate to classroom culture, agency, or engagement codes; the middle number, 2, 0 or 1, relates to whether the code was classed as negative, neutral, or positive, and the final number, 9 or 10 relates to the year level case study. For example, the code TAY-1-9 relates to teacher agency, positive, year 9 whereas the code SEL-0-10 relates to student engagement levels, neutral, year 10.

The following examples show how blocks of text were coded at each level, starting at level one, leading to the final Level three code construct. This illustrates the full coding process. All blocks of texts were treated in this same way. The text block “still getting to know the boys” (year 9 teacher, phase one) was in response to the interview question ‘how would you describe your relationships with your students?’ This was placed in the pre-identified Level one Code Construct: TSR (Teacher Student Relationships). As this was from the teacher of the year 9 class case study the Level two Code Construct was TSR-9 (Teacher Student Relationships Year 9). The next step was to identify whether this statement was neutral (0), positive (1) or negative (2). In this case the statement was identified as being neutral, leading to the Level 2a Code Construct TSR-0-9 (Teacher Student Relationships Neutral Year 9). The final level three codes were assigned as either TCC (Teacher Classroom Culture), TAY (Teacher Agency) or Teacher Engagement (TEN). As relationships are an important aspect of classroom culture (Bishop & Berryman, 2006) this Level two Code was categorised in TCC (Teacher Classroom Culture) as the final Level 3 Code. Being

from the year 9 case study the Level three Code was TCC-9 (Teacher Classroom Culture Year 9) and as the block of text was neutral the final Level 3b Code was TCC-0-9 (Teacher Classroom Culture Neutral Year 9).

The block of text “yes, most definitely” (student, phase two) was a response from the interview question ‘do you enjoy this class and subject more now? Has it changed at all over the last few weeks?’ This was placed in the pre-determined Level one Code Construct SES (Student Enjoyment of Subject). Like all other codes the next step was to code according to the year level. As the respondent was a year 10 student this text was coded SES-10 (Student Enjoyment of Subject Year 10). As it was determined that this response was positive in nature it was assigned the numeral 1, leading to this block of text being coded SES-1-10 (Student Enjoyment of Subject Positive Year 10) at Level 2. The final determination was to decide what final Level three Code Construct this block of text fits. In this case as enjoyment of a subject is linked to increase motivation and agency (Reeve & Tseng, 2011) this block of text was assigned the Level three Code Construct SAY (Student Agency). As the response was from the year 10 case the Level three Code Construct is SAY-10 (Student Agency Year 10) with the final Level 3a Code Construct being SAY-1-10 (Student Agency Positive Year 10) due to the block of text being positive in manner.

### ***4.4.3 Quantitative Statistical analysis***

#### **4.4.3.1 Introduction**

This section outlines the methods and statistical tests used to analyse the data collected from the online questionnaires and online lesson observation forms. Responses were collated using a 5-point scale response, much like a Likert Scale, developed by Rinses Likert in 1932 (Allen & Seaman, 2007). With the online surveys, responses ranged from 1 to 5, where 1 equated to very poor / low / not at all and 5 equated to very good / very low / very much so / all the time. With the online lesson observation forms these responses ranged from 1 (very weak) to 5 (very strong). In each case 1 equates to a very low or negative response and 5 equates to a very high or positive response. In the online lesson observations carried out at each phase in each case study the same sample of students who were involved in the interviews were observed.

When carrying out quantitative analysis with numerical data four principal scales are used: ordinal, nominal, interval, and ratio (Allen & Seaman, 2007; Stevens, 1946). Likert scales generally categorise ordinal data on a continuous ranking scale, where the major statistical issue is that as the data is ordinal, unlike interval and ratio scales, there is no certainty that the intervals are equal (Jamieson, 2004). As no measure of distance is possible data analysis can be controversial (Allen & Seaman, 2007). Analysis can potentially be misleading with some authors treating such scales as interval scales in carrying out parametric analysis (Jamieson, 2004) and far from straightforward. This contrasts with analyses using interval and ratio data which allow parametric testing using the central limit theorem (Allen & Seaman, 2007). The consensus is that when using ordinal data nonparametric statistical tests, be they descriptive statistics such as the median, mode, range, or frequency, as opposed to the mean

or standard deviation, or inferential statistics such as chi squared, spearman's rho correlation should be used (Allen & Seaman, 2007; Jamison, 2004).

If the Likert items can be combined into related indexes components, then it is appropriate to treat Likert scales as having interval values and use parametric tests, with the proviso that the Cronbach's alpha is high (Allen & Seaman, 2007). Cronbach's coefficient alpha,  $\alpha$ , is computed to determine internal reliability within components, where "all the items in a test measure the same concept or construct and hence it is connected to the inter-relatedness of the items within the test" (Tavakol & Dennick, 2011, p. 1). Cronbach's alpha has a value between .00 and 1.00, with higher values indicating higher internal validity or consistency, with a normal threshold value of .70.

#### 4.4.3.2 Methodology

The initial phase of statistical analysis involved input of the data from the online surveys and lesson observations into SPSS (v 26.0), a statistical software package developed by IBM. Separate data files were created for the online teacher and student surveys as well as the online lesson observations. The mean and the mode, where appropriate, were used in data analysis.

To maintain consistency in analysis, data from the online surveys and lesson observations was categorised and grouped into classroom culture, agency, and engagement scales. This was in line with the coding data from the interviews and comments. Where appropriate, paired samples t-tests were carried out on the final categories to determine statistical significance, as well as effect sizes. Paired samples t-tests, or dependent samples t-tests are usually carried out to compare two means from the same individual, object, or related units, such as a measurement taken at two different times to determine the effect of an intervention (LibGuides: SPSS Tutorials: Paired Samples t Test, 2020); in this case at phase one, before the implementation of the digital tools and at phase two after the implementation of the two digital tools. To make sense of a t-test analysis the null hypothesis was used, in which it is hypothesised that there is no difference in the mean of the two samples (Price et al., 2015) between phases one and two. The alternative hypothesis is that there is a difference. A significance value of .05 (5%) is used to either prove or disprove the null hypothesis, with a value  $< .05$  indicating a significant difference, disproving the null hypothesis.

According to Lenhard and Lenhard (2016) statistical significance helps determine whether results may be due to randomness and are mainly dependent on sample size, the quality of the data and statistical procedures. To determine the degree of the significance, due to the intervention the effect size is calculated. As McLeod (2019) states significant  $p$ -values indicate whether an intervention works, whereas an effect size (ES) tells us by how much it works, mirroring the argument made by Durlak (2009, p. 918) when stating that "ESs assess the magnitude or strength of the findings that occur in research studies." Due to this Durlak (2009) goes on to argue that effect sizes should be reported for all research outcomes regardless of the  $p$  value.

Becker (2020) argues that when calculating the effect size with paired samples the original standard deviations should be rather than the paired *t*-test value or the within subject's *F* value as the paired *t*-test value considers the correlation between the two scores and overestimates the effect size. This approach has been taken when computing effect sizes in the study. Cohen's *d* (Cohen et al, 2011) is the most popular effect size measurement (Lenhard & Lenhard (2016) and has been used in this study (Effect Size Calculator, 2020). An alternative effect size, Hedges' *g*, can be used, as it is a better indicator when sample sizes are small ( $n < 20$ ) (Grissom & Kim, 2005), as it uses pooled weighted standard deviations as opposed to pooled standard deviations and uses  $n-1$  for each sample. Due to there being variations in sample sizes, with  $n > 20$  in some it was decided to use Cohen's *d* in all cases.

As Durlak (2009) argues care must be taken when using the general rule of thumb around effect sizes where .20 is small, .50 is medium and .80 is, as initially put forward by Cohen. Not only should the magnitude of the effect be considered but also the practical value. As Hedges and Hedberg (2007) state ESs of .20 are of interest to policy makers, as indicated by educational researchers, when they measure academic achievement, although Hattie (2009) indicates a hinge point of .40, above which effect sizes are significant.

#### **4.5 Qualitative validity**

Research needs credibility and validity (Cresswell & Miller, 2000). According to Schwandt (1997) validity is a measure of the accuracy representing respondents' realities of the social phenomena and is credible to them. Studies must also show neutrality or confirmability, consistency or dependability and applicability or transferability (Guba & Lincoln, 1994). Many methods to ensure credibility and validity have been put forward including triangulation, disconfirming evidence, member checking, collaboration, audit trails, reflexivity, peer debriefing and long engagement in the field (Creswell & Miller, 2000). This study by using a range of techniques, namely interviews with teachers and students; online surveys with teachers and students, and lesson observations carried out by the researcher has used triangulation (Patton, 2002) thereby strengthening the research. Triangulation engages multiple methods - in this case observations, questionnaires, and interviews – to enhance validity, reliability, and credibility in constructing diverse realities (Golafshani, 2003).

Member checking is paramount for establishing credibility (Guba & Lincoln, 1994). Teacher participants were asked to review raw data, from interview transcripts and questionnaires to check accuracy. Examples done to confirm this included replaying interview audio files, asking teachers to read interview transcripts and to check online observation forms before completing them. Going one step further in collaboration with participants, teachers ran the interventions and assisted with collection of data by sharing online questionnaires with their respective classes.

By ensuring systematic documentation of decision making, data collection and analysis an audit trail for external review, enhancing credibility and trustworthiness (Cresswell & Miller (2000) was created. This also allows

for checking transferability, adding validity (Cohen et al., 2011). By reflecting early on, any biases and assumptions that may influence the study can be reported on and suspended as the study progresses, further adding to validity. In this study the initial classification of the level one code constructs reflected my biases and beliefs as to what is meant by such concepts as classroom culture, student agency and engagement, which form the basis for the iterative coding process. By looking at Schwandt's (1997) understanding of validity as being a measure of the accuracy representing respondents' realities of the social phenomena credible to them (Cresswell & Miller, 2000) validity is increased as the interview transcripts were recorded and transcribed verbatim, primarily through a post positivist paradigm. By studying the interview transcript, several times and looking for patterns in the transcript that coalesce around common themes triangulation has been carried out to enhance validity, where triangulation is a systematic post positivist paradigmatic process employing the researchers' lens only (Cresswell & Miller, 2000, p. 127). Also, by making inferences from the data (Cresswell & Miller, 2000) that have solid foundations, validity is further enhanced.

By utilising a spreadsheet to track and 'count' codes a rigorous and systematic system has been employed that looks for quantitative support (Cresswell & Miller, 2000, p. 125). The spreadsheets also act as an audit trail by providing further documentation that supports the narrative, inferences and decisions made. Such audits, according to Cresswell and Miller (2000) examine the process and product to determine the trustworthiness of the findings.

## Chapter 5: Results Year 9 Case Study

*“Not everything that can be counted counts, and not everything that counts can be counted.”*

*Albert Einstein*

### 5.1 Introduction

For the convenience of the reader the data collection timeline for the year 9 case study is shown in figure 5.1.

**Figure 5. 1**

*Data Collection Timeline Year 9 Case Study*

#### DATA COLLECTION TIMELINE

Digital tools and engagement: An evaluation whether collaborative and generic tools can positively affect classroom culture, agency and engagement in junior science in a New Zealand Boys' High School

Note NZ lockdown commenced Wednesday March 25th. At this stage data collection stopped and was only collected at two phases.

PHASE											
WEEK:		27	3	10	17	24	2	9	16	23	
1	Pre data collection	Informed consent	Handout and collection of consent forms								
		Appropriateness of data collection	Testing interview and online survey questions								
2	Phase 1 Year 9 Case Study. Before the implementation of Padlet and Flipgrid. Baseline data.	Teacher interview (n=1)		Record and transcribe interview							
		Student Interviews (n=6)			Record and transcribe interviews						
		Teacher Online Survey		Teacher received and filled in online survey							
		Student Online Survey (whole class)		Teacher shared survey with students. Student filled in							
3	Phase 2 Year 9 Case Study. After the implementation of Padlet and Flipgrid. Comparative data.	Lesson Observation (n=6)		Lesson observation carried out							
		Teacher interview (n=1)							Record and transcribe interview		
		Student Interview (n=6)							Record and transcribe interviews		
		Teacher Online Survey							Teacher received and filled in online survey		
		Student Online Survey							Teacher shared survey with students. Student filled in		
	Lesson Observation							Lesson observation carried out			

At each phase student data was analysed first, followed by teacher then lesson observation data. Phase two data was then compared against the phase one baseline data to analyse whether the implementation of Padlet and

Flipgrid had any effect on classroom culture, agency, and student engagement. Statistical analysis was carried out on data collected from the online surveys and lesson observations. Data was grouped into the final scales, classroom culture, agency, and engagement, in line with the qualitative coding and lesson observation data. The Likert Scales used to collect data were 5-point scales, with 1 being very low / poor and 5 being very high / good, whilst 3 is average.

## **5.2 Year 9 Case Study Class Description**

Research took place in a boys' decile 1-3 high school. Boys in year 9, the first year in secondary education, come, in the main, from two intermediate feeder schools. Before being placed into a year 9 class boys are streamed from results and reports from intermediate school as well as entrance tests. Boys with better academic results and reports, including literacy and numeracy, are placed into higher streamed classes. There are usually eight classes in year 9, with 9a1 being the highest streamed class and 9a8 the lowest. This large class (n=32) is streamed as 9a2. Higher streamed classes have higher numbers of students than the lowest streamed class. Although the school is a decile 1-3 school, indicating much of the catchment is from a lower socio-economic background there are still catchment areas from higher socio-economic areas, and boys in this class come from a range of backgrounds. The teacher in this case study is a recently qualified teacher in the second year of teaching.

## **5.3 Year 9 Phase 1**

### ***5.3.1 Student Quantitative Data***

Table 5.1 shows the phase one online survey individual quantitative data measurement items from the students' perspectives.

**Table 5. 1**  
*Student Statistics Year 9 Phase 1*

Measurement Category	N	Median	Mean, $\bar{x}$	Mode	S.D, $\sigma$
Peer Respect	25	4.00	4.12	4.00	.78
Student Teacher Respect	25	4.00	3.32	4.00	1.07
Behaviour Levels	24	3.00	3.46	3.00	1.06
Teacher Expectations	25	4.00	4.24	4.00	.88
Student Expectations	25	4.00	3.92	4.00	1.22
Student Whole Class Engagement	25	3.00	3.16	3.00	.90
Individual Pupil Engagement	25	4.00	3.68	4.00	1.18
Levels of Student Voice	25	3.00	2.92	3.00	1.29
Engaging Learning Activities	25	4.00	3.40	4.00	.96
Levels of Collaboration	24	3.00	3.42	3.00	.88
General Student Engagement	25	4.00	3.60	4.00	1.19

In all the individual measurement categories the mode directly relates to the Likert Scale measurement. For example, a mode of 2.00 corresponds to poor, a mode of 3.00 corresponds to average, and a mode of 4.00 corresponds to good. Behaviour levels, student whole class engagement, levels of student voice and levels of collaboration returned a mode of 3.00, or average. Peer respect, student teacher respect, teacher expectations, student expectations, individual student engagement, engaging learning activities, general student engagement and individual student engagement returned a mode of 4.00, or good.

In all measurement items the standard deviation shows some variation in student responses, with student peer respect having the lowest  $\sigma$  of .78 and level of student voice having the highest  $\sigma$  of 1.29. According to Altman & Bland (2005) the standard deviation indicates the variability in the dataset and is descriptive in nature. A  $\sigma$  value in excess of 1.00 is greater than the unit boundary in the Likert Scale, indicating a high variation in student responses. Due to the research group being a young school class a range of responses for each measurement item would be expected. Secondary school classes are fairly heterogenous in nature, and this class is no exception. Students have different levels of maturity at this age and come from a range of socio-economic and ethnic backgrounds, potentially influencing how they view and rate the measurement items.

### 5.3.1.1 Collated Measurement Items

The individual measurement items were collated into the three final scales in line with the engagement model (p. 22) and for consistency, as highlighted in table 5.2. Due to the grouping of several items into the overall final category the mean ( $\bar{x}$ ) is being used for analysis, as the data in grouped scales is interval in nature.

**Table 5. 2**  
*Student Final Scales Year 9 Phase 1*

<b>Final Scale</b>	<b>Individual items within final category online surveys</b>
Classroom Culture	Peer Respect
	Student Teacher Respect
	Levels of Behaviour
	Teacher Expectations
	Student Self-Expectation
Agency	Level of Student Voice
	Engaging Learning Activities
	Levels of Collaboration
Engagement	Student Whole Class Engagement
	Student Individual Engagement
	General Student Engagement

Table 5.3 details the relevant statistics for the final scales.

**Table 5. 3**  
*Student Results for Classroom Culture, Agency, and Engagement Year 9 Phase 1*

<b>Final Scale</b>	<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>	<b>Cronbach's alpha, <math>\alpha</math></b>
Classroom Culture	24	3.81	3.80	.72	.76
Agency	24	3.24	3.00	.78	.60
Engagement	25	3.46	3.25 <sup>a</sup>	.90	.88

<sup>a</sup> denotes multiple modes exist. The smallest value is shown

Before the implementation of Padlet and Flipgrid the overall classroom culture, from the students' perspective can be inferred as approaching good, as shown by a  $\bar{x}$  of 3.81. Students perceived agency as above average but not good, as indicated by a  $\bar{x}$  of 3.24. The same inference can be made for overall levels of engagement

with a  $\bar{x}$  of 3.41, although this scale is closer to good. In all scales the  $\sigma$  shows some variation in student responses, although less than the unit value of the scales (1.00).

The  $\alpha$  value of .76 for the classroom culture scale shows a good level of internal consistency in the scale, where a Cronbach's value of .70 and above is generally taken as showing high consistency. Looking at the agency scale the  $\alpha$  of .60 falls below this usual threshold value of .70. Lower Cronbach's alpha values indicate less correlation between the mean scores, indicating a larger spread of responses within different items. This can indicate that there is less surety that the same constructs are being measured. However, Cronbach's alpha is dependent on the number of items in the scale, with fewer items generally leading to an underestimation in the internal consistency validity (Nunnally & Bernstein, 1994; Vaske et al., 2016). The agency scale, for example only has three items within it. Due to such reasons, in exploratory research, such as this, an  $\alpha$  of between .60 and .70 is tolerable and acceptable (Nunnally & Bernstein, 1994). An  $\alpha$  of .88 in the engagement scale indicates a high degree of internal consistency in this scale.

### ***5.3.2 Student Qualitative Data***

Student (and teacher) responses were rigorously coded through initially identified level one codes to the final level three code scales: classroom culture, agency, and engagement to align with the theoretical engagement model and to be consistent with all data collection methodologies. Refer to appendices 6 and 7 for further coding responses and results, including initial codes.

#### **5.3.2.1 Students' Final Code Scales**

Table 5.4 shows the final code scales and the initial codes grouped into them.

**Table 5. 4**  
*Classification of Student Final Coding Scales Year 9 Phase 1*

<b>Final Student Code Scales</b>	<b>Initial Codes</b>
SCC (Student Classroom Culture)	SCE (Student Classroom Environment) SRP (Student Relationships with Peers) SRT (Student Relationships with Teacher) SLB (Student Levels of Behaviour)
SAY (Student Agency)	SES (Student Enjoyment of Subject) STE (Student Teacher Expectations) SSE (Student Self-Expectations) SVO (Student Voice) SCO (Student Collaboration) SUT (Student Used Tools) SBT (Student Belief in Tools)
SEL (Student Engagement Levels)	SEN (Student Engagement) SIE (Student Increasing Engagement) SWE (Student Whole Class Engagement) SPE (Student Pupil / Individual Engagement) SAE (Student Activities Engaging) STI (Student Teacher Improve Engagement)

Tables 5.5 – 5.7 detail the final code category results.

***Student Classroom Culture***

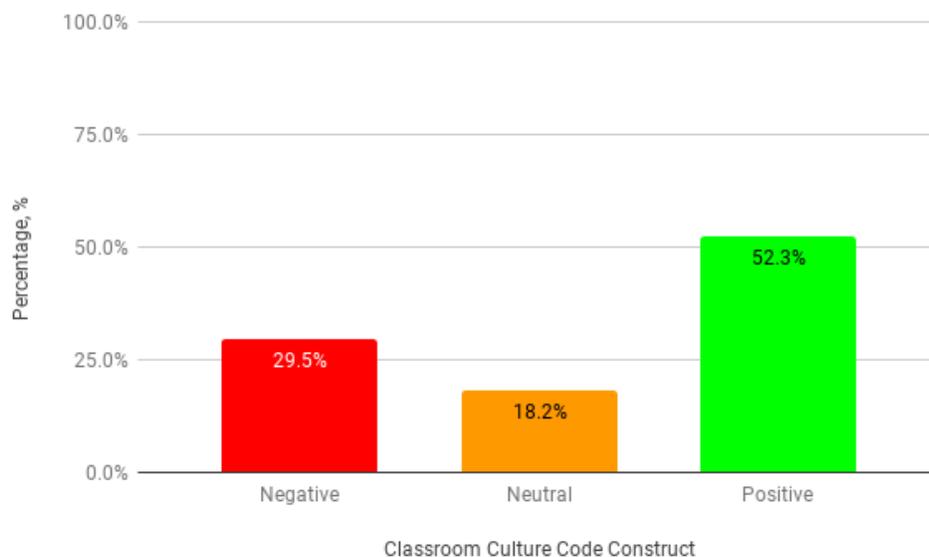
**Table 5. 5**  
*Student Classroom Culture Year 9 Phase 1*

<b>Code Descriptor: SCC</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	13	8	23	44
Percentage, %	29.5	18.2	52.3	100

Figure 5.2 shows the percentages of the classroom culture codes.

**Figure 5. 2**

*Student Classroom Culture Code Percentages Year 9 Phase 1(n =44)*



From the students' perceptions classroom culture is generally more positive than negative. 52.3% of responses are positive, with students stating, "it's pretty good" (student 1, interview), and "we can have a little bit of fun yet at the same time we have to do a little bit of work" (student 4, interview). This may be because their perceptions around education in general are more positive, being in a high streamed class. If the neutral responses are added, then 70.5% of coded responses are non-negative.

At phase one, near the start of the year there is a school wide focus, especially at year 9 and 10, around developing relationships through consistent classroom management and numerous schoolwide initiatives. Students are potentially more aware of the importance of relationships and culture throughout the school and are actively participating in programmes whose purpose it is to develop this. Relationships with peers seem to be generally friendly with each other. According to a student "we all get along, we're all good friends" (student 4, interview). Additionally, it appears that relationships with the teacher, although in their infancy are good. As student 1 (interview) states this relationship is "pretty good so far," with another stating "I guess it's good" (student 6, interview). Perhaps even more tellingly a student states that the teacher "treats everyone the same no matter what" (student 4, interview). This underlines the importance students have around being treated fairly and consistently, especially regarding behaviour management, which at this stage is more neutral. Reasons for such neutral behaviours can potentially be attributed to the start of the year and students pushing boundaries, as student 6 (interview) highlights when stating "everyone does what they want when the teacher turns her back or leaves the classroom."

## Student Agency

**Table 5. 6**

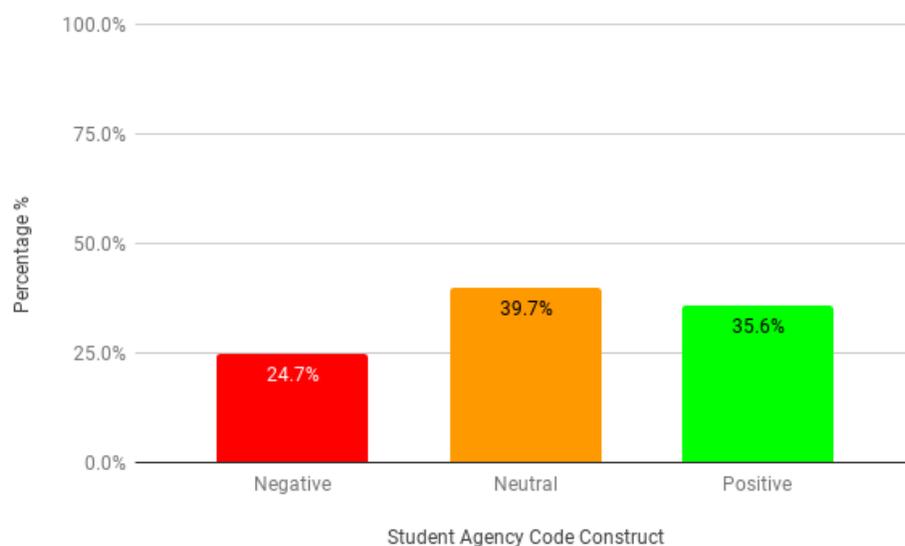
*Student Agency Year 9 Phase 1*

Code Descriptor: SAY	Negative	Neutral	Positive	Totals
Frequency	18	29	26	73
Percentage, %	24.7	39.7	35.6	100

Figure 5.3 shows the percentages of the student agency codes.

**Figure 5. 3**

*Student Agency Code Percentages Year 9 Phase 1 (n=73)*



Positive responses from students account for 35.6% of codes, with neutral responses accounting for 39.7%, meaning 75.3% or responses are non-negative, as illustrated by the following responses, “learn a lot of new things and stuff” (student 4, interview), and I enjoy the subject “when we’re doing experiments” (student 6, interview). Students are still developing their likes, wants and ideas around their expectations, their interactions with each other and their subjects and extra and co-curricular options, with more time, for example, spent developing relationships.

Regarding expectations a student states “the teacher really pushes us” (survey comment), indicating the consistent approach and high expectations this teacher has, which this student realises. Students also seem to have high levels of expectations for themselves, which would be more expected in this high streamed class, with students stating, “I want to be the best of my abilities” and “I want to get a good grade” (survey comment). Such expectations would indicate that agency has decent beginnings.

However, responses around levels of student voice and collaboration potentially account for more neutral perceptions around agency as the following comments indicate: “I don’t like talking “(student, survey comment) and “we don’t need to speak up or anything” (student survey comment). They also might not have much exposure to student voice collection tools, being new to secondary school and this being the start of the school year, although potentially they are gaining an understanding and idea of what student voice is and how it can be used to co-construct in the classroom. In addition, levels of collaboration are low, potentially due to the type of activities. According to students “we barely collaborate on anything” (survey comment) and “I don’t think anyone likes the worksheets we are doing everyday instead of actual experiments” (survey comment).

Regarding use of the two digital tools and links to agency, most students had not used them at this phase. When asked if they had interacted with the tools students commented “no” (survey) and “maybe” (survey). More importantly with regards to growing agency is their belief in the tools. Do students have a growth mindset and positive perceptions that the implementation of the digital tools can help improve engagement? There appears more positivity around the potential benefits of the digital tools than there is negativity, which when combined with the neutral perceptions indicates that students believe there is potential for the tools to improve engagement. This seems to indicate that agency has scope to grow.

### *Student Engagement Levels*

**Table 5. 7**

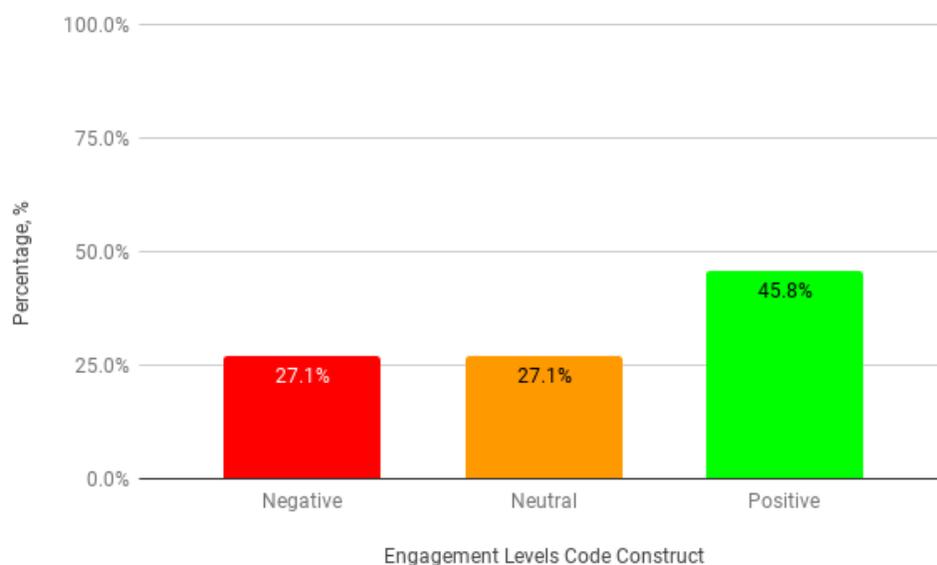
*Student Engagement Levels Year 9 Phase 1*

<b>Code Descriptor: SEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	13	13	22	48
Percentage, %	27.1	27.1	45.8	100

Figure 5.4 shows the percentages of the levels of engagement codes.

**Figure 5.4**

*Student Engagement Levels Code Percentages Year 9 Phase 1 (n=48)*



Positive responses are the highest at 45.8%, with one student saying that engagement is “I think 8” (student 2, interview), when measured out of 10. This may potentially be linked to the start of the school year with higher levels of enthusiasm and motivation in new settings. Although negative and neutral coded responses, such as “out of 10? Mm...6” (student 3, interview), “others just don’t care” (student survey comment), and “some kids get bored easily” (student survey comment), account for 54.2% of codes, if positive and neutral responses are collated then 72.9% of responses are non-negative. As student 4 (interview) states “my teacher makes sure I’m engaged at all times. Same as my peers.”

The overall inference is that the students believe engagement is more positive than negative. Students generally link increasing engagement to learning activities, specifically practical work at this phase, as highlighted by the following student responses, “yes, more experiments” (student 2, interview) and “we are all excited to do more experiments” (survey comment). The inference can also be made that other pedagogies can potentially have a similar effect, such as the implementation of digital tools, as highlighted by a student commenting “more hands-on activities,” (student 5), would help in increasing engagement.

### **5.3.3 Teacher Quantitative Data**

#### **5.3.3.1 Teacher Initial Measurement Items**

Table 5.8 shows the phase one measurement items along with the actual value, as n (teacher) = 1.

**Table 5. 8**  
*Teacher Statistics Year 9 Phase 1*

Measurement Category	Actual Value
Peer Respect	3.00
Student Teacher Respect	4.00
Behaviour Levels	4.00
Student Engagement	3.00
Belief in Digital Tools	4.00

Using the scale measurement of 1.00 - 5.00 it can be inferred that the teacher believes levels of peer respect are average, as shown by the actual value of 3.00, whereas the level of respect between the students and the teacher, as well as the levels of behaviour were perceived as good (4.00). The teacher perceived engagement as average (3.00), whereas the teacher has a positive belief in the potential efficacy of the digital tools, as shown by the value of 4.00 (good).

### 5.3.3.2 Teacher Final Measurement Scales

Table 5.9 highlights the final measurement scale results. From the teacher survey the following items were grouped into classroom culture: peer respect, teacher respect and levels of behaviour. There was only one item for agency, which was belief in tools. Similarly, there was only one item for engagement.

**Table 5. 9**  
*Teacher Results for Classroom Culture, Agency, and Engagement Year 9 Phase 1*

Measurement Scale	Mean, $\bar{x}$	Mode
Classroom Culture	3.67	3.67
Agency	4.00	4.00
Engagement	3.00	3.00

Due to there being only one response per case study,  $n(\text{teacher}) = 1$ , the mode is the same as the mean. A  $\bar{x}$  of 3.67 indicates that the classroom culture at phase one is perceived to be above average (3.00) approaching good (4.00). A  $\bar{x}$  of 4.00 indicates that agency is positive or good. With regards to engagement a  $\bar{x}$  of 3.00, indicates the teacher believes it to be average.

### 5.3.4 Teacher Qualitative Data

Like the student qualitative coding teacher responses were initially coded into level one codes before systematically being coded into the final scales in line with the student coding data.

### 5.3.4.1 Teacher Final Code Scales

Table 5.10 shows individual measurement items that were grouped into the final teacher code scales.

**Table 5. 10**

*Classification of Teacher Final Coding Scales Year 9 Phase 1*

<b>Teacher Final Scales</b>	<b>Initial Codes</b>
TCC (Teacher Classroom Culture)	TCE (Teacher Classroom Environment)
	TSR (Student Teacher Relationships)
	TPR (Teacher Peer Respect)
	TTR (Teacher Teacher Respect)
	TLB (Teacher Levels of Behaviour)
TAY (Teacher Agency)	TTE (Teacher Enjoyment of Subject)
	TSE (Teacher Student Enjoyment of Subject)
	TBT (Teacher Belief in Tools)
TEL (Teacher Engagement Levels)	TEN (Teacher Student Engagement)
	TIE (Teacher Increasing Engagement)

Tables 5.11 - 5.13 detail the frequencies and percentages for the final code scales, respectively.

#### *Teacher Classroom Culture*

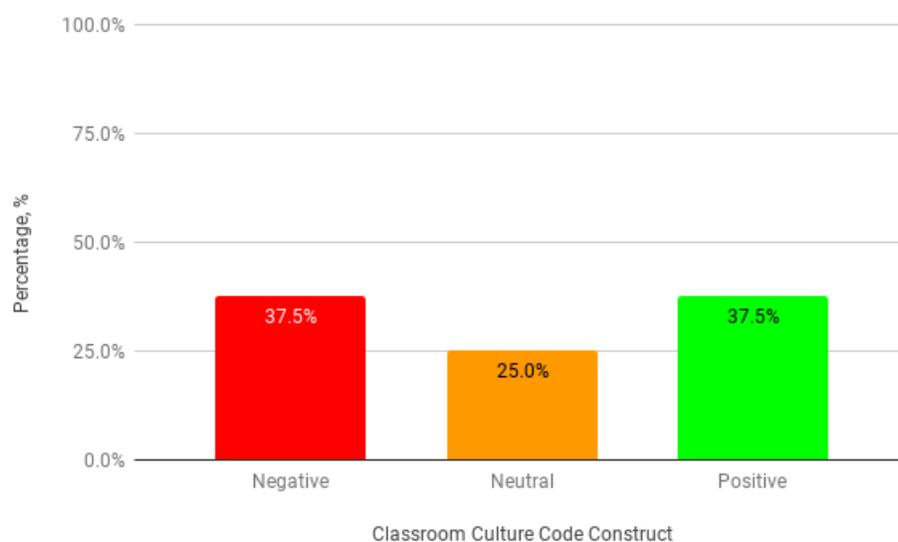
**Table 5. 11**

*Teacher Classroom Culture Year 9 Phase 1*

<b>Code Descriptor: TCC</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	3	2	3	8
Percentage, %	37.5	25.0	37.5	100

Figure 5.5 shows the percentages of the teacher classroom culture codes at phase two.

**Figure 5.5**  
*Teacher Classroom Culture Code Percentages Year 9 Phase 1*



The teacher's perception is that the classroom culture is mixed, with positive and negative responses both at 37.5%. As neutral responses accounting for 25%, non-negative and non-positive codes account for 72.5% of responses, leading to an overall inference is that classroom culture at phase 1 is somewhat neutral, with scope for improvement. The following teacher statements from the interview potentially highlight this, "yeah, but generally, generally a nice classroom culture" and "maybe a couple of boys still just pushing the boundaries."

This case study is in a high stream banded class. To be placed in higher streamed classes students have demonstrated better engagement through academic results, along with better attitudes to their learning and interactions in a classroom, which would indicate the potential for higher levels of classroom culture. In addition, from a teacher perspective preconceived biases around high streamed classes could affect perceptions. The teacher is newly qualified with potentially higher levels of enthusiasm and general perceptions are that students in higher streamed classes are better behaved and want to learn more. However, relationships between the students and the teachers, from the teacher's perspective are not as good as they could be. A contributory factor at phase one is that it is close to the start of the school year. Although there are only two intermediate feeder schools, from which all students progress to local secondary schools, some students may not know each other well, or even at all. Students are in the process of forming new relationships with their peers as well as with the teacher, who does not know any of the students, who are new to school. At the same time the teacher is trying to set up classroom management systems to help with behaviour and relationships later in the year, meaning that the teacher may be viewed as less 'friendly and approachable.' A new class dynamic needs to develop. This may account for the heterogeneity in perceived culture. On top of this This will result in a range of interactions, both neutral, positive, and negative, contributing to the overall heterogenous nature of the classroom culture.

## Teacher Agency

**Table 5. 12**

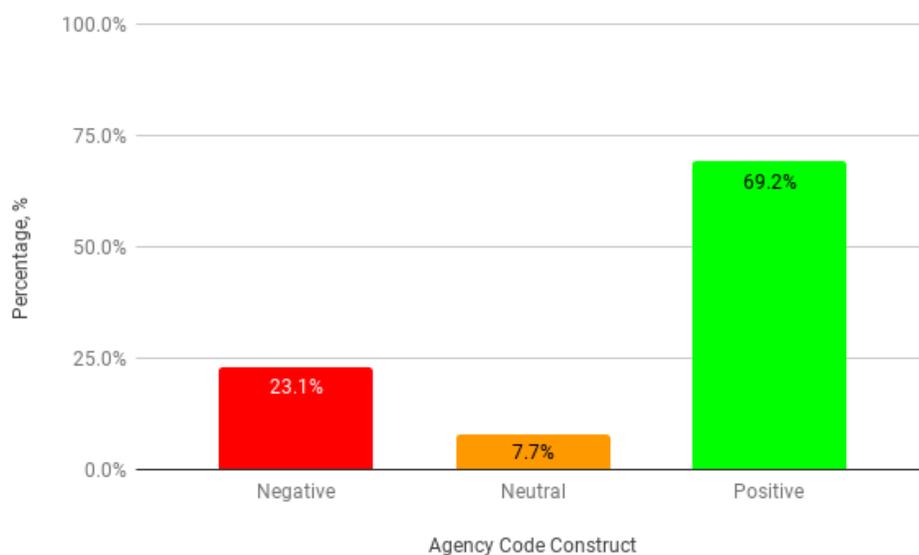
*Teacher Agency Year 9 Phase 1*

Code Descriptor: TAY	Negative	Neutral	Positive	Totals
Frequency	3	1	9	13
Percentage, %	23.1	7.7	69.2	100

Figure 5.6 shows the percentages of the teacher agency codes at phase 1.

**Figure 5. 6**

*Teacher Agency Code Percentages Year 9 Phase 1 (n=13)*



Although it is the start of the year and students may be more enthusiastic, motivated, and dedicated to learning there were negative teacher perceptions around student enjoyment of the subject. This may be linked to start of year routines and how they impact on student enjoyment of the subject, with a focus on classroom management. However, with 69.2% of codes being positive it can be inferred that the teacher perceives agency as positive. If the neutral responses are added, then 76.9% of responses are non-negative. A major contributory factor to the positive perception of agency can be attributed to the high stream of this class who have demonstrated more agency in their educational choices and are still making these positive choices when it comes to getting down to work in the class. As the teacher stated when discussing students' enjoyment of the subject, "we did something practical yesterday so the engagement there was pretty high" (interview).

The teacher also has positive agency and is demonstrating a positive enjoyment of teaching science. A general inference is that subject teachers should enjoy teaching their subject, with greater enjoyment leading to

more positive benefits for teaching and learning. This teacher is also likely to be more enthusiastic and motivated. Not only is it the start of a new school year, but the teacher is a newly qualified teacher. Being a newly qualified teacher may account for this teacher's belief in the potential positive effects of using digital tools. This is an important factor - teachers are the agents of change implementing the digital tools into learning activities in their classes. If they have negative perceptions that digital tools can impact positively on student engagement, then this will make it harder for them to buy into the implementation. Although this teacher had not come across and used the tools previously, they had a positive mindset about their potential efficacy. From this it can be inferred that buy in and implementation will be better, heightening agency.

### ***Teacher Engagement Levels***

**Table 5. 13**

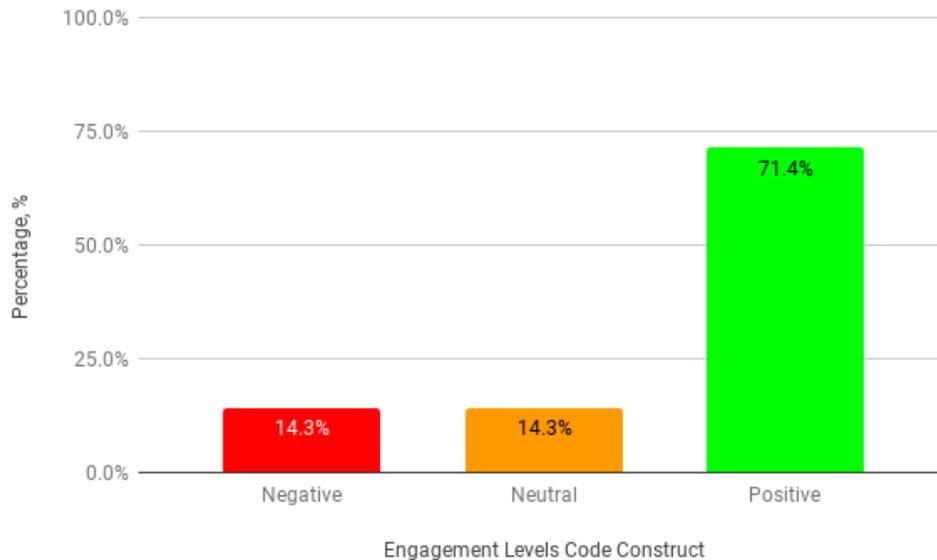
*Teacher Engagement Levels Year 9 Phase 1*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	1	1	5	7
Percentage, %	14.3	14.3	71.4	100

Figure 5.7 shows the percentages of the teacher engagement level codes at phase 1.

**Figure 5.7**

*Teacher Engagement Level Code Percentages Year 9 Phase 1 (n=7)*



The teacher's perception in phase one is that levels of engagement are generally high, with 71.4% of responses being positive. This is highlighted when the teacher states, "boys are completing their work." The inference is that students are getting down to and completing work by engaging with the subject matter, which again is potentially attributable to the high stream of this class, with students in higher streams having demonstrated higher results and better engagement with education in the past, and potentially having greater motivation and enthusiasm at the start of the year.

Regarding potentially raising engagement at phase one this doesn't involve implementing the digital tools but maybe due to practical work. The teacher highlighted this when saying, "we have had three practical lessons using equipment." Practical work needs considering when measuring whether engagement as defined by this model has been improved due to the implementation of the digital tools. If the levels of practical work throughout the study period remained consistent then any changes in engagement, classroom culture and agency can be attributed more to the implementation of the digital tools.

### *5.3.5 Lesson Observation*

Like the online surveys, 5-point Likert Scales, ranging from very poor (low) to very good (strong) were used, with 3.00 being average.

### 5.3.5.1 Online Lesson Observation Initial results

Table 5.14 shows the data collected from the phase 1 lesson observation. For the lesson observations  $n = 6$  as the observation focused on the same students who comprised the interview group. Although the sample size is small, statistical data was generated in the same manner as for the online surveys.

**Table 5. 14**  
*Lesson Observation Statistics Year 9 Phase 1*

Measurement Item	N <sup>a</sup>	Median	Mean, $\bar{x}$	Mode	SD, $\sigma$
Class Attentive to Instructions / Tasks	6	2.00	2.17	2.00	.41
Class Follow Instructions / Tasks	6	3.00	2.83	3.00	.75
Class Constructively Collaborate	6	3.00	3.00	3.00	.00
Class Organised Work Habits	6	2.50	2.50	2.00 <sup>b</sup>	.55
Class Work Carefully / Neatly	6	2.00	2.17	2.00	.41
Class Complete Assigned Tasks	6	2.50	2.33	3.00	.82
Class Work Willingly / Without Frustration	6	3.00	3.00	3.00	.63
Class Friendly / Respectful to Teacher	6	2.00	2.00	2.00	.00
Class Engages with Teacher	6	2.50	2.50	2.00 <sup>b</sup>	.55
Class Friendly / Respectful to Peers	6	2.00	2.17	2.00	.41
Class Interacts Appropriately with Peers Socially	6	2.00	2.33	2.00	.52
Class Interacts Appropriately with Peers Academically	6	3.00	3.00	3.00	.00
Class Engages with Peers	6	3.00	2.67	3.00	.52
Class General Work Ethic	6	2.50	2.67	2.00	.82
Class General Manners	6	2.50	2.50	2.00 <sup>b</sup>	.55
Class Positive Role Modelling	6	3.00	3.00	3.00	.00
Class Concern for Classroom Environment	6	3.00	3.00	3.00	.00

<sup>a</sup>  $n$  of 6 is a result of the observation focusing on the same 6 students who were the interview group.

<sup>b</sup> multiple modes exist. The smallest value is shown

Initial measurements indicate almost every measurement item being between poor and average. For example, results indicate that the students' attentiveness to instructions and tasks and class works neatly produced a mode of 2.00 (poor on the Likert Scale) and a  $\bar{x}$  of 2.17 ( $\sigma = .41$ ), which is closer to poor than average. A similar measurement item around students' abilities to follow instructions indicate a similar outcome, with a mode of 3.00 (average) and a  $\bar{x}$  of 2.83 ( $\sigma = .75$ , with the inference that this is between poor and average, but closer to average. The  $\sigma$  of .75 indicates a relatively widespread of results in comparison to most of the other measurement items,

apart from completing assigned tasks and general work ethic, where  $\sigma = .82$ . However, all  $\sigma$  values are less than 1.00, the scale unit value.

There are a few measurement items which can be inferred as being average, with reported modes and  $\bar{x}$  of 3.00 and 3.00. Items that can be inferred as average include students constructively collaborating; students working willingly and without frustration; students interacting appropriately with their peers academically; showing positive role modelling, and students showing concern for the classroom environment.

### 5.3.5.1 Lesson Observation Final Results

For consistency measurement items in the lesson observations were grouped into the final three scales, as shown in table 5.15.

**Table 5. 15**

*Lesson Observation Final Scales Year 9 Phase 1*

<b>Final Scale</b>	<b>Individual items within final category</b>
Classroom Culture	Class Friendly / Respectful to Teacher Class Engages with Teacher Class Friendly / Respectful to Peers Class Interacts Appropriately with Peers Socially Class Interacts Appropriately with Peers Academically Class Engages with Peers Class General Manners Class Concern for Classroom Environment
Agency	Class Constructively Collaborates Class Organised Work Habits Class Works Carefully / Neatly Class Positive Role Modelling
Engagement	Class Attentive to Instructions / Tasks Class Follow Instructions / Tasks Class Completes Assigned Tasks Class Works Willingly / Without Frustration Class General Work Ethic

Table 5.16 details the statistics for these final three scales.

**Table 5. 16**  
*Lesson Observation Final Scale Results Year 9 Phase 1*

<b>Final category</b>	<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>
Classroom Culture	6	2.52	2.50	.18
Agency	6	2.67	2.50	.20
Engagement	6	2.60	2.60	.61

The  $\bar{x}$  of 2.52 ( $\sigma = .18$ ) indicates that at phase one classroom culture is between poor (2.00) and average (3.00), as is agency, with a  $\bar{x}$  of 2.67 ( $\sigma = .20$ ), and engagement, with a  $\bar{x}$  of 2.60 ( $\sigma = .61$ ).

## 5.4 Year 9 Case Study Phase 2

### 5.4.1 Student Quantitative Data

Table 5.17 shows the phase 2 student individual quantitative measurement items data.

**Table 5. 17**  
*Student Statistics Year 9 Phase 2*

<b>Measurement Category</b>	<b>N</b>	<b>Median</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>
Peer Respect	28	4.00	4.21	4.00	.69
Student Teacher Respect	28	3.00	3.36	3.00	.78
Levels of Behaviour	28	3.00	3.43	3.00	.69
Student Whole Class Engagement	27	4.00	3.89	4.00	.70
Student Individual / Pupil Engagement	28	4.00	4.18	4.00	.72
Levels of Student Voice	28	3.00	3.39	3.00	1.13
Engaging Learning Activities	28	4.00	3.71	4.00	.90
Tools Improve Classroom Culture	28	3.00	3.29	3.00	1.05
Tools Increase Student Voice	28	3.00	3.32	3.00	.95
Tools Made Learning Better	28	4.00	3.54	4.00	.84
Tools Increased Collaboration	28	3.00	3.43	3.00	1.10
Tools Increased Individual Engagement	28	4.00	3.89	4.00	.75

In all the individual measurement categories the actual mode value directly relates to the Likert Scale measurement. Looking at the data, student teacher respect, levels of behaviour, levels of student voice tools improve classroom culture, tools increase student voice and tools increase collaboration return a mode of 3.00 behaviour levels, student whole class engagement, levels of student voice and levels of collaboration returned a mode of 3.00,

or average. Peer respect, student whole class engagement, student individual engagement, engaging learning activities, tools made learning better, and tools increased individual engagement returned a mode of 4.00, or good.

In all measurement items the standard deviation ranges shows some variation in student responses, with student peer respect having the lowest  $\sigma$  of .689 and level of student voice having the highest  $\sigma$  of 1.13, which mirrors the phase one results. A  $\sigma$  value in excess of 1.00 is greater than the unit boundary in the Likert Scale, indicating a high variation in student responses. The  $\sigma$  values are potentially indicative of the heterogenous nature of a secondary school class, especially in general science. Students are still developing at different rates, have different backgrounds and supports outside of the classroom.

#### 5.4.1.1 Collated Measurement Items

Table 5.18 shows the individual measurement items that were grouped into the final student code scales at phase 2.

**Table 5. 18**

*Student Final Scales Year 9 Phase 2*

<b>Final Scale</b>	<b>Individual Items within Final Scale / Category</b>
Classroom Culture	Peer Respect Student Teacher Respect Levels of Behaviour Tools Improved Classroom Culture
Agency	Level of Student Voice Engaging Learning Activities Tools Increase Student Voice Tools Made Learning Better Tools Increased Collaboration
Engagement	Student Whole Class Engagement Student Individual Engagement Tools Increased Individual Engagement

Table 5.19 details the relevant statistics for the final categories.

**Table 5. 19***Student Results for Classroom Culture, Agency, and Engagement Year 9 Phase 2*

<b>Final Scale</b>	<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, (<math>\sigma</math>)</b>	<b>Cronbach's Alpha, <math>\alpha</math></b>
Classroom Culture	28	3.57	3.00 <sup>a</sup>	.59	.69
Agency	28	3.48	3.00	.79	.86
Engagement	28	4.01	4.00	.57	.67

<sup>a</sup> *multiple mode exist. The smallest value is shown*

The  $\bar{x}$  of 3.57 ( $\sigma = .59$ ) indicates that, at phase two, after the implementation of Padlet and Flipgrid the overall classroom culture, from the students' perspective was between average and good. The  $\alpha$  of .69 indicates that the classroom culture scale has an acceptable level of internal consistency; being almost at the usual acceptable hinge point of .70. Students also believe that agency is between average and good with a  $\bar{x}$  of 3.48 ( $\sigma = .79$ ). The agency scale at phase two has a high degree of internal validity with an  $\alpha$  of .86. With engagement it can be inferred levels are good, as shown by a  $\bar{x}$  of 4.01 ( $\sigma = .57$ ). The  $\alpha$  value of .67 indicates that internal reliability, although slightly below .70, is acceptable and tolerable, as argued by Nunally & Bernstein (1994). A reason for this is that there are fewer items in this scale which leads to an underestimation of  $\alpha$  (Vaske et al., 2016).

#### 5.4.2 Student Qualitative Data

Coding data in phase two was analysed in the same manner as for phase one. Refer to Appendices 6 and 7 for further coding details.

##### 5.4.2.1 Final Student Code Scales

Table 5.20 details the individual initial codes that were grouped into the final student code scales at phase two.

**Table 5. 20**  
*Classification of Student Final Coding Scales Year 9 Phase 2*

<b>Final Level 3 Student Scales</b>	<b>Initial Codes</b>
SCC (Student Classroom Culture)	SCE (Student Classroom Environment) SRP (Student Relationships with Peers) SRT (Student Relationships with Teacher) SLB (Student Levels of Behaviour) TIC (Student Tools Increase Classroom Culture)
SAY (Student Agency)	SES (Student Enjoyment of Subject) SVO (Student Voice) STA (Student Tool Use Improves Activities) SIV (Student Tool Use Improved Voice) STC (Student Tools Improved Collaboration)
SEL (Student Engagement Levels)	SEN (Student Engagement) SAE (Student Learning Activities Engaging) SWE (Student Whole Class Engagement) SPE (Student Individual / Pupil Engagement (SPE)) SWT (Student Whole Class Improved Engagement with Tools) SIE (Student Increasing Engagement)

Tables 5.21 – 5.23 detail these code results.

### *Student Classroom Culture*

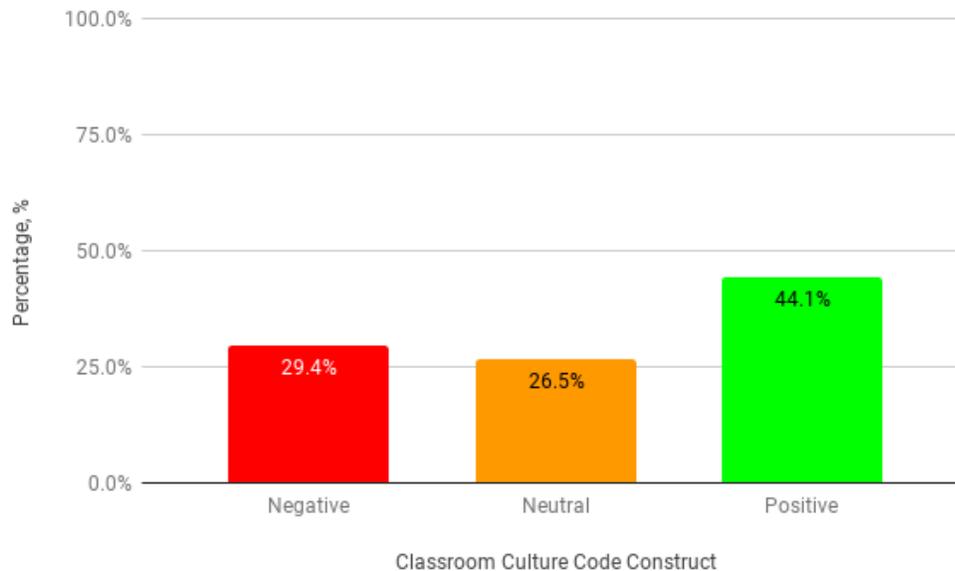
**Table 5. 21**  
*Student Classroom Culture Year 9 Phase 2*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	10	9	15	34
Percentage, %	29.4	26.5	44.1	100

Figure 5.8 shows the percentages of the final student classroom culture codes at phase 2.

**Figure 5.8**

*Student Classroom Culture Code Percentages Year 9 Phase 2 (n=34)*



Perceptions are that the year 9 students have somewhat mixed perceptions around classroom culture, with 44.1% of responses being positive and 29.4% negative and 26.5% neutral. However, this perception is more positive than negative, with 70.6% of responses being non-negative. As student 6 (interview) responded, “miss has got them to start listening,” and “It’s been better since people have started engaging more,” indicating an explicit link between classroom culture and engagement. The inference is that the implementation of Padlet and Flipgrid has helped as engagement has increased, with the only change to pedagogy being their implantation. However, the link between the digital tools and improvements in classroom culture may be more difficult for the students to make. There may be less understanding of what classroom culture is and the factors that influence it. As one student (survey comment) stated when discussing this he is “not really sure.” Potentially there is maybe some uncertainty about what a positive classroom culture is, alongside what they feel is important within the classroom dynamic. As student 3 (interview) stated when talking about behavioural aspects of classroom culture, “it’s still the same bit of cheekiness around but we still do the work and stuff,” which implies that behavioral issues are evident, which they may view as being less of an issue than the teacher. Also, due a focus on class management and behaviour, by phase two students seem to have a better idea about what is permissible. Due to the higher streamed class, levels of behaviour would be expected to be decent, with minor distractions, due to the large size being the main issue. However, potentially students see less of a link between behaviour and engagement. If they are doing the work and the teacher deals with distracting behaviour, caused by a minority, then it is not a major concern for them, and they can engage. Survey comments such as “yesterday about 6 students got sent out of class,” and “some people should do what they are told” highlight that, potentially, most boys are behaving and engage with their work when the teacher is stricter with behaviour.

As the term has progressed and students have become more familiar with each other, the class and school expectations around respect it would be expected that levels of peer respect would, in general rise. Peer respect is potentially easier to develop, and initially more important than teacher respect especially with a teacher they don't know well. This is highlighted when student 6 (interview) stated "since we went to camp, I've had a lot better friendship with everyone." Levels of respect shown to the teacher seem to have not developed as much. In year 9 more time is devoted at the start of the year to classroom management, with the teacher being stricter. This may lead to lower levels of teacher respect. However, with more time in class, relationships with the teacher will develop. Although several students did state that levels had not changed several believed it had improved. As student 2 (interview) said, "It's gotten a little better."

### *Student Agency*

**Table 5. 22**

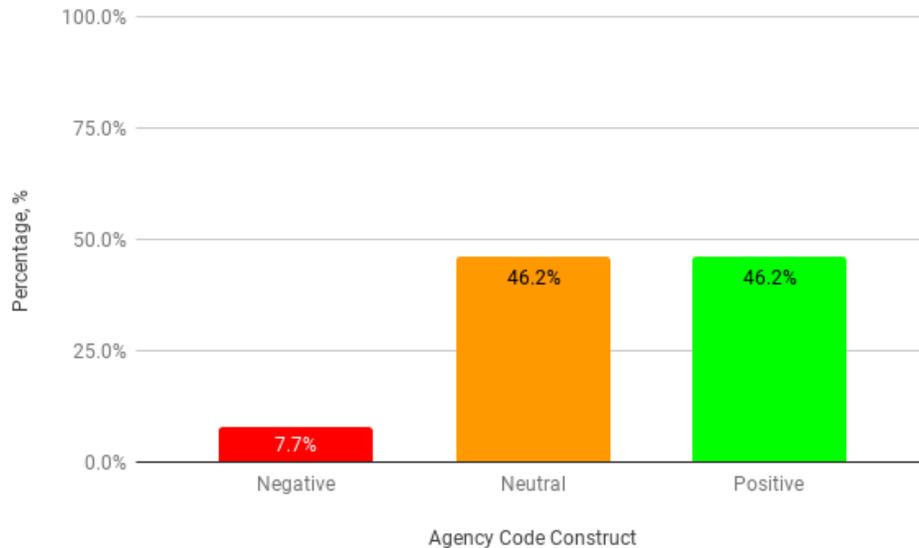
*Student Agency Year 9 Phase 2*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	1	6	6	13
Percentage, %	7.7	46.2	46.2	100

Figure 5.9 shows the percentages of the final student agency codes at phase 2.

**Figure 5.9**

*Student Agency Code Percentages Year 9 Phase 2 (n=13)*



Students perceive agency at phase two as very much towards the positive / neutral side with 92.4% of responses in these categories. As student 3 (interview) commented when discussing whether he enjoyed the subject, “yes I do,” indicating that, this student at least, is engaging with the subject and making positive choices around science. Not only does there appear to be a positive link between increased enjoyment and relationships with the teacher, but it can also be inferred that there is a link with engagement levels, as highlighted when student 3 (interview) stated “everyone gets stuck in and does their work...so it’s alright.” There are more comments along the lines of “yes I do” when discussing their enjoyment. This can be attributed to the implementation of the digital tools, as this is the only change.

However, the positive and neutral responses are equal at 46.2%, as indicated by another student (survey) commenting “not sure,” when discussing whether the digital tools improve learning activities. What some of these comments highlight is the uncertainty that students have and the fact that some students, due to absences, had not used the tools. This is highlighted by the following survey comments, “not sure,” “I haven’t used yet” from students. It can be inferred that although agency is almost 50% positive there is still scope for improvement. Some issues contributing to this potentially include students’ ideas around student voice and a lack of understanding as well as opportunity to share voice at this early stage of the school year. Student voice and feedback surveys are more of a feature as the school year progresses.

Similarly, it can also be inferred that it is difficult for students to be able to say with confidence whether the digital tools have improved voice. These results are similar to student results about whether the tools have improved classroom culture and levels of collaboration and levels of student voice in general. Although the tools, especially Padlet, are collaborative in nature, overall collaboration may still be perceived as not very high. With

time and continued use of the tools this may increase, although this could not be checked in this study due to the impacts of COVID-19. Even more pertinent is that the implementation of the tools is in its' infancy so there has potentially been less co-construction and collaboration with the teacher. With improvements here student-teacher relations may improve further.

### *Student Engagement Levels*

**Table 5. 23**

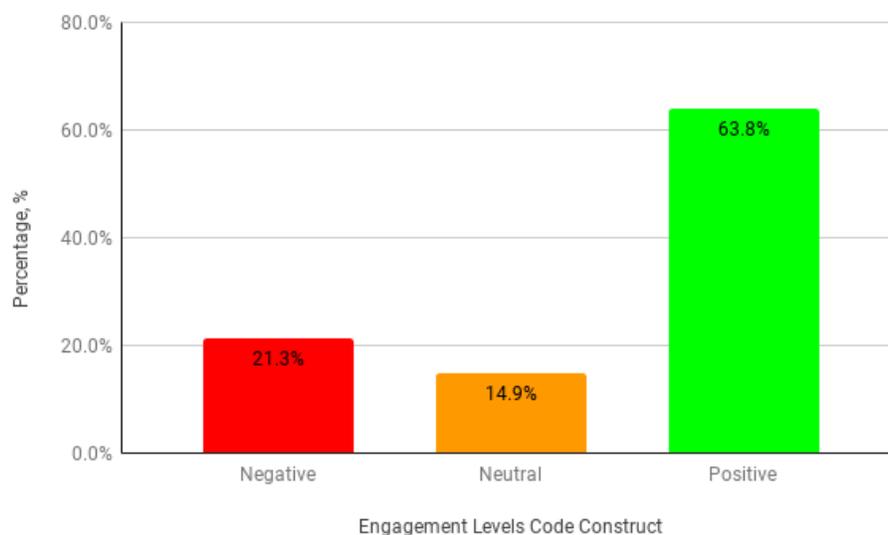
*Student Engagement Levels Year 9 Phase 2*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	10	7	30	47
Percentage, %	21.3	14.9	63.8	100

Figure 5.10 shows the percentages of the final student engagement level codes at phase 2.

**Figure 5. 10**

*Student Engagement Levels Code Percentages Year 9 Phase 2 (n=47)*



With 63.8% of responses being positive it can be inferred that students believe engagement is positive, as highlighted by student 3 (interview) stating that engagement was a “good solid nine out of ten.” Before the implementation of the digital tools, students were more engaged when doing practical work. This was difficult for the teacher to organise due to lack of experience and large class size and was not common. The frequency of practical work has remained the same. Therefore, increases in engagement levels can be attributed to changes in other learning activities in the class, namely using Padlet and Flipgrid, which it appears students enjoy using. As a

student said, “students find it a lot easier doing work on devices as we are mostly accustomed to them” (survey). Another student, when asked whether engagement had increased using the digital tools, stated, “yes... makes it easier to like understand how to do it” (student 2, interview). Students are more technologically immersed and want to use digital platforms and tools in education. As a student stated, “students find it a lot easier doing work on devices as we are mostly accustomed to them” (survey). However, with 21.3% of responses being negative there appears room for engagement to be improved further.

What is interesting is that more students left comments in categories measuring engagement as opposed to those linked to classroom culture and agency. Such comments can therefore be seen to be more representative of the whole class. It can be inferred that students were more comfortable commenting on engagement and whether Padlet and Flipgrid, increased engagement, as they have more ideas around engagement, as opposed to student voice and collaboration being increased due to the tools.

### 5.4.3 Teacher Quantitative Data

#### 5.4.3.1 Teacher Initial Measurement Items

Table 5.24 shows the initial phase 2 measurement items along with the actual value scored by the teacher.

**Table 5. 24**

*Teacher Statistics Year 9 Phase 2*

Measurement Category	Actual Value
Peer Respect	3.00
Student Teacher Respect	4.00
Levels of Behaviour	3.00
Student Engagement	4.00
Belief in Digital Tools	4.00

At phase two the teacher believes that levels of peer respect are neutral, as shown by the actual value of 3.00 (average in the Likert scale), whereas levels of respect between the students and the teacher are perceived as high (good), as shown by the value of 4.00. The teacher perceives behaviour levels as average, with a value of 3.00, whereas students’ engagement levels are good, with a value of 4.00. The teacher’s perception is that the belief in digital tools as a positive pedagogical strategy is high, with a value of 4.00.

#### 5.4.3.2 Teacher Online Survey Final Scale Results

The measurement items were collated into the three final scales as detailed in table 5.25.

**Table 5. 25***Teacher Final Scales Year 9 Phase 2*

<b>Final Teacher Code Scales</b>	<b>Initial Codes</b>
Classroom Culture	Peer Respect Student Teacher Respect Levels of Behaviour
Agency	Belief in Digital Tools
Engagement Levels)	Student Engagement

Table 5.26 shows the values recorded in the teacher final scales.

**Table 5. 26***Teacher Results for Classroom Culture, Agency, and Engagement Year 9 Phase 2*

<b>Measurement Scale</b>	<b>Actual Value</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>
Classroom Culture	3.33	3.33	3.33
Agency	4.00	4.00	4.00
Engagement	4.00	4.00	4.00

With an actual value of 3.33 it can be inferred that classroom culture at phase two from the teacher's perception is above average (3.00), whereas agency is positive or good (high) with an actual value of 4.00. The teacher also perceives engagement as high at phase two with a value of 4.00.

#### **5.4.4 Teacher Qualitative Data**

For details of the initial level 1 code frequencies refer to appendix 8.

##### **5.4.4.1 Qualitative Coding Final Teacher Code Scales**

Table 5.27 details the individual initial codes that have been grouped into the final teacher code scales.

**Table 5. 27**  
*Classification of Teacher Final Coding Scales Year 9 Phase 2*

<b>Final Teacher Scales</b>	<b>Initial Codes</b>
TCC (Teacher Classroom Culture)	TCE (Teacher Classroom Environment) TSR (Student Teacher Relationships) TPR (Teacher Peer Respect) TTR (Teacher Teacher Respect) TLB (Teacher Levels of Behaviour)
TAY (Teacher Agency)	TTE (Teacher Enjoyment of Subject) TSE (Teacher Student Enjoyment of Subject) TBT (Teacher Belief in Tools)
TEL (Teacher Engagement Levels)	TEN (Teacher Student Engagement) TIE (Teacher Increasing Engagement)

Tables 5.28 – 5.30 detail these code results.

### ***Teacher Classroom Culture***

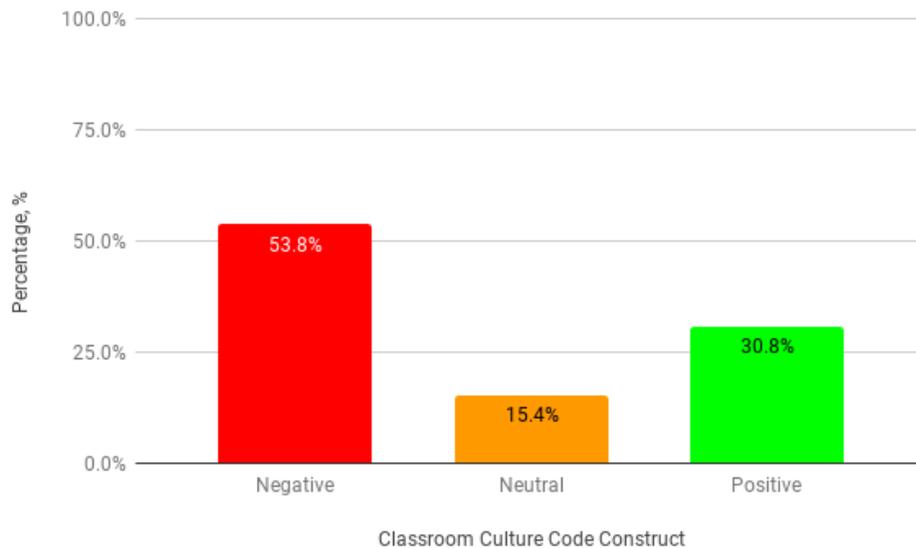
**Table 5. 28**  
*Teacher Classroom Culture Year 9 Phase 2*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	7	2	4	13
Percentage, %	53.8	15.4	30.8	100

Figure 5.11 shows the percentages of the final teacher classroom culture codes.

**Figure 5. 11**

*Teacher Classroom Culture Code Percentages Year 9 Phase 2 (n=13)*



The inference is that the teacher perceives classroom culture at phase two to be more negative. Negative responses, from the teacher interview, such as “they sort of had their honeymoon period at the start” and “just real little things like pens kept getting stolen” account for 53.8% of responses. Although positive responses account for 30.8% of responses there were sometimes caveats placed on these, as highlighted by the teacher stating, “behaviour is generally good when they are reminded constantly of expectations” (survey). Due to the nature of this streamed class such negative behaviours are more likely to be horseplay and disruptive behavior. They may be due to boys being more ‘comfortable’ with where they think they belong in the hierarchy of the class and acting; accordingly, students are finding their feet in a new school environment and pushing boundaries a little, a point made by this teacher when stating “2 - 3 boys still pushing boundaries” (survey).

There is a constant battle between expectations and engagement with activities, which may be linked to the teacher having higher expectations of students in higher streamed classes. This is highlighted when stating that “off task behaviour is still a problem with those who think I am not paying attention to them, or during practical experiments” (survey). This again points to the causal link between increasing engagement and behaviour levels which underpin classroom culture and relationships. It also highlights the potential role technological tools can have in bridging this gap, if implemented as part of an effective strategy.

Overall, implementation of the two digital tools has seemingly not led to an increase in classroom culture. It is difficult to infer this, with many other factors probably having a greater effect, not least student involvement in other schoolwide programmes aimed at building relationships and the continual building of relationships as the term progresses. The teacher notes this when saying “I guess with some of them yeah you can sort of hold a better conversation” (interview).

## Teacher Agency

**Table 5. 29**

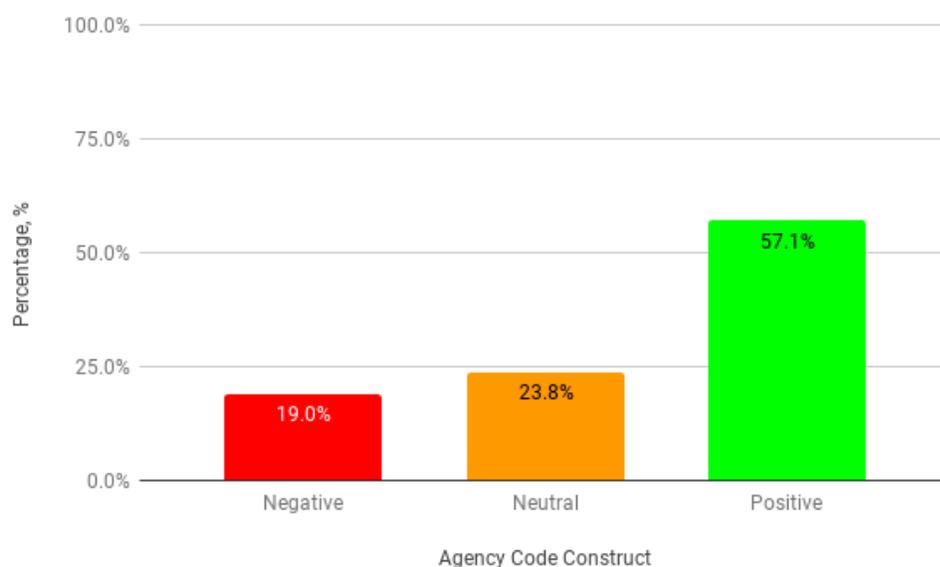
*Teacher Agency Year 9 Phase 2*

Code Descriptor: TAY	Negative	Neutral	Positive	Totals
Frequency	4	5	12	21
Percentage, %	19.0	23.8	57.1	100

Figure 5.12 shows the percentages of the final teacher agency codes at phase 2.

**Figure 5. 12**

*Teacher Agency Code Percentages Year 9 Phase 2 (n=21)*



The teacher's perception is that agency seemingly lies more towards the neutral - positive side, with the negative responses being low, at 19.0%. Seemingly the teacher's perception is that students are making more positive choices around their learning interaction, and that agency is developing. If other learning activities, such as the frequency of practical work, have remained constant, then the implementation of Padlet and Flipgrid has had a positive effect on students' enjoyment of the subject. Another related factor that could influence perceptions is the teacher's preconceived ideas and biases in relation to their enjoyment of using the digital tools. For example, the teacher specifically refers to the digital tools and how students are interacting with them and enjoying the process, when stating "I think they've enjoyed Padlet and I think they quite like seeing their, their own answers coming up and reading other answers" (interview).

Although overall, agency is more positive the teacher's enjoyment of teaching the subject seems to have dropped from phase one. However, this seems to be more linked to teaching a large class (n=32) of young boys and trying to manage behaviour and carry out practical work safely. This is a major challenge for an experienced teacher and more so for a new teacher with little experience. As the teacher states "when we're doing practical stuff, I have not enjoyed taking the class because that's when I've had to start raising my voice" (interview). However, it is apparent that the teacher has more positive perceptions around using Padlet and Flipgrid, which has helped with their enjoyment of teaching. This can potentially be attributed to starting with a more open mind being young and new to teaching. However, there are still reservations, as highlighted with this response, "I'd like to continue using them a little bit more before giving a justified opinion" (interview). From this teacher's perspective this issue is being met and dealt with as these comments indicate when discussing this issue "but both have been very easy to use, " (survey) and "once that was done it has been very easy to use and incorporate into lessons" (survey). Overall, this teacher highlights the positive potential that such tools can have on, for example, time spent teaching and learning when discussing a hard copy pedagogical technique on paper, akin to *A/L* when stating that a paper task "could take half an hour just to answer 5 questions whereas Padlet I guess is sort of a similar concept but a lot quicker" (survey).

### *Teacher Engagement Levels*

**Table 5. 30**

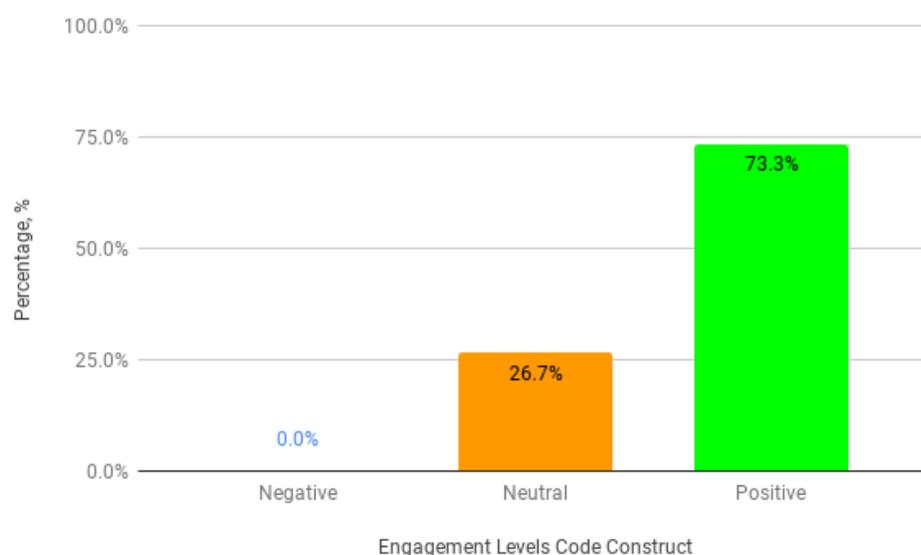
*Teacher Engagement Levels Year 9 Phase 2*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	0	4	11	15
Percentage, %	0.0	26.7	73.3	100

Figure 5.13 shows the percentages of the final teacher student levels of engagement at phase 2.

**Figure 5.13**

*Teacher Engagement Levels Code Percentages Year 9 Phase 2 (n=15)*



The inference is that the teacher believes engagement is positive, with 73.3% of responses falling into this category. As the teacher stated when asked if student engagement had improved “from my own perceived view ... I think so” (interview). Seemingly the teacher thinks there is a direct causal link between improvements in engagement and the use of the two digital tools, as highlighted when the teacher said, “I think they are enjoying the online simulation, particularly as they are not using online tools on a daily basis” (survey). This also aligns with perceptions around their enjoyment of the subject, which would be expected. There is an explicit link with use of the digital tools when stating “I think they have enjoyed it...it has been quite good to...summarise ... what they’re doing” (interview), when referring to digital tools in the interview. This indicates that Padlet and Flipgrid have had a positive impact on engagement and have helped improve engagement levels. This seems to link to the teacher’s positive belief in the benefits of using the tools.

#### **5.4.5 Lesson Observation**

##### **5.4.5.1 Lesson Observation Initial Individual Measurement Items**

Table 5.31 shows the initial results derived from the classroom observations in phase 2.

**Table 5. 31**  
*Lesson Observation Statistics Year 9 Phase 2*

Measurement Item	N <sup>a</sup>	Median	Mean, $\bar{x}$	Mode	SD, $\sigma$
Class Attentive to Instructions / Tasks	6	4.00	3.67	4.00	.52
Class Follow Instructions / Tasks	6	3.00	3.17	3.00	.41
Class Constructively Collaborate	6	3.00	3.00	3.00	.00
Class Organised Work Habits	6	4.00	3.83	4.00	.41
Class Work Carefully / Neatly	6	3.50	3.67	3.00	.82
Class Complete Assigned Tasks	6	3.50	3.50	3.00 <sup>b</sup>	.55
Class Work Willingly / Without Frustration	6	4.00	3.67	4.00	.52
Class Friendly / Respectful to Teacher	6	4.00	3.83	4.00	.75
Class Engages with Teacher	6	3.50	3.50	3.00 <sup>b</sup>	.55
Class Friendly / Respectful to Peers	6	4.00	3.83	4.00	.41
Class Interacts Appropriately with Peers Socially	6	4.00	3.83	4.00	.41
Class Interacts Appropriately with Peers Academically	6	3.00	3.17	3.00	.41
Class Engages with Peers	6	3.00	3.33	3.00	.52
Class General Work Ethic	6	4.00	3.83	4.00	.41
Class General Manners	6	4.00	3.83	4.00	.75
Class Positive Role Modelling	6	3.50	3.50	3.00 <sup>b</sup>	.55
Class Concern for Classroom Environment	6	3.50	3.50	3.00 <sup>b</sup>	.55

<sup>a</sup> *n of 6 is a result of the observation focusing on the same 6 students who were the interview group.*

<sup>b</sup> *Multiple mode exists. The lowest value is shown.*

It can be inferred from the  $\bar{x}$  that all measurement items are somewhere between average (3.00) and good (4.00). Looking at the mode then all items are either average or good. The overall inference is the levels of all the measurement items are above average towards good. If the items are grouped then the ability to constructively collaborate ( $\bar{x} = 3.00$ ) follow instruction and interacting with peers academically ( $\bar{x} = 3.17$ ) are the lowest, at or just above average. Several measurement items are closer to good, such as organised work habits, respectful to the teacher, respectful to peers, interacts appropriately with peers socially, general work ethic and general manners ( $\bar{x} = 3.83$ ). All other items are close to being halfway between average and good ( $\bar{x}$  either 3.50 or 3.67). In all measurement categories the value of  $\sigma$  is below 1.00. Most values are between .41 and .55 which is approximately half of the scale item width of 1.00. This indicates that there is not too much of a spread in the responses in each category. In the class constructively collaborates category a  $\sigma$  of .00 indicates all responses were the same.

### 5.4.5.2 Lesson Observation Final results

Table 5.32 shows the individual lesson observation items that were collated into the final scales.

**Table 5. 32**

*Lesson Observation Final Scales Year 9 Phase 2*

<b>Final Scale</b>	<b>Individual Items Within the Final Scale</b>
Classroom Culture	Class Friendly / Respectful to Teacher
	Class Engages with Teacher
	Class Friendly / Respectful to Peers
	Class Interacts Appropriately with Peers Socially
	Class Interacts Appropriately with Peers Academically
	Class Engages with Peers
	Class General Manners
	Class Concern for Classroom Environment
Agency	Class Constructively Collaborates
	Class Organised Work Habits
	Class Works Carefully / Neatly
Engagement	Class Positive Role Modelling
	Class Attentive to Instructions / Tasks
	Class Follow Instructions / Tasks
	Class Completes Assigned Tasks
	Class Works Willingly / Without Frustration
	Class General Work Ethic

Table 5.33 details the relevant statistics for these final three scales for phase 2 from the lesson observations.

**Table 5. 33**

*Lesson Observation Final Scale Results Year 9 Phase 2*

<b>Final category</b>	<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>
Classroom Culture	6	3.60	3.63	.27
Agency	6	3.50	3.50	.35
Engagement	6	3.57	3.80	.38

With the  $\bar{x} = 3.60$ , it can be inferred at phase two that the classroom culture is somewhere between average (3.00) and good (4.00). Agency can also be inferred as being between average and good, shown by the  $\bar{x} = 3.50$ , as can engagement with a  $\bar{x} = 3.57$ .

## **5.5 Year 9 Case Study Comparison and Conclusions Phase 1 to Phase 2**

### *5.5.1 Phase 1 and Phase 2 Vignettes*

The following vignettes at phase one and phase two are snapshots in time of perceptions from the teacher-researcher of the year 9 case study and provide an initial comparison between the phases. Details of the use of the digital tool/s is included in the phase 2 vignette and is from lesson observation memories and discussion with the relevant teacher.

#### *Phase 1 Vignette*

At the start of the academic year this large class ( $n = 32$ ) is finding its' feet. Boys are new to the school and secondary schooling and the different rhythms and expectations compared to previous schooling. They are having to deal with forming new relationships with unknown students as well as with up to six new teachers and other staff, and a new timetable structure. This can be a daunting time for many. In this class some boys have adjusted quickly whilst others are taking more time. This is leading to the heterogeneity within this class with regards to classroom culture, agency, and engagement, both within the student body and between the students and teacher, who as a newly qualified teacher has high levels of motivation, organisation, and enthusiasm.

The students seem more concerned at this stage in making friends through relational developments and finding their place than with academic work it. Although there seemed to be a degree of respect shown between the students and the teacher when communicating, the teacher needed to repeat instructions a number of times before attention was given, and work was engaged with. It is apparent is that at this phase there is room for improvement in all aspects of classroom culture, agency, and engagement. As the students become more comfortable and the teacher finds the balance between management of the class and stimulating worthwhile learning activities it is envisaged this will happen.

#### *Phase 2 Vignette*

At the end of phase two after the implementation of Padlet and Flipgrid into teaching and learning in an attempt to raise student engagement and improve relationships it was instructive to be able to go back into this class and get an overall perception as to how classroom culture, agency and engagement were compared to the start of the year. It was striking that initially there did not seem to be too much difference around the relationships and interactions in the classroom both student to student and student to teacher. There was still a considerable

background noise as students were communicating with each other which caused some exasperation for the teacher. However, on closer inspection the communications were overall respectful towards each other and to the teacher when necessary, indicating the classroom culture seemed reasonably positive, with seemingly very little noticeable change having taken place. What was also instructive was that despite the levels of noise, students, for the most part, were following instructions and engaging with set work, and helping each other out as, and when appropriate. This is indicative of students making positive choices, developing agency, and engaging with the work. Overall students, apart from a very small minority, seemed to enjoy each other's company, forming decent relationships within the class, and engaging with the work.

During the lesson observation the teacher used Padlet when teaching about changes of state of water. The teacher posted key ideas and prompt questions on the shared interactive wall which was displayed. Students, in groups, had to post responses that answered these key prompts, for example what is condensation? what is evaporation? What happens to the water particles when condensation occurs? What happens to the particles when evaporation occurs? Posts could be written by hand or typed, and include extras, such as images or videos. Different groups of students were tasked to collaborate on assigned key prompts. In discussion with the teacher at the end of this observation Padlet was used like this to collect and curate key information about a particular topic as well as a form of AfL at other times, to check whether students had understood, or retained, key concepts.

### 5.5.2 Quantitative Analysis Collated Findings

#### *Classroom Culture*

Table 5.34 shows the comparison of student results between the phases from the online surveys.

**Table 5. 34**  
*Student Results for Classroom Culture Year 9 Phase Comparison*

<b>Final scale</b>		<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>	<b>Cronbach's Alpha, <math>\alpha</math></b>
Classroom Culture	Phase 1	25	3.81	3.80	.72	.76
	Phase 2	28	3.57	3.00	.59	.69

These results seemingly indicate that from the perspective of the students' classroom culture has worsened, although the drop is almost negligible. The  $\bar{x}$  has reduced from 3.81 to 3.57 between phases one and two. It is difficult to attribute this seeming change in classroom culture to the implementation of the digital tools, with classroom culture being affected by a variety of factors. Table 5.35 shows the comparison of teacher results between phase one and phase two from the online surveys.

**Table 5. 35**  
*Teacher Results for Classroom Culture Year 9 Phase Comparison*

<b>Final Scale</b>		<b>Actual Value</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>
Classroom Culture	Phase 1	3.67	3.67	3.67
	Phase 2	3.33	3.33	3.33

The student results are mirrored by the results from the teacher surveys, where classroom culture has shown a small decrease, with the  $\bar{x}$  reducing by .34 from 3.67 to 3.33. Overall, it can be inferred that any change, although negative, from the quantitative analysis of the online surveys, has been small.

### **Agency**

Table 5.36 shows the comparison of student results between the two phases from the online surveys.

**Table 5. 36**  
*Student Results for Agency Year 9 Phase Comparison*

<b>Final category</b>		<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>	<b>Cronbach's Alpha, <math>\alpha</math></b>
Agency	Phase 1	25	3.24	3.00	.78	.60
	Phase 2	28	3.48	3.00	.79	.86

Regarding agency there is also very little change. From the student results there is an insignificant change, with the  $\bar{x}$  improving slightly from 3.24 to 3.48. Table 5.37 shows the comparison of teacher results between phase 1 and phase 2 from the online surveys.

**Table 5. 37**  
*Teacher Results for Agency Year 9 Phase Comparison*

<b>Measurement Scale</b>		<b>Actual Value</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>
Agency	Phase 1	4.00	4.00	4.00
	Phase 2	4.00	4.00	4.00

There is no change in the teacher results ( $\bar{x}$  remains at 4.00). These results would indicate that the digital tools haven't affected agency. Overall, it can be inferred that there has been little to no overall change in agency as determined from quantitative analysis of the online surveys.

### **Engagement**

Table 5.38 shows the comparison of student results between phases one and two 2 from the online surveys.

**Table 5. 38**  
*Student Results for Engagement Levels Year 9 Phase Comparison*

<b>Final category</b>		<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>	<b>Cronbach's Alpha, <math>\alpha</math></b>
Engagement	Phase 1	25	3.46	3.25 <sup>a</sup>	.90	.88
	Phase 2	28	4.01	4.00	.57	.67

<sup>a</sup> denotes multiple modes exist. The smallest value is shown

Looking at engagement the student results show an increase, with the  $\bar{x}$  having increased by .45, from 3.46 to 4.01). Table 5.39 shows the comparison of teacher results between phase 1 and phase 2 from the online surveys.

**Table 5. 39**  
*Teacher Results for Engagement Levels Year 9 Phase Comparison*

<b>Measurement Scale</b>		<b>Actual Value</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>
Engagement	Phase 1	3.00	3.00	3.00
	Phase 2	4.00	4.00	4.00

The teacher results also show an increase. The  $\bar{x}$  has increased by 1.00, from 3.00 to 4.00. As the only change within this class has been the implementation of the two digital tools it can be inferred that the digital tools have had a positive effect on engagement. Although the tools seemed to have improved engagement this does not seem to have had a concomitant effect on classroom culture and agency.

Seemingly the link between the implementation of Padlet and Flipgrid and engagement levels in an individual classroom is more explicit, direct, and easier to measure. Conversely the links between the pedagogical intervention, engagement, agency, and classroom culture are perhaps more implicit, indirect, and harder to measure, with agency and classroom culture being more affected by a wider range of external factors, potentially outside the classroom and even the school. Classroom culture and agency may also need more time to change conclusively.

5.5.3 Qualitative Coding Collated Findings

**Classroom Culture**

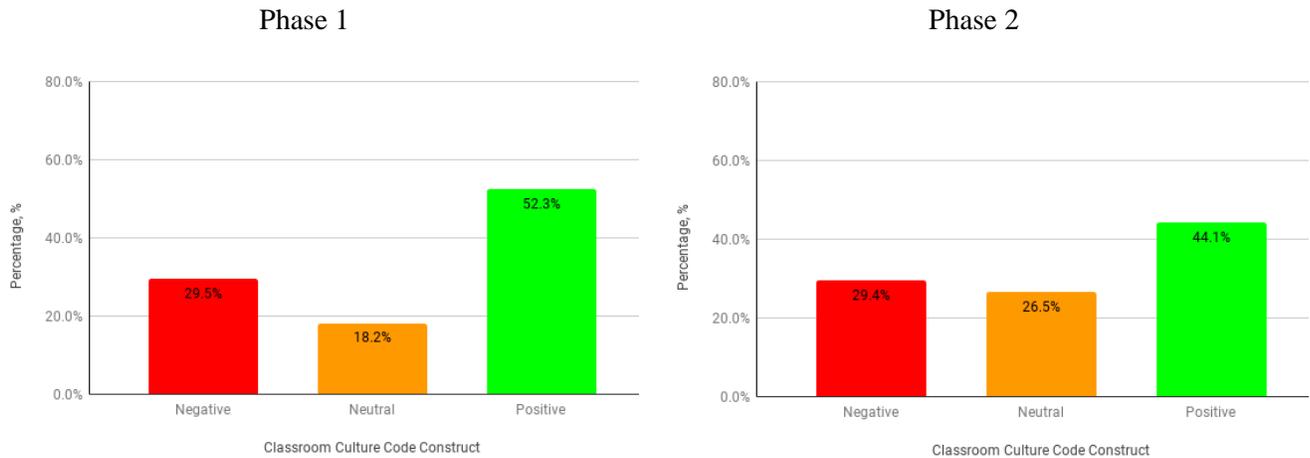
Table 5.40 summarises the qualitative coding findings from phase 1 and phase 2, from the student and teacher perspectives for the classroom culture codes; SCC (student classroom culture) and TCC (Teacher Classroom Culture).

**Table 5. 40**  
*Qualitative Coding Results Classroom Culture Year 9 Phase Comparison*

Code descriptor		Negative (%)	Neutral (%)	Positive (%)
SCC	Phase 1	29.5	18.2	52.3
	Phase 2	29.4	26.5	44.1
TCC	Phase 1	37.5	25.0	37.5
	Phase 2	53.8	15.4	30.8

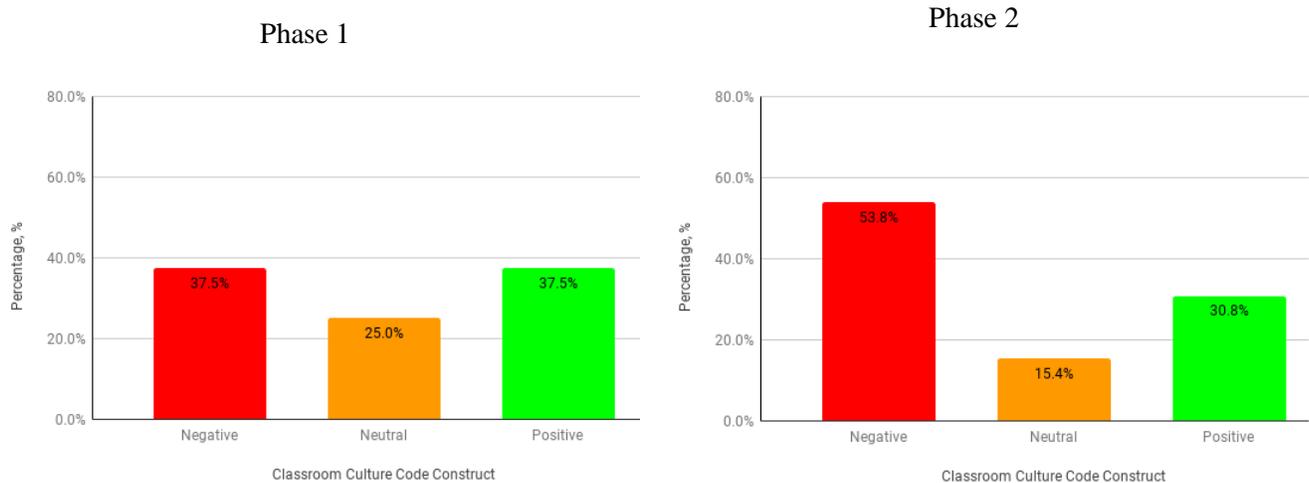
Figures 5.14 and 5.15 show classroom culture comparisons graphically for students and the teacher, respectively.

**Figure 5. 14**  
*Student Classroom Culture Year 9 Phase 1 to Phase 2 Comparison*



**Figure 5.15**

*Teacher Classroom Culture Year 9 Phase 1 to Phase 2 Comparison*



Mirroring quantitative results from the online surveys this coding model leads to the inference that classroom culture has become more negative. This is the case both from the teacher's perception as well as from the students' perspective, although from the students' perspective this drop is less marked. From the teacher's viewpoint the positive responses have dropped from 37.5% to 30.8%, a drop of 6.7%. There has also been a drop of 9.6% in neutral responses. From a student perspective although the drop in positive responses is greater at 9.9% the rise in negative responses is much smaller at 0.8%; there is a larger proportion of neutral responses, accounting for less of a drop in the overall classroom culture. From this it can also be inferred that the implementation of the two digital tools has not improved the culture.

Chi square tests were carried out to determine whether the phase of the study and the final code scales are correlated. Using the null hypothesis, the phase of the study is independent of the final code scale, in this instance, classroom culture. In other words, the phase has no influence on classroom culture. This hypothesis can be rejected if the  $p$  value associated with the chi square test is  $< .05$ , in which case there is some probability that there is some correlation between the phase and classroom culture. Tables 5.41 and 5.42 show the chi-squared results for student classroom culture coding and the teacher classroom culture coding at each phase, respectively.

**Table 5. 41***Chi Square Computation Student Classroom Culture Year 9 Phase Comparison*

<b>Phase</b>	<b>Classroom Culture Negative</b>	<b>Classroom Culture Neutral</b>	<b>Classroom Culture Positive</b>	<b>Totals</b>	<b>Chi Square, X<sup>2</sup></b>	<b>Df</b>	<b>P</b>
1	13	8	23	44	.867 <sup>a</sup>	2	.648
2	10	9	15	34			
Totals	23	17	38	78			
p = .05							
<sup>a</sup> 0 cells (0%) have expected count less than 5. The minimum expected count is 7.41							

As can be seen from table 5.41,  $X^2(2, N=78) = .65, p = .65$ . This means the null hypothesis cannot be rejected and classroom culture and phase for the year 9 student qualitative results are independent.

**Table 5. 42***Chi Square Computation Teacher Classroom Culture Year 9 Phase Comparison*

<b>Phase</b>	<b>Classroom Culture Negative</b>	<b>Classroom Culture Neutral</b>	<b>Classroom Culture Positive</b>	<b>Totals</b>	<b>Chi Square, X<sup>2</sup></b>	<b>Df</b>	<b>p</b>
1	7	2	4	13	.586 <sup>a</sup>	2	.746
2	3	2	3	8			
Totals	10	4	7	21			
p = .05							
<sup>a</sup> 5 cells (83.3%) have expected count less than 5. The minimum expected count is 1.52							

Table 5.42 shows that  $X^2(2, N=21) = .59, p = .75$ . This means the null hypothesis cannot be rejected. Note must be taken of the fact that 83.3% of cells have an expected count <5 which affects the significance accuracy. These results further highlight that any inferred changes are potentially difficult to state with a high degree of confidence and cannot be ascribed to the implementation of Padlet and Flipgrid.

**Agency**

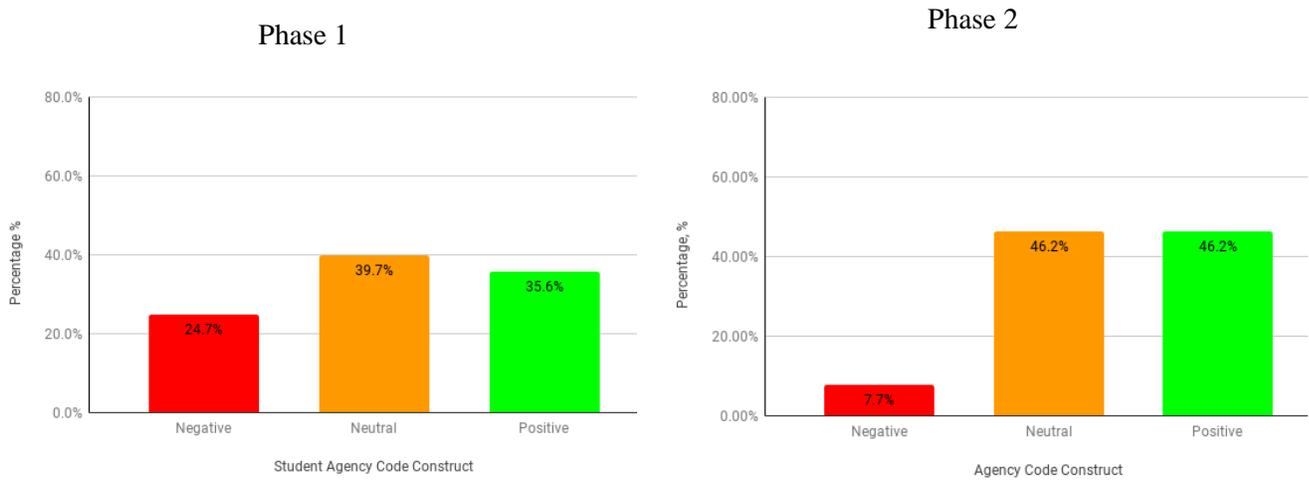
Table 5.43 summarises the qualitative coding findings from phase 1 and phase 2, from the student and teacher perspectives for agency; SAY (Student Agency) and TAY (Teacher Agency).

**Table 5. 43**  
*Qualitative Coding Results Agency Year 9 Phase Comparison*

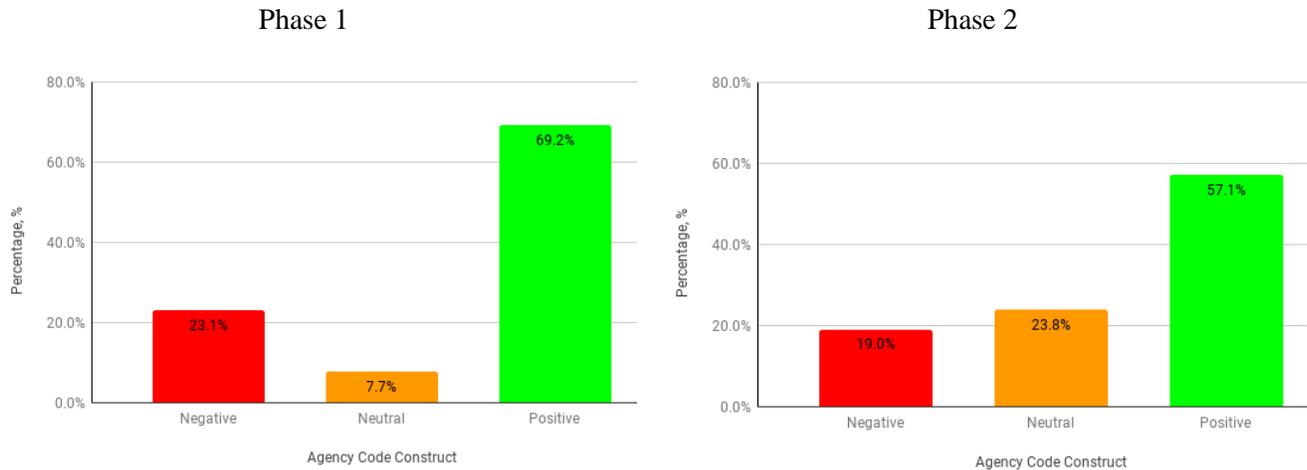
Code descriptor		Negative (%)	Neutral (%)	Positive (%)
SAY	Phase 1	24.7	39.7	35.6
	Phase 2	7.7	46.2	46.2
TAY	Phase 1	23.1	7.7	69.2
	Phase 2	19.0	23.8	57.1

Figures 5.16 and 5.17 show agency comparisons graphically for students and the teacher, respectively.

**Figure 5. 16**  
*Student Agency Year 9 Phase 1 to Phase 2 Comparison*



From the students’ perspectives agency has increased with both positive and neutral responses increasing by 10.6% and 6.5% respectively, with a concomitant drop in neutral responses of 17%.

**Figure 5. 17***Teacher Agency Year 9 Phase 1 to Phase 2 Comparison*

From the teacher's perspective agency has reduced. Positive responses have dropped by 12.1%. However, even though there is a drop in positive agency this is not reflected in a rise in negative agency and responses, which have also dropped, albeit by a small amount of 4.1%. This means that the teacher believes agency has become more neutral, which mirrors the teacher results from the online surveys. Different perspectives around agency from the students and the teacher make it difficult to make strong inferences, especially around whether the digital tools have had an effect.

Tables 5.44 and 5.45 show the chi square cross tab tables for a comparison of the coding responses at each phase for student agency and teacher agency, respectively.

**Table 5. 44***Chi Square Computation Student Agency Year 9 Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, $X^2$	Df	P
1	18	29	26	73	1.879 <sup>a</sup>	2	.391
2	1	6	6	13			
Totals	19	35	32	86			

p = .05

<sup>a</sup> 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.87

Table 5.44 shows that  $X^2 (2, N=86) = 1.88, p = .391$  indicating that the null hypothesis cannot be rejected. The phase of the study and student agency qualitative coding results are independent, highlighting the difficulties

in making strong inferences about student agency and whether it has been affected by the implementation of Padlet and Flipgrid from the perspective of the year 9 students.

**Table 5. 45**

*Chi Square Computation Teacher Agency Year 9 Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, X <sup>2</sup>	Df	P
1	3	1	9	13	1.435 <sup>a</sup>	2	.488
2	4	5	12	21			
Totals	7	6	21	34			

p = .05

<sup>a</sup> 4 cells (66.7%) have expected count less than 5. The minimum expected count is 2.29

Table 5.45 shows that  $X^2 = (2, N= 34) = 1.44$ ,  $p = .49$ . meaning the null hypothesis cannot be rejected. The phase of the study and agency as perceived by the teacher is independent, highlighting the difficulties in measuring agency from the teacher's perspective and linking it to the digital tools.

### **Engagement**

Table 5.46 summarises the qualitative coding findings from phases one and two, from the student and teacher perspectives for the engagement levels codes; SEL (Student Engagement Levels) and TCC (Teacher Engagement Levels).

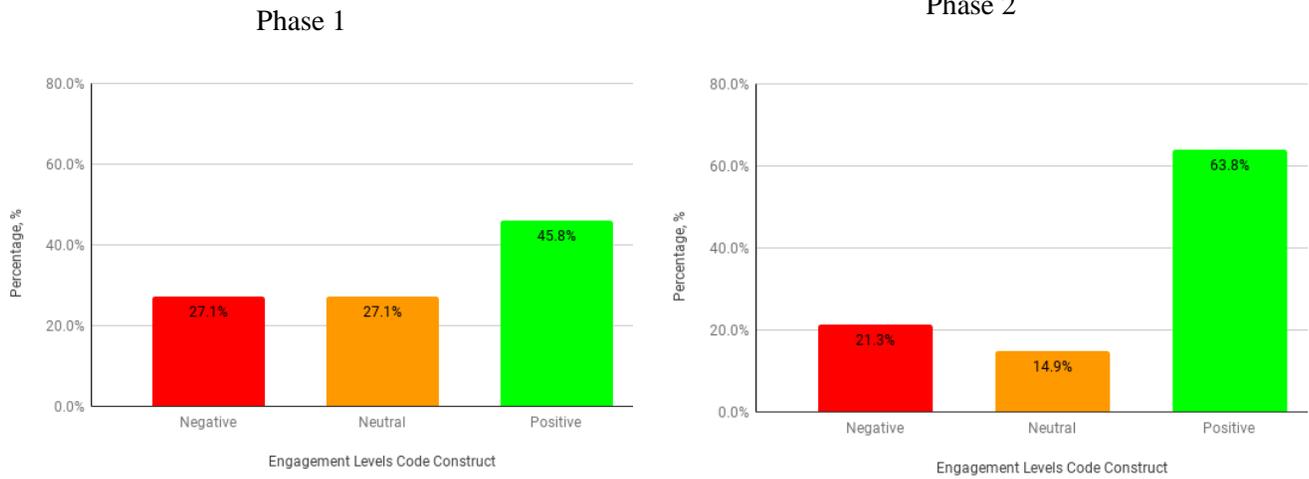
**Table 5. 46**

*Qualitative Coding Results Engagement Levels Year 9 Phase Comparison*

Code Descriptor		Negative (%)	Neutral (%)	Positive (%)
SEL	Phase 1	27.1	27.1	45.8
	Phase 2	21.3	14.9	63.8
TEL	Phase 1	14.3	14.3	71.4
	Phase 2	0.0	26.7	73.3

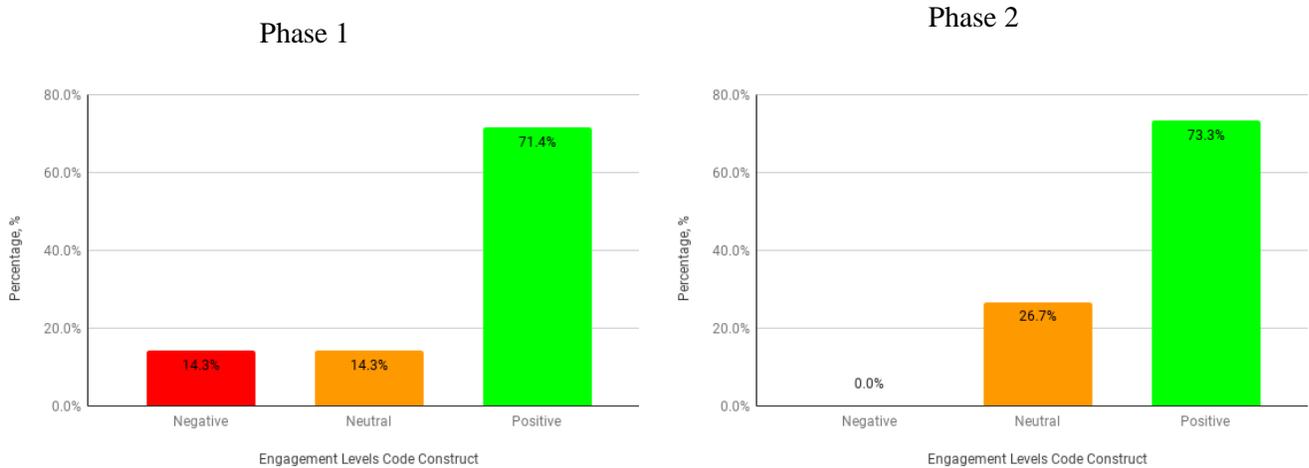
Figures 5.18 and 5.19 show engagement comparisons graphically for students and the teacher, respectively.

**Figure 5. 18**  
*Student Engagement Levels Year 9 Phase 1 to Phase 2 Comparison*



Using this coding model, the inference is that student engagement has increased with the implementation of the digital tools, which mirrors the quantitative results from the online surveys. This is particularly pronounced from the students’ perspectives, with an increase in positive responses of 18% and a concomitant drop in negative responses of 5.8%.

**Figure 5. 19**  
*Teacher Engagement Levels Year 9 Phase 1 to Phase 2 Comparison*



Coding responses from the teacher’s viewpoint indicate that engagement has shifted in a positive manner with an overall drop in negative responses of 14.3% to a more neutral / positive force, with an increase in positive

responses of 1.9% compared to an increase in neutral responses of 12.4%. From results from both stakeholders the inference is that there is a positive causal link between the implementation of the digital tools and engagement, as there has been no other intervention in teaching and learning. With better engagement classroom culture and agency would seemingly also increase through better and more worthwhile interaction with learning activities arising from more positive choices, leading to better behaviour and relationships. In this heuristic coding model these links are not explicitly clear in all cases from both stakeholders. With more time this may become clearer, which points to both a limitation of this study, partly attributed to the impact COVID-19 has had on this study, and an implication for future study.

Table 5.47 shows the chi square table comparing the coding responses at each phase for student engagement levels.

**Table 5. 47**

*Chi Square Computation Student Engagement Levels Year 9 Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, $\chi^2$	Df	P
1	13	13	22	48	104.753 <sup>a</sup>	2	.000
2	10	7	30	47			
Totals	23	20	52	95			
p = .05							
<sup>a</sup> 4 cells (33.3%) have expected count less than 5. The minimum expected count is 2.87							

The null hypothesis is that the phase of the study and student engagement levels from the perspective of the year 9 students are independent. Table 5.47 shows that  $\chi^2 = (2, N = 95) = 104.75$ ,  $p = .00$ . This means that the null hypothesis can be rejected and there is some probability that there is a correlation between the phase and student engagement levels.

Table 5.48 shows the chi square table for a comparison of the coding responses at each phase for engagement levels from the perspective of the year 9 teacher.

**Table 5. 48***Chi Square Computation Teacher Engagement Levels Year 9 Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, $X^2$	Df	P
1	0	4	11	15	2.487 <sup>a</sup>	2	.291
2	1	1	5	7			
Totals	1	5	16	22			
p = .05							
<sup>a</sup> 4 cells (66.7%) have expected count less than 5. The minimum expected count is .32							

Table 5.48 shows that  $X^2 = (2, N = 22) = 2.48$ ,  $p = .29$ . This means that the null hypothesis cannot be rejected and the phase and the student engagement levels from the teacher's perspective are independent.

### 5.5.3 Lesson Observations Collated Findings

Table 5.49 summarises the quantitative coding findings from phase one and phase two for the classroom culture, agency, and engagement level codes from the classroom observations.

**Table 5. 49***Lesson Observation Results Year 9 Phase Comparison*

Final Scale		N	Mean, $\bar{x}$	Mode	SD, $\sigma$
Classroom Culture	Phase 1	6	2.52	2.50	.184
	Phase 2	6	3.60	3.63	.267
Agency	Phase 1	6	2.67	2.50	.204
	Phase 2	6	3.50	3.50	.354
Engagement	Phase 1	6	2.60	2.60	.607
	Phase 2	6	3.57	3.80	.388

### Classroom Culture

The lesson observation results regarding perceptions around classroom culture are at variance with the results from the quantitative analysis from the student and teacher online surveys as well as the qualitative coding. According to the lesson observations there has been a significant increase in the classroom culture category  $\bar{x}$  of 1.1, from 2.5 to 3.6.

### ***Agency***

A similar pattern is evident in the results for agency where there is a significant increase in agency as shown by the increase in the  $\bar{x}$  of 0.8 from 2.7 to 3.5. This result is also at variance with the results indicated by the online surveys of the students and teachers as well as the qualitative coding.

### ***Engagement***

However, the increase in engagement as evidenced by the increase in the  $\bar{x}$  of 1.0 from 2.6 to 3.6 between phase 1 and phase 2, is more in line with the results from the online student and teacher surveys, as well as the qualitative coding. This confirms the conclusion that the implementation of the two digital tools has had a positive effect on student engagement in the year 9 case study. Using these results only there is an inference that the digital tools have had a positive effect on classroom culture and agency as well as engagement. However, the results from the online surveys and the qualitative coding make this link harder to make, pointing to the greater difficulty in measuring classroom culture and agency.

## **5.6 Summary**

Chapter 5 examined the data collected from the online surveys and interviews at phase 1, before the implementation of Padlet and Flipgrid, and at phase 2 after the implementation of Padlet and Flipgrid. This was done from the perspective of the two key stakeholders as well as from the teacher-researcher. An overall comparison of the results from the three data sources at phase one and phase two was discussed, with the inference being that, although engagement levels have risen between the phases and can be attributed to the implementation of Padlet and Flipgrid, the effects on classroom culture and agency are more ambiguous. Changes in these constructs are harder to measure and attribute to the implementation of Padlet and Flipgrid. Chapter 6 carries out the same analysis for the year 10 case study.

## Chapter 6: Results Year 10 Case Study

*“Nothing has such power to broaden the mind as the ability to investigate systematically and truly all that comes under thy observation in life.”*

-Marcus Aurelius-

### 6.1 Introduction

For the convenience of the reader figure 6.1 indicates the data collection timeline for the year 10 case study.

**Figure 6. 1**  
*Data Collection Timeline Year 10 Case Study*

### Data Collection Timeline

PROJECT TITLE		Digital tool implementation and the effects on classroom culture, agency and student engagement									
Note		NZ lockdown commenced Wednesday March 25th. At this stage data collection stopped and was only collected at two phases.									
PHASE	DETAILS	FEB					MAR				
WEEK:		27	3	10	17	24	2	9	16	23	
1	Pre data collection	Informed consent	Handout and collection of consent forms								
		Appropriateness of data collection	Testing interview and online survey questions								
2	Phase 1 Year 10 Case Study. Before the implementation of Padlet and Flipgrid. Baseline data.	Teacher interview (n=1)		Record and transcribe interview							
		Student Interview (n=6)			Record and transcribe interviews						
		Teacher Online Survey		Teacher received and filled in online survey							
		Student Online Survey (whole class)		Teacher shared survey with students. Student filled in							
		Lesson Observation (n=6)			Lesson observation carried out						
3	Phase 2 Year 10 Case Study. After the implementation of Padlet and Flipgrid. Comparative data.	Teacher interview							Record and transcribe interview		
		Student Interview							Record and transcribe interviews		
		Teacher Online Survey							Teacher received and filled in online survey		
		Student Online Survey							Teacher shared survey with students. Student filled in		
		Lesson Observation							Lesson observation carried out		

## 6.2 Year 10 Case Study Class Description

This is a large (n=25) low streamed (a6) class in the second year of a New Zealand Secondary School. Boys in year 10 classes are streamed into their class dependent on their end of year results in year 9, with better results leading to higher streams. There are usually eight classes in year 10, with 10a1 being the highest streamed class and 10a8 the lowest. In general, higher streamed classes have higher numbers of students than the lowest streamed class. Most of the boys in this class would be from lower socio-economic catchment areas of the school. The teacher in this case study class is a highly experienced science teacher who is a few years away from retirement.

## 6.3 Year 10 Case Study Phase 1

### 6.3.1 Student Quantitative Data Phase 1

Table 6.1 shows the phase 1 individual measurement items from the year 10 students' perspectives.

**Table 6. 1**  
*Student Statistics Year 10 Phase 1*

Measurement Category	N	Median	Mean, $\bar{x}$	Mode	SD, $\sigma$
Peer Respect	22	4.00	3.45	4.00	1.06
Student Teacher Respect	21	4.00	3.62	4.00	1.07
Behaviour Levels	22	4.00	3.50	4.00	.86
Teacher Expectations	22	4.00	3.77	4.00	1.31
Student Expectations	22	4.00	3.68	5.00	1.25
Student Whole Class Engagement	22	3.00	3.36	3.00 <sup>a</sup>	.90
Individual Student Engagement	22	4.00	3.77	4.00	.92
Levels of Student Voice	22	3.00	3.23	3.00	1.02
Engaging Learning Activities	22	4.00	3.81	3.00	1.10
Levels of Collaboration	22	4.00	3.55	3.00 <sup>a</sup>	1.10
General Student Engagement	22	3.00	3.23	4.00	1.02

<sup>a</sup> denotes multiple modes exist. The smallest value is shown.

The mode in all the individual measurement categories directly relates to the Likert Scale measurement. Student whole class engagement, levels of student voice, engaging learning activities and levels of collaboration returned a mode of 3.00, or average. Peer respect, student teacher respect, behaviour levels, individual student engagement, and general student engagement returned a mode of 4.00, or good, whereas student expectations returned a mode of 5.00, or very good.

In all measurement items the  $\sigma$  is either close to 1.00, the Likert Scale boundary, or  $>1.00$ , showing variation in student responses. As this case study is a low streamed class with a wide range of student abilities, previous engagement with education in general alongside coming from a range of different socio-economic and ethnic backgrounds, the expectation would be that student responses would vary.

### 6.3.1.1 Collated Measurement Items

The individual measurement items were grouped into the three final scales: classroom culture, agency, and engagement, as highlighted in table 6.2.

**Table 6. 2**

*Student Final Scales Year 10 Phase 1*

<b>Final Scale</b>	<b>Individual Items Within Final Scales Online Surveys</b>
Classroom Culture	Peer Respect
	Student Teacher Respect
	Levels of Behaviour
	Teacher Expectations
	Student Self-Expectation
Agency	Level of Student Voice
	Engaging Learning Activities
	Levels of Collaboration
Engagement	Student Whole Class Engagement
	Student Individual Engagement
	General Student Engagement

Table 6.3 details the relevant statistics for the final scales.

**Table 6. 3**  
*Student Results for Classroom Culture, Agency, and Engagement Year 10 Phase 1*

<b>Final category</b>	<b>n</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>	<b>Cronbach's Alpha, <math>\alpha</math></b>
Classroom Culture	22	3.60	3.60 <sup>a</sup>	.95	.91
Agency	22	3.53	3.00	.90	.79
Engagement	22	3.45	3.50	.69	.72

<sup>a</sup> denotes multiple modes exist. The smallest value is shown.

At phase one year 10 students' perceptions around overall classroom culture can be perceived as between average and good, as shown by the  $\bar{x}$  of 3.60. With an  $\alpha$  of .91 this scale has a high internal consistency. Similar inferences can be made for agency, with a  $\bar{x}$  of 3.53 and engagement levels with a  $\bar{x}$  of 3.45. The value of  $\alpha$  (.79) indicates the agency scale has a high internal consistency. With an  $\alpha$  value of .72 the engagement scale has high internal consistency. In all scales the  $\sigma$  value is less than the scale unit boundary of 1.00, although  $\sigma$  for classroom culture and agency is approaching 1.00 indicating some variation in student responses.

### 6.3.2 Student Qualitative Data

Initial level one codes were coded into the final level three code scales as per the year 9 case study. For a more detailed breakdown of the coding analysis refer to Appendices 6 and 7.

#### 6.3.2.1 Students' Final Level Code Scales

Table 6.4 shows the final code scales and the individual codes grouped into them.

**Table 6. 4**  
*Classification of Student Final Coding Scales Year 10 Phase 2*

<b>Final Level 3 Teacher Codes</b>	<b>Initial Codes</b>	
SCC (Student Classroom Culture)	SCE (Student Classroom Environment)	
	SRP (Student Relationships with Peers)	
	SRT (Student Relationships with Teacher)	
	SLB (Student Levels of Behaviour)	
	SAY (Student Agency)	SES (Student Enjoyment of Subject)
		STE (Student Teacher Expectations)
		SSE (Student Self-Expectations)
		SVO (Student Voice)
		SCO (Student Collaboration)
	SEL (Student Engagement Levels)	SUT (Student Used Tools)
SBT (Student Belief in Tools)		
SEN (Student Engagement)		
SIE (Student Increasing Engagement)		
SWE (Student Whole Class Engagement)		
SPE (Student Pupil / Individual Engagement)		
SAE (Student Activities Engaging)		
STI (Student Teacher Improve Engagement)		

These codes provide the code frequencies and percentages for analysis of classroom culture, agency, and student engagement from the students' perspectives, which are detailed in Tables 6.5 – 6.7.

### *Student Classroom Culture*

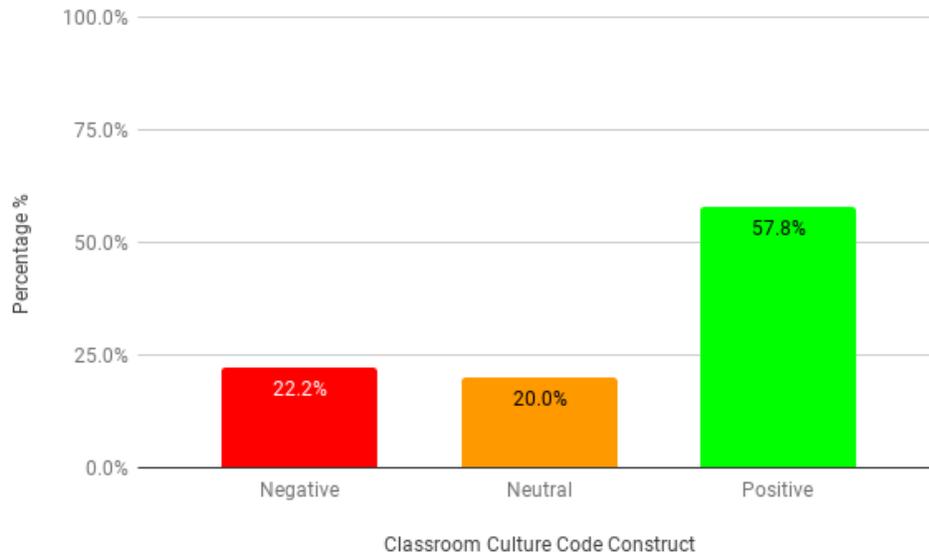
**Table 6. 5**  
*Student Classroom Culture Year 10 Phase 1*

<b>Code Descriptor: SCC</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	10	9	26	45
Percentage, %	22.2	20.0	57.8	100.0

Figure 6.2 shows the percentages of the classroom culture codes.

**Figure 6. 2**

*Student Classroom Culture Code Percentages Year 10 Phase 1 (n = 45)*



The overall perception is that the year 10 students believe classroom culture to be more positive than negative, as highlighted by 57.8% of responses being positive. As student 3 (interview) stated, “yeah, we share heaps of respect.” If the neutral responses are added, then 77.8% of responses in the year 10 case study are non-negative. Students had some negative perceptions around interactions with learning activities in the classroom, as highlighted by student 3 (interview) stating “most of us zone out in class.” This can potentially be attributed to being in a low streamed class.

However, they felt relationships with their peers were good. As student 1 (interview) stated peer relationships are “pretty good,” which are potentially due to the students knowing each and their place in school more, as this is their second year in this school. Although they may not have shown such high engagement with academic work, as indicated by their low streaming band, they have spent more time around each other, in a variety of social, sporting, and cultural settings, related to the school, developing relationships. Most students perceived relationships with the teacher as being good, as highlighted by responses such as “pretty good” (student 4, interview), “fine” (student 6, interview) and “good” (student 2, interview). This is likely to be an overall reflection of the school wide culture where respect is one of the five key school wide culture values and a focus in term one, contributing to the overall positive perceptions around classroom culture. Perceptions around behaviour levels reinforce this. As one student (online survey) stated behaviour levels “are very good.”

### *Student Agency*

**Table 6. 6**

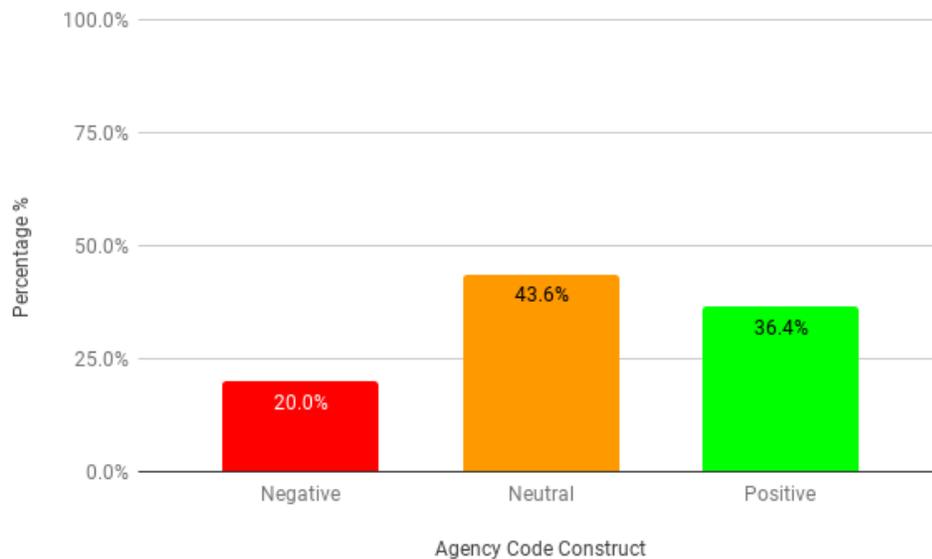
*Student Agency Year 10 Phase 1*

<b>Code Descriptor: SAY</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	11	24	20	55
Percentage, %	20.0	43.6	36.4	100.0

Figure 6.3 shows the percentages of the student agency codes.

**Figure 6. 3**

*Student Agency Code Percentages Year 10 Phase 1 (n = 55)*



The largest percentage of responses was neutral at 43.6%, leading to the inference that students' perceptions of agency are reasonably neutral, as highlighted by students stating he “hopes (the teacher) we can do well in our learning” (online survey), and when referring to self-expectation, “I can probably do well in my work if I try and focus” (online survey in reference to self-expectations). However, when positive responses, which account for 36.4%, are taken into consideration the overall perception around agency is considerably more positive than negative.

Students were more ambiguous about levels of voice; they are seemingly more about their level of voice in the classroom. Perceptions around collaboration are more positive, attributable to the nature of learning activities, as highlighted when a student commented, “we mostly work in groups” (online survey). This includes a significant

amount of practical work due to the high degree of experience and pedagogical knowledge held by the experienced teacher.

When discussing whether they had used the digital tools most responses came back as “no” (online survey) or “maybe” (online survey), with only three students indicated they had used one, or both, of the tools before, potentially when in year 9 or before. Perhaps, more importantly there is positivity around the potential benefits of the digital tools, an important indicator of the students’ mindset, and whether they believe the digital tools can help improve engagement. When combined with neutral perceptions the indication is that there is potential for the tools to improve agency and, thus engagement. The overall inference, at this early stage of the school year, is that students are still developing their likes, wants and ideas around their expectations and interactions with each other, their subjects, and extra and co-curricular options.

### *Student Engagement Levels*

**Table 6. 7**

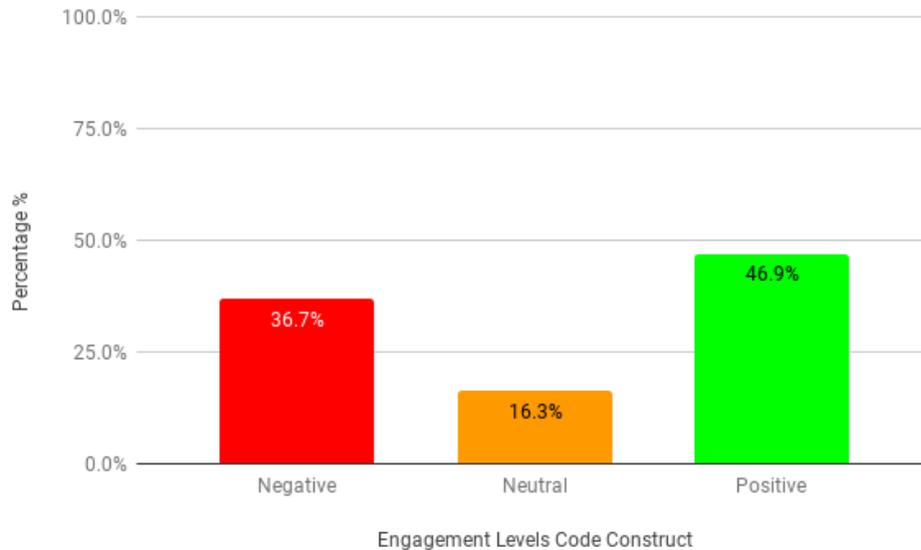
*Student Engagement Levels Year 10 Phase 1*

<b>Code Descriptor: SEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	18	8	23	49
Percentage, %	36.7	16.3	46.9	99.9

Figure 6.4 shows the percentages of the student engagement levels codes.

**Figure 6. 4**

*Student Engagement Levels Code Percentages Year 10 Phase 1 (n = 49)*



Although the positive responses are the highest percentage, at 46.9%, they are under 50%. However, if combining the neutral and positive responses, which account for 63.3%, then engagement can be inferred as being more positive than negative, as highlighted by a student (online survey) stating, “I want to learn in science this year because I am not that good at science, so I try to engage myself in my learning.” There were other positive perceptions around engagement with several students stating that their engagement was “probably eight” (students 1, 4 and 5, interview) and “seven” (student 6, interviews), when rating engagement out of 10. Such comments could be linked to the time of school year with more enthusiasm being evident at the start of the year. There were however a number of negative responses, such as “because I sometime zone out” (student 3, interview) and “we get bored fast” (online survey), indicating the lower levels of academic motivation and engagement generally prevalent in lower streamed classes, as well as the wider range of students’ general engagements.

A general inference that can be made is that the students perceive that levels of engagement are not as high as they could be. However, practical work seems to increase engagement, making activities fun. This is highlighted by students stating, “some really want to learn new experiment” and “I don’t think anyone likes the worksheets we are doing everyday instead of actual experiments” (all online survey). Although engagement can be increased through practical work, the aim of this study is to determine whether using Padlet and Flipgrid as part of learning activities can improve engagement, with the assumption that levels of practical work remain the same.

Students also felt that engagement could potentially be increased through their actions and choice – agency – as opposed to teacher perspectives and actions. This is highlighted by students commenting “just for me to listen more and ask for help when I need it” (student 3, interview), and “stop talking all the time” (student 4, interview). At this phase this shows negative agency. When asked whether they thought the teacher could improve engagement

overall perceptions were between neutral and positive, reflecting the overall perceptions around engagement. As a student stated the teacher is “doing a good job” (online survey).

### 6.3.3 Teacher Quantitative Data Phase 1

#### 6.3.3.1 Teacher Initial Measurement Items

Table 6.8 shows the phase one measurement items along with the returned value, which can be inferred as the real value at this time according to the teachers’ perspectives.

**Table 6. 8**

*Teacher Statistics Year 10 Phase 1*

Measurement Category	Actual Value
Peer Respect	3.00
Student Teacher Respect	3.00
Behaviour Levels	3.00
Student Engagement	4.00
Belief in Digital Tools	4.00

Using the scale measurement of 1.00-5.00 it can be inferred that the year 10 teacher believes that levels of peer respect, respect shown to the teacher and levels of behaviour were average, given that a value of 3.00 was returned. As far as student engagement and belief in the digital tools was perceived in phase one the year 10 case study teacher felt both were good at 4.00.

#### 6.3.3.2 Teacher Final Measurement Items

The measurement items were collated into the three final scales as detailed in table 6.9. From the teacher survey the following items were grouped into classroom culture: peer respect, teacher respect and levels of behaviour. There was only one item for agency, which was belief in tools. Similarly, there was only one item for engagement.

**Table 6. 9***Teacher Results for Classroom Culture, Agency, and Engagement Year 10 Phase 1*

<b>Measurement Scale</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>
Classroom Culture	3.00	3.00
Agency	4.00	4.00
Engagement	4.00	4.00

Due to there being only one response per case study,  $n(\text{teacher}) = 1$ , the mode is the same as the mean. Results for classroom culture for the year 10 teacher show a  $\bar{x}$  of 3.00, from which it can be inferred that classroom culture at phase 1 is average. The inference is that both agency and engagement levels are reasonably positive or good with a  $\bar{x}$  of 4.00.

### 6.3.4 Teacher Qualitative Data

Qualitative coding for the teacher data was analysed in the same manner as all other qualitative data. For a fuller analysis of the coding results refer to Appendices 6 and 7.

#### 6.3.4.1 Teacher Final Code Scales

Table 6.10 shows the individual measurement items that were grouped into the final teacher code scales.

**Table 6. 10***Classification of Teacher Final Scales Year 10 Phase 1*

<b>Final Level 3 Teacher Codes</b>	<b>Initial Codes</b>
TCC (Teacher Classroom Culture)	TCE (Teacher Classroom Environment)
	TSR (Student Teacher Relationships)
	TPR (Teacher Peer Respect)
	TTR (Teacher Teacher Respect)
	TLB (Teacher Levels of Behaviour)
TAY (Teacher Agency)	TTE (Teacher Enjoyment of Subject)
	TSE (Teacher Student Enjoyment of Subject)
	TBT (Teacher Belief in Tools)
TEL (Teacher Engagement Levels)	TEN (Teacher Student Engagement)
	TIE (Teacher Increasing Engagement)

### *Teacher Classroom Culture*

Table 6.11 details the code frequencies for classroom culture from the teacher’s perspective.

**Table 6. 11**

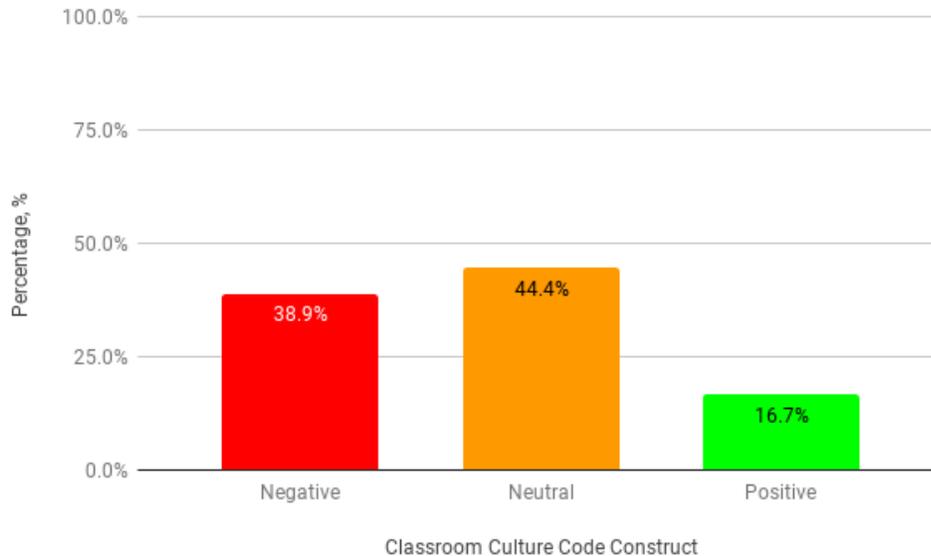
*Teacher Classroom Culture Year 10 Phase 1*

<b>Code Descriptor: TCC</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	7	8	3	18
Percentage, %	38.9	44.4	16.7	100.0

Figure 6.5 shows the percentages of the teacher classroom culture codes.

**Figure 6. 5**

*Teacher Classroom Culture Code Percentages Year 10 Phase 1 (n =18)*



Neutral responses at 44.4% were the largest amount, potentially due to teacher preconceived biases, who is nearing retirement and teaching a lower streamed new class at the start of the year. As the teacher stated this is a “brand new class ... huge variation in abilities” (interview) with “an extremely large spread of abilities and behaviour patterns” (online survey). The teacher also perceives the levels of respect shown by the students as neutral, which may be linked to the class and the wide range of students. This is potentially due to it being the start of the school year and the students are getting settled into school and the class and at this stage do not know the teacher.

As negative responses, at 38.9%, are approximately twice as prevalent as positive responses, at 16.7%, when added to the neutral responses (83.3%) it can be inferred that the classroom culture from the teacher’s

perspective is more negative than positive. This is indicative of the low streamed class of these students, which generally show poorer academic results and attitudes to education, which is highlighted by several repeat year 9 students being in this class. The teacher perceives that relationships between the students and the teacher are more negative. The low stream this class is, cannot be overlooked here. Boys in this class are starting from a more negative level than a higher stream class, leading to lower teacher perceptions around relationships and behaviour. Perceptions are generally that students in lower streamed classes exhibit more negative behaviour and lower engagement. The teacher highlights this when stating “some students are polite and attentive” (online survey) however “others are unmotivated and distracted” (online survey), which potentially feeds into deficit theorising and preconceived biases that can arise when dealing with lower streamed classes, affecting how the teacher views relational levels.

Being at the start of the year may also have an effect. Although the students may know each other as this is their second year, or in some cases third year for the repeaters, in secondary school, they do not know the teacher involved that well. In addition, peer relationships may not be that well developed as some students would’ve been in different classes in year 9; in effect there is a new class dynamic. The teacher will also be setting up classroom management systems to help with behaviour and relationships later in the year, meaning that students may feel the teacher is less ‘friendly and approachable. As the teacher states in the interview, “I’m only starting so effectively I’m boxing them into shape.” The teacher also perceives peer relationships as being more negative. Additionally, in this low streamed case study students who have been less engaged academically with more disruptive behaviours have been aggregated, potentially affecting relatedness and classroom culture. Overall, there seems scope for improvement in the classroom culture.

### *Teacher Agency*

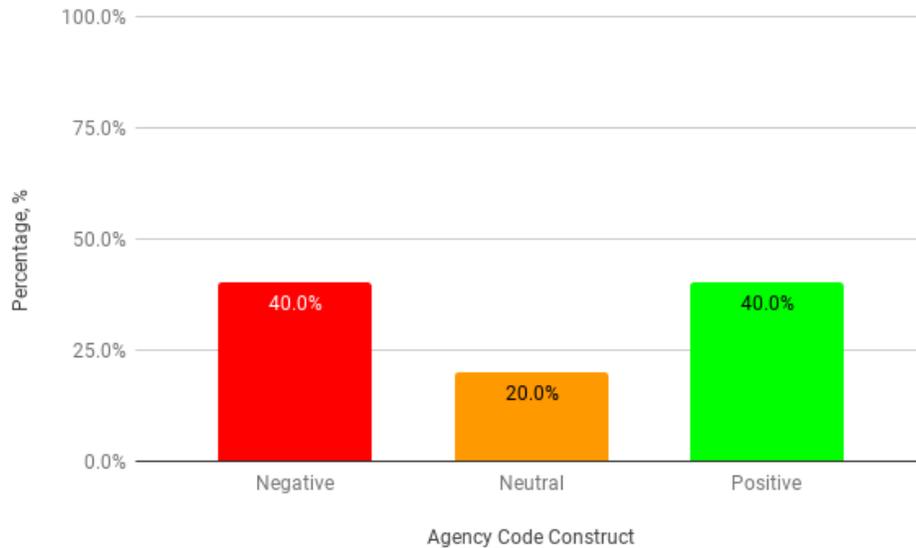
Table 6.12 details the code frequencies for agency from the teacher’s perspective.

**Table 6. 12**  
*Teacher Agency Year 10 Phase 1*

<b>Code Descriptor: TAY</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	4	2	4	10
Percentage, %	40.0	20.0	40.0	100.0

Figure 6.6 shows the percentages of the teacher agency codes.

**Figure 6. 6**  
*Teacher Agency Code Percentages Year 10 Phase 1 (n = 10)*



Agency from the perspective of the teacher was heterogenous, with both positive and negative responses accounting for 40% each. As the teacher states in the interview when discussing student enjoyment of the subject, “some are into shape,” whereas “some don’t want to.” Overall, the teacher perceived students’ enjoyment of the subject as being negative. As the teacher stated, “you’ve got a real low threshold for motivation anyway” (interview). Again, this is likely due to the low streamed class and teacher experiences around lack of motivation and engagement that many students in these classes exhibit.

The teacher’s perception of their own enjoyment of teaching the subject were more ambiguous, potentially due to approaching retirement and the low stream of the class, which may potentially feed into any pre-conceived biases, around deficit theorising. As the teacher stated, “they’ve just started it’s going to be a challenge.” Additionally, due to this phase being at the start of the year where routines around classroom management are a focus, along with school wide practices affecting the flow of teaching, the actual enjoyment of teaching is affected. The teacher highlights this when stating that “in some respects we’re starting the year and it’s been broken too because they’ve been away” (interview).

The teacher was more positive when discussing their belief in the potential efficacy of the digital tools. This is an important factor as the teachers are the change agents by implementing the digital tools into learning activities. If perceptions around the potential benefits on engagement arising from the implementation of the digital tools are positive, then it will be easier for the teachers to buy into the implementation. as confirmed when stating “I haven’t seen them (Padlet and Flipgrid) yet so I’m hoping so yeah” (interview). In the context of this study this is positive, as the teacher is demonstrating more of a growth mindset with regards to using digital tools. In some ways this was

a little more surprising from the year 10 teacher, due to their career and age profile. Although overall perceptions around agency seem to be more neutral or mixed, there seems scope for improvement.

### *Teacher Engagement Levels*

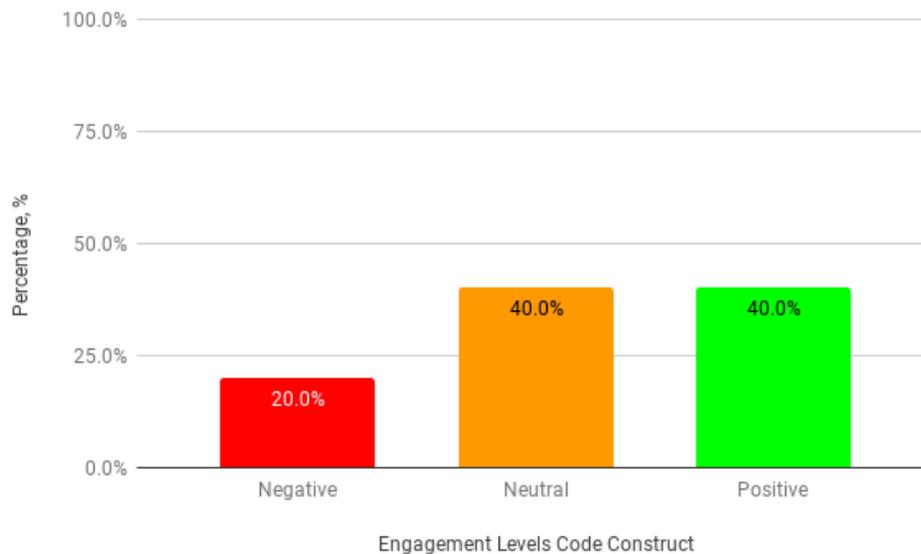
Table 6.13 details the code frequencies for engagement from the teacher’s perspective.

**Table 6. 13**  
*Teacher Engagement Levels Year 10 Phase 1*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	2	4	4	10
Percentage, %	20.0	40.0	40.0	100.0

Figure 6.7 shows the percentages of the teacher engagement level codes.

**Figure 6. 7**  
*Teacher Engagement Levels Code Percentages Year 10 Phase 1 (n = 10)*



It can be inferred that engagement levels are more on the positive side of any engagement continuum. 40% of responses are positive as opposed to only 20% being negative, and 40% neutral. With such a high level of neutral response it can, however, be inferred that the teacher believes that there is scope for engagement to be improved, with a more neutral view, as highlighted when stating that engagement was “very very varied” (interview.) There also seems to be a link to students’ enjoyment of the subject and motivations, and the teacher’s perceptions around that, as highlighted by the teacher when stating, “others will spend quite a long time looking around or anything other than what we’re doing” (interview). Being a low streamed class, this is more to be expected. The fact that this

phase is at the start of the school year may artificially heighten overall perceived engagement levels due to increased levels of enthusiasm and motivation.

However, the teacher is more positive around potential increases in engagement. At this stage this does not involve implementing the digital tools but is predominantly down to practical work, with the year 10 teacher stating that learning activities are “as practically based as possible” (online survey). This needs considering when measuring whether engagement as defined by this model has been improved between phase one and phase two due to the implementation of the digital tools. Using this model if the levels of practical work throughout the study period remained consistent then any changes in engagement, classroom culture and agency can be attributed to the implementation of the digital tools.

### ***6.3.5 Lesson Observation Phase 1***

Like the online surveys, 5-point Likert Scales were used, with 3.00 being average. Lesson observations were carried out by the teacher researcher, so they do not include perspectives from teachers and students that need collating.

#### **6.3.5.1 Lesson Observation Initial results**

Table 6.14 shows the data collected from the phase one lesson observation. To recap there was one lesson observation per Case Study at each phase.

**Table 6. 14**  
*Lesson Observation Measurements Year 10 Phase 1*

Measurement Item	N <sup>a</sup>	Median	Mean, $\bar{x}$	Mode	SD, $\sigma$
Class Attentive to Instructions / Tasks	6	2.50	2.50	2.00 <sup>b</sup>	.55
Class Follow Instructions / Tasks	6	3.00	2.83	3.00	.41
Class Constructively Collaborate	6	3.00	2.83	3.00	.41
Class Organised Work Habits	6	3.00	2.83	3.00	.41
Class Work Carefully / Neatly	6	3.00	3.17	3.00	.41
Class Complete Assigned Tasks	6	3.00	2.83	3.00	.41
Class Work Willingly / Without Frustration	6	3.00	2.83	3.00	.41
Class Friendly / Respectful to Teacher	6	2.50	2.50	2.00 <sup>b</sup>	.55
Class Engages with Teacher	6	3.00	3.17	3.00	.41
Class Friendly / Respectful to Peers	6	2.50	2.50	2.00 <sup>b</sup>	.55
Class Interacts Appropriately with Peers Socially	6	2.00	2.33	2.00	.52
Class Interacts Appropriately with Peers Academically	6	3.00	3.00	3.00	.00
Class Engages with Peers	6	3.00	3.00	3.00	.00
Class General Work Ethic	6	2.50	2.50	2.00 <sup>b</sup>	.55
Class General Manners	6	2.00	2.00	2.00	.00
Class Positive Role Modelling	6	3.00	2.67	3.00	.52
Class Concern for Classroom Environment	6	3.00	3.00	3.00	.00

<sup>a</sup> denotes multiple modes exist. The lowest value is shown.

<sup>b</sup> the lesson observation focused on the same group of students in the interview group, hence n=6

Initial measurements at phase one indicate almost every item was between poor and average. For example, attentiveness to instructions and tasks has a  $\bar{x}$  of 2.50 ( $\sigma = .55$ ), whereas class works collaboratively and have organised work habits, amongst others have a  $\bar{x}$  of 2.83 ( $\sigma = .41$ ). A few categories, such as the students' engagement with peers and the ability to interact with peers academically in an appropriate manner can be viewed as average with a  $\bar{x}$  of 3.00 ( $\sigma = .00$ ). There are two measurement items that have a  $\bar{x}$  in excess of 3.00 (average), namely class working neatly and class engagement with the teacher, but the  $\bar{x}$  of 3.17 ( $\sigma = .00$ ) are closer to average than good.

### 6.3.5.2 Lesson Observation Final Results

Measurement items in the lesson observations were grouped into the final three scales, as shown in table 6.15, for consistent analysis.

**Table 6. 15***Lesson Observations Final Scales Year 10 Phase 1*

<b>Final Scale</b>	<b>Individual Items Within Final Scale</b>	
Classroom Culture	Class Friendly / Respectful to Teacher	
	Class Engages with Teacher	
	Class Friendly / Respectful to Peers	
	Class Interacts Appropriately with Peers Socially	
	Class Interacts Appropriately with Peers Academically	
	Class Engages with Peers	
	Class General Manners	
	Class Concern for Classroom Environment	
	Agency	Class Constructively Collaborates
		Class Organised Work Habits
Class Works Carefully / Neatly		
Class Positive Role Modelling		
Engagement	Class Attentive to Instructions / Tasks	
	Class Follow Instructions / Tasks	
	Class Completes Assigned Tasks	
	Class Works Willingly / Without Frustration	
	Class General Work Ethic	

Table 6.16 details the relevant statistics for these final three scales.

**Table 6. 16***Lesson Observation Results Final Scales Year 10 Phase 1*

<b>Final Scale</b>	<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>
Classroom Culture	6	2.69	2.50 <sup>a</sup>	.21
Agency	6	2.88	2.75 <sup>a</sup>	.26
Engagement	6	2.70	2.40 <sup>a</sup>	.278

<sup>a</sup> denotes multiple modes exist. The lowest value is shown.

***Classroom Culture***

With a  $\bar{x}$  of 2.69 ( $\sigma = .21$ ) the inference is that classroom culture at phase one, from the lesson observation perspective, in the year 10 case study is between poor (2.00) and average (3.00), but closer to average.

***Agency***

With a  $\bar{x}$  of 2.88 ( $\sigma = .26$ ) agency can also be inferred as between poor and average, but closer to average.

***Engagement***

Engagement, with a  $\bar{x}$  of 2.70 ( $\sigma = .28$ ) can also be inferred as between poor and average, but closer to average.

The overall inference is that levels of classroom culture, agency and engagement overall are just below average, with scope for improvement.

**6.4 Year 10 Case Study Phase 2*****6.4.1 Student Quantitative Data Phase 2***

Table 6.17 shows the phase 2 individual measurement items quantitative data from the students' perspectives.

**Table 6. 17**  
*Student Statistics Year 10 Phase 2*

Measurement Category	N	Median	Mean, $\bar{x}$	Mode	SD, $\sigma$
Peer Respect	12	4.00	3.92	3.00	.90
Student Teacher Respect	12	4.00	4.25	4.00	.75
Levels of Behaviour	12	3.50	3.83	3.00	.94
Student Whole Class Engagement	12	3.50	3.75	3.00	.87
Student Individual / Pupil Engagement	12	4.00	4.08	4.00	.70
Levels of Student Voice	12	4.00	4.00	4.00	.95
Engaging Learning Activities	12	4.50	4.42	5.00	.70
Tools Improve Classroom Culture	12	4.00	3.73	4.00	1.10
Tools Increase Student Voice	12	4.00	3.92	4.00	1.16
Tools Made Learning Better	12	4.00	3.83	4.00	1.11
Tools Increased Collaboration	12	4.00	3.75	4.00	1.14
Tools Increased Individual Engagement	12	4.00	4.17	4.00	.72

In all the individual measurement categories the actual mode value directly relates to the Likert Scale measurement. Looking at the data, peer respect, levels of behaviour, and student whole class behaviour returned a mode of 3.00, or average. Student teacher respect, student individual engagement, levels of student voice, tools improve classroom culture, tools increase student voice, tools made learning better, tools increased collaboration and tools increased individual engagement returned a mode of 4.00, or good, whereas engaging learning activities returned a mode of 5.00, or very good.

In all measurement items the standard deviation show variation in student responses, with the  $\sigma$  ranging from .70 for student individual engagement and engaging learning activities to 1.16 for tools increased student voice, where the  $\sigma$  variations in student responses are greater than the Likert Scale unit boundary. Due to the nature of this case study being a low streamed junior science class the range of expectations is not totally unexpected. Boys are still maturing at different rates, have a range of abilities and backgrounds and may value and rate responses slightly differently.

#### 6.4.1.1 Collated Measurement Items

The individual measurement items were collated into the final scales: classroom culture, agency, and engagement, to align with all data collection methods and the engagement model (p. 22) and show consistency in analysis, as shown in table 6.18.

**Table 6. 18***Student Final Scales Year 10 Phase 2*

<b>Final Scale</b>	<b>Individual Items Within Final Scale</b>
Classroom Culture	Peer Respect
	Student Teacher Respect
	Levels of Behaviour
	Tools Improved Classroom Culture
Agency	Level of Student Voice
	Engaging Learning Activities
	Tools Increase Student Voice
	Tools Made Learning Better
	Tools Increased Collaboration
Engagement	Student Whole Class Engagement
	Student Individual Engagement
	Tools Increased Individual Engagement

Table 6.19 details the relevant statistics for the final scales.

**Table 6. 19***Statistics for Classroom Culture, Agency, and Engagement Year 10 Phase 2*

<b>Final category</b>	<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>	<b>Cronbach's Alpha, <math>\alpha</math></b>
Classroom Culture	12	3.93	3.50	.73	.73
Agency	12	3.98	4.00	.74	.77
Engagement	12	4.00	3.67 <sup>a</sup>	.60	.72

<sup>a</sup> denotes multiple modes exist. The lowest value is shown.

### ***Student Classroom Culture***

The inference at phase two, after the implementation of Padlet and Flipgrid, is that classroom culture, from the students' perspective, in the year 10 Case Study is approaching good, as shown by the  $\bar{x}$  of 3.93 ( $\sigma = .73$ ). The value of  $\alpha$  (.73) for the classroom culture scale shows high internal consistency.

### ***Student Agency***

With a  $\bar{x}$  of 3.98 ( $\sigma = .74$ ) agency levels are similar to classroom culture and can be perceived as good. An  $\alpha$  value of .77 indicates high internal consistency for the agency scale at phase two.

### ***Student Engagement Levels***

With a  $\bar{x}$  of 4.00 ( $\sigma = .60$ ) year 10 students perceive engagement levels as good, the  $\alpha$  value of .72 indicates high internal consistency for the engagement scale at phase 2.

## ***6.4.2 Student Qualitative Data***

The individual code items were grouped into the final level three code scales: classroom culture, agency, and engagement in line with all other data collection methodologies. For further details of coding data refer to appendices 6 and 7.

### **6.4.2.1 Final Student Code Scales**

Table 6.20 details the individual initial codes that have been grouped into the final student code scales, used at phase two.

**Table 6. 20***Classification of Student Final Scales Year 10 Phase 2*

<b>Final Level 3 Student Code Scales</b>	<b>Initial Codes</b>
SCC (Student Classroom Culture)	SCE (Teacher Classroom Environment) SRP (Student Relationships with Peers) SRT (Student Relationships with Teacher) SLB (Student Levels of Behaviour) TIC (Student Tools Increase Classroom Culture)
SAY (Student Agency)	SES (Student Enjoyment of Subject) SVO (Student Voice) STA (Student Tool Use Improves Activities) SIV (Student Tool Use Improved Voice) STC (Student Tools Improved Collaboration)
SEL (Student Engagement Levels)	SEN (Student Engagement) SAE (Student Learning Activities Engaging) SWE (Student Whole Class Engagement) SPE (Student Individual / Pupil Engagement) SWT (Student Whole Class Improved Engagement with Tools) SIE (Student Increasing Engagement)

Tables 6.21 – 6.23 detail these code results.

### *Student Classroom Culture*

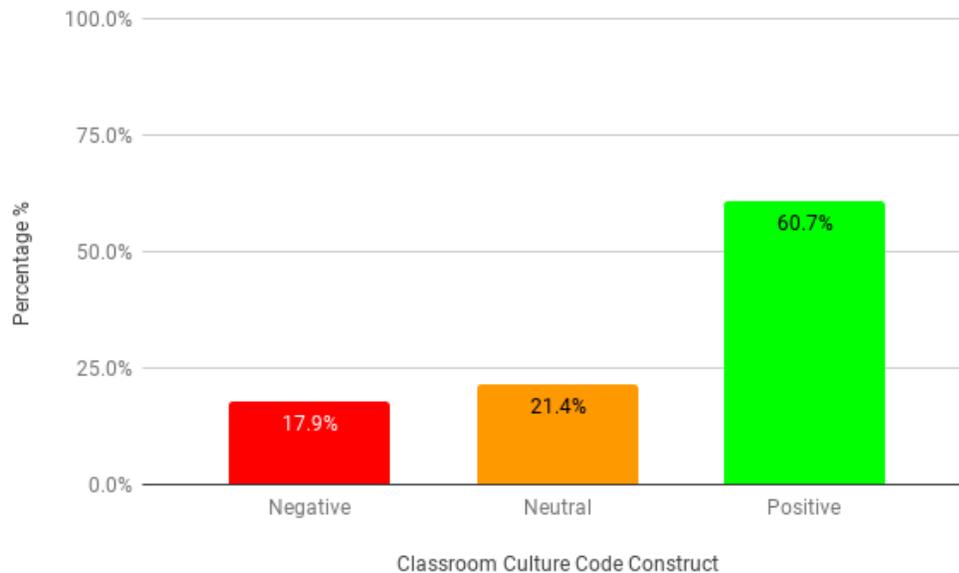
**Table 6. 21***Student Classroom Culture Year 10 Phase 2*

<b>Code Descriptor: SCC</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	5	6	17	28
Percentage, %	17.9	21.4	60.7	100.0

Figure 6.8 details the final student classroom culture code frequencies.

**Figure 6. 8**

*Student Classroom Culture Code Percentages Year 10 Phase 2 (n=28)*



Although some students feel that classroom culture is “still the same” (student 1, interview), overall perspectives are more positive. Although there were some negatively coded responses from students, such as “half the class is very rude and joke about Corona” (online survey), such negative responses accounted for less than 18% of responses. More than 60% of responses, such as “I’ve made more friends than before and got more engaging with the others as well” (student 2, interview) were positive, indicating that peer respect has grown. With time and increasing familiarity with the classroom environment and expectations, along with involvement in school programs, the expectation is that levels of peer respect would develop. Responses referring to peer respect, such as “still good” (online survey) and “yeah made a tighter bond” (student 3, interview) indicate this. Students also seem to hold high levels of respect for the teacher. Although most responses indicate that levels of respect have not changed, they started at a high level. This may be due to the higher maturity levels of the year 10 students who have been in school longer. A further inference is that this positive relationship is founded on respect built on enjoyment of the subject and engagement.

Although perceptions around behaviour levels are perceived to be average to good there is evidence of some frustration that behaviour can be distracting making it harder to engage with the work, as highlighted by a student stating “when bad students are being annoying it gets me frustrated” (online survey). Previous inferences around the wider range of abilities and attitudes prevalent in lower streamed classes help explain this. There is a small handful of boys, present in these classes, who show good attitudes to their work and try their best but find it difficult. This is often due to larger numbers of students who seem more indifferent to education, causing a disproportionate negative impact. This may reflect the lower streamed class, where there is less focus for more

students on academic work, leading to more disruptive and distractive behaviour. However, at this stage of the term behaviour is generally more settled with students knowing the limits around what they can get away with.

More tellingly, students' perceptions are that Padlet and Flipgrid have had a positive effect on classroom culture, with perceptions being between average and good. These students potentially have a slightly better idea of what classroom culture is and see more of a link between learning activities and classroom culture. If the tools have contributed to learning activities being more engaging as can potentially be inferred then it can also be inferred that students believe that the tools, by engaging them more, are potentially leading to better behaviours and levels of respect in the classroom.

### *Student Agency*

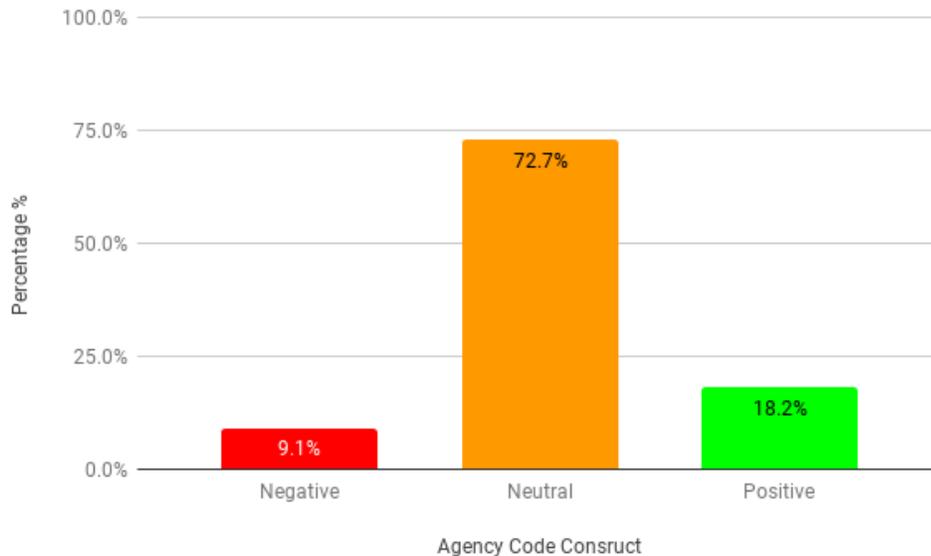
**Table 6. 22**  
*Student Agency Year 10 Phase 2*

<b>Code Descriptor: SAY</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	1	8	2	11
Percentage, %	9.1	72.7	18.2	100.0

Figure 6.9 details the final student agency code frequencies.

**Figure 6.9**

*Student Agency Code Percentages Year 10 Phase 2 (n=11)*



It can be inferred that agency is less well developed. Even though the negative responses account for only 9.1% the positive responses only account for 18.2%, meaning 72.7% of responses are neutral. Responses such as “sometimes” (student 1, interview) and similar, highlight this neutrality around enjoyment of the subject and agency. It is apparent that most students are not exercising a great degree of agency and making positive choices regarding their interactions with learning. The obverse is that they are also not making negative choices. This can potentially be attributed to this being a low streamed class where agentic choices made in the past have not been overly positive.

Although the year 10 students may potentially have a greater understanding of what student voice is, having had opportunities to fill in surveys around student voice and class feedback more when in year 9, they seemingly have not had the opportunity to share voice or have not wanted to. More importantly in the context of this study there has not been too much student voice input into how the tools have been implemented, due to the early stages of implementation and the teachers still developing their efficacies with the tools. Related to this issue is the apparent uncertainty around Padlet and Flipgrid that some students hold, with some students, due to absences, having not used them. As a student stated, “I haven’t used one” (online survey). This has led to neutral perceptions around whether Padlet and Flipgrid have improved levels of student voice, collaboration, and overall classroom culture.

### *Student Engagement Levels*

**Table 6. 23**

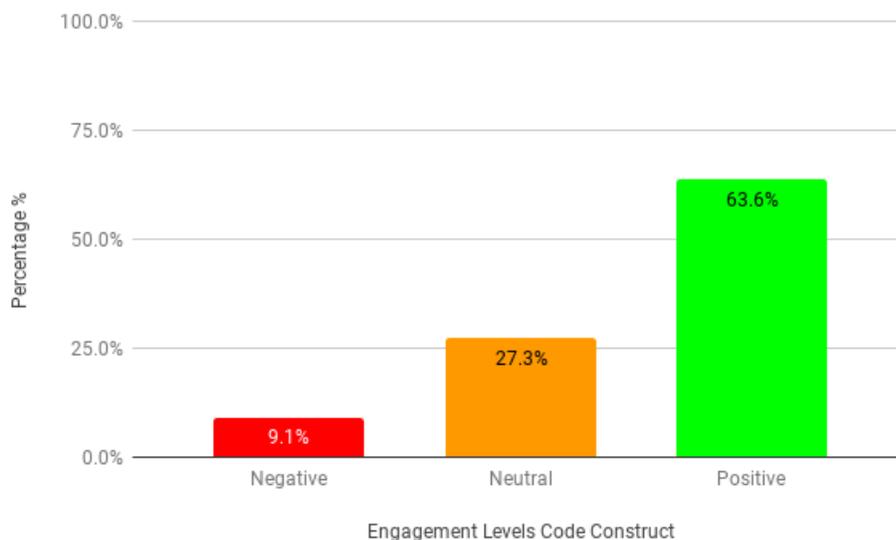
*Student Engagement Levels Year 10 Phase 2*

<b>Code Descriptor: SEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	2	6	14	22
Percentage, %	9.1	27.3	63.6	100.0

Figure 6.10 details the final student levels of engagement code frequencies.

**Figure 6. 10**

*Student Engagement Levels Code Percentages Year 10 Phase 2 (n=22)*



With positive responses at 63.6% it can be inferred that levels of engagement are perceived as positive. This is highlighted by a student when stating that his engagement was now “up to 9” (out of 10) (student 2, interview). There were several statements along similar lines. This inference is even stronger when neutral responses, such as “Padlet books, they’re alright” (student 3, interview), are also considered, meaning only 8.7% of responses were negative. This response also highlights that the digital tools have had an impact that is, at least, not negative for this student.

The overall perception around whether learning activities are helping them to engage more seem to be good. Some of this may be attributable to practical work. Although practical activities are part of the teaching and learning, their frequency has not changed. It can be inferred that new learning activities incorporating the digital tools are interesting and engaging at phase two, as highlighted by a student stating that “kids like technology other than paper” (online survey), signposting that digital tool use is contextually relevant. It can be inferred that there is a

positive causal link between the implementation of the digital tools and increased engagement in this case study. Although the year 10 students hold positive perceptions around the effect the digital tools have had on increasing engagement, they were not very specific in their comments, with a simple “yes” (online survey) being a common response.

### 6.4.3 Teacher Quantitative Data

#### 6.4.3.1 Teacher Initial Measurement Items

Table 6.24 shows the initial phase two measurement items along with the actual value from the teacher’s perspective for each measurement item.

**Table 6. 24**  
*Teacher Statistics Year 10 Phase 2*

Measurement Category	Actual Value
Peer Respect	4.00
Student Teacher Respect	3.00
Levels of Behaviour	3.00
Student Engagement	3.00
Belief in Digital Tools	4.00

From the teacher’s perspective in phase two the level of peer respect is good, as shown by a value of 4.00. However, the teacher’s perceptions around the levels of respect between the students and the teacher, along with levels of behaviour and engagement levels can be inferred as being average, with a value of 3.00. The teacher’s perception is that the belief in digital tools as a positive pedagogical strategy is positive, with a value of 4.00 (good).

#### 6.4.3.2 Teacher Online Survey Final Measurement Scales Results

The measurement items were collated into the final scales as detailed in table 6.25.

**Table 6. 25**  
*Teacher Final Scales Year 10 Phase 2*

<b>Final Teacher Code Scales</b>	<b>Initial Codes</b>
Classroom Culture	Peer Respect Student Teacher Respect Levels of Behaviour
Agency	Belief in Digital Tools
Engagement Levels	Student Engagement

The values for these final scales are shown in table 6.26. As only one item is the final agency and engagement categories then the actual value recorded is the value used for data analysis. In the classroom culture category three items were grouped, so the mean and mode have been used.

**Table 6. 26**  
*Teacher Results for Classroom Culture, Agency, and Engagement Year 10 Phase 2*

<b>Measurement Category</b>	<b>Actual Value</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>
Classroom Culture	3.33	3.33	3.33
Agency	4.00	n/a	n/a
Engagement	3.00	n/a	n/a

#### ***Classroom Culture***

With an actual value and a  $\bar{x}$  of 3.33 it can be inferred that the teacher perceives classroom culture at phase two to be above average (3.00).

#### ***Agency***

The inference is that agency from the teacher's perception is good with an actual response value of 4.00.

#### ***Engagement***

With a value of 3.00 the inference is that engagement as perceived by the teacher is average.

#### ***6.4.4 Teacher Qualitative Data***

For a more detailed breakdown of the individual initial level, one codes that were grouped into the final level three scales used for coding analysis refer to Appendices 6 and 7.

#### 6.4.4.1 Qualitative Coding Teacher Final Codes

Table 6.27 details the individual initial codes grouped into the final level teacher code scales used at phase two.

**Table 6. 27**

*Classification of Teacher Final Scales Year 10 Phase 2*

<b>Final Level 3 Teacher Codes</b>	<b>Initial Codes</b>
TCC (Teacher Classroom Culture)	TCE (Teacher Classroom Environment) TSR (Student Teacher Relationships) TPR (Teacher Peer Respect) TTR (Teacher Teacher Respect) TLB (Teacher Levels of Behaviour)
TAY (Teacher Agency)	TTE (Teacher Enjoyment of Subject) TSE (Teacher Student Enjoyment of Subject) TBT (Teacher Belief in Tools)
TEL (Teacher Engagement Levels)	TEN (Teacher Student Engagement) TIE (Teacher Increasing Engagement)

Tables 6.28 – 6.30 detail these code results.

#### *Teacher Classroom Culture*

**Table 6. 28**

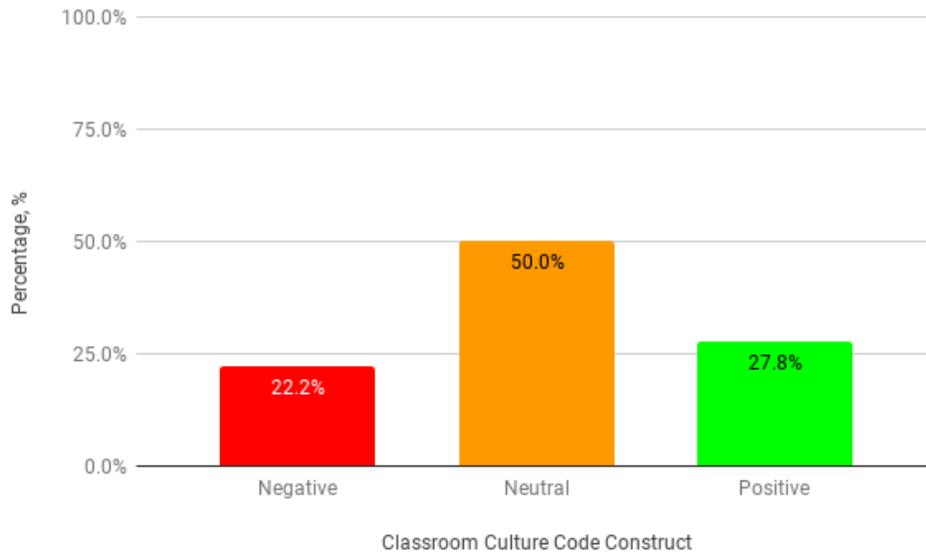
*Teacher Classroom Culture Year 10 Phase 2*

<b>Code Descriptor: TCC</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	4	9	5	18
Percentage, %	22.2	50.0	27.8	100.0

Figure 6.11 details the final teacher classroom culture code frequencies.

**Figure 6. 11**

*Teacher Classroom Culture Code Percentages Year 10 Phase 2 (n=18)*



The frequency of the positive and negative responses is reasonably similar, 27.8% positive and 22.2% negative, indicating that the teacher perceives classroom culture as heterogenous. However, when considering the neutral responses, which are the most frequent at 50%, the overall inference is that the teacher perceives classroom culture at phase two as being more neutral, with little change since phase one. When stating that levels of behaviour are “very varied” (online survey), the teacher highlights the broad range of abilities and, more specifically, attitudes that are more prevalent in lower streamed classes. As the teacher states “we’ve still that split” (interview) in the class. Initial perceptions may have been due to the start of year enthusiasm. Seemingly, the teacher also perceives lack of attendance as a contributory factor, when explicitly stating, “we’ve got major issues of absenteeism” (interview).

Although the teacher perceives that teacher – student relationships are more positive at phase two the perception is that they can still improve. Seemingly they are not quite as well developed or positive as the teacher’s perceptions around peer relationships, which are potentially linked to the greater familiarity with each other year 10 students have. It cannot be inferred that any type of relational improvement is due to the implementation of the digital tools. There are too many other factors that probably have a greater effect, not least student involvement in other schoolwide programmes aimed at building relationships and the continual building of relationships as the term progresses. The teacher notes this when saying relationships are “still developing” (interview). The teacher also links this student-teacher relational development explicitly with engagement when stating that it is “still hard work to keep students focused” (online survey), implying that relationships may improve with more engagement,

highlighting the link between engagement and relationships as part of classroom culture that this study's model of engagement proposes.

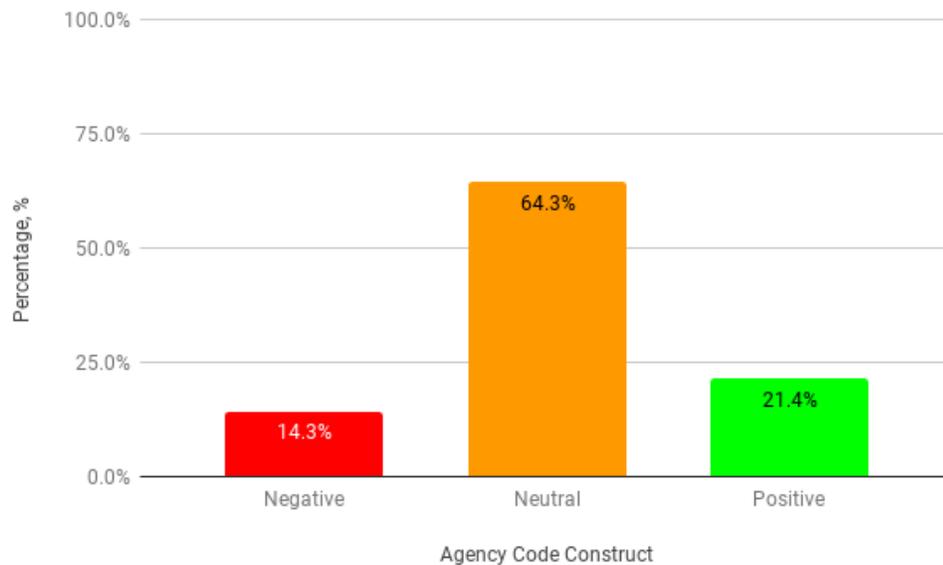
### *Teacher Agency*

**Table 6. 29**  
*Teacher Agency Year 10 Phase 2*

<b>Code Descriptor: TAY</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	2	9	3	14
Percentage, %	14.3	64.3	21.4	100.0

Figure 6.12 details the final teacher agency code frequencies.

**Figure 6. 12**  
*Teacher Agency Code Percentages Year 10 Phase 2 (n=14)*



The perception from the teacher is that agency is more neutral in nature, with 64.3% of responses in this category, with scope for development. At phase two the teacher seems to enjoy the teaching, when stating, “I like the challenge” (interview). This more positive outlook can probably be inferred as being due to greater experience in teaching lower streamed more challenging classes, alongside running practical sessions. However, the teacher's perceptions as to whether the students enjoy the subject is much more neutral in outlook. It cannot be stated with any degree of certainty that students in this case study are enjoying the subject due to the implementation of the digital tools from the teacher's perspective. The obverse is that no negative inference can be drawn around the correlation between the digital tools and enjoyment. Another potential causal factor worth considering is any teacher

preconceived biases in relation to their enjoyment of using the digital tools. The teacher makes no reference to the digital tools and seems to equate student enjoyment more with behaviour management than the pedagogies being used, when stating “when I think about it there is one major change now, they walk into class, they get their books out, they get their objectives set up, almost to a man they do that quietly” (interview).

This highlights the teacher’s neutral belief in the efficacies of Padlet and Flipgrid. This may be due to lack of time and familiarity with digital tool use and overcoming early implementation – ‘teething problems’ - as highlighted by the teacher who stated, “unfortunately at that stage I didn’t have the ability to remove the posts that were inappropriate” (interview), when discussing Padlet. Not only are the use of these digital tools new for this teacher, but they are also new for most, if not all, the students. As the teacher says, when discussing Padlet “so many of the kids giggled and laughed at what somebody else had written” (interview), highlighting issues around students having to deal with the novelty factor of the tools first, before the educational opportunities can be fully embraced.

### *Teacher Engagement Levels*

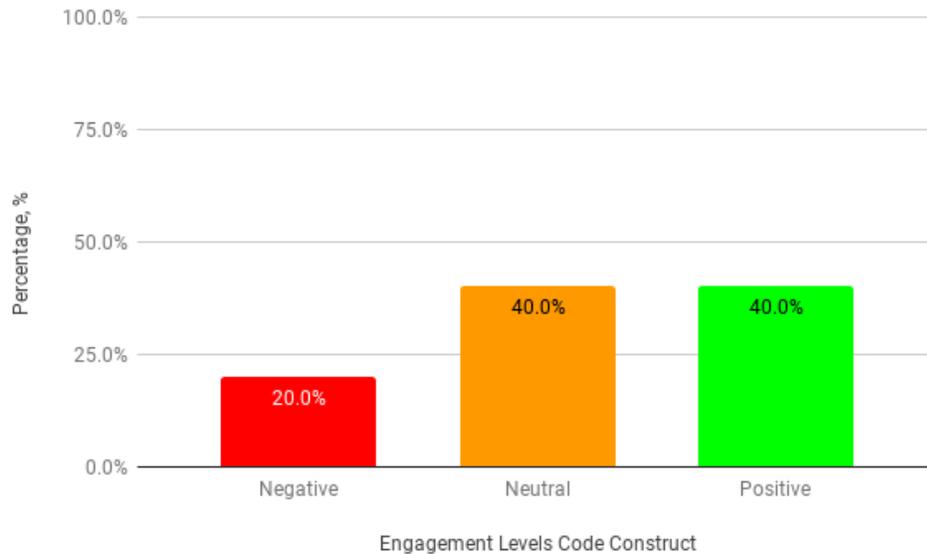
**Table 6. 30**  
*Teacher Engagement Levels Year 10 Phase 2*

<b>Code Descriptor: TEL</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
Frequency	1	2	2	5
Percentage, %	20.0	40.0	40.0	100.0

Figure 6.13 details the final teacher agency code frequencies.

**Figure 6. 13**

*Teacher Engagement Levels Code Percentages Year 10 Phase 2 (n=5)*



The inference is that the teacher believes engagement is more positive than negative, as highlighted when stating that engagement is overall “sometimes better” (online survey). 80% of responses fall under neutral and positive, with 40% each. However, it must be borne in mind that the number of responses for the year 10 case study are low, so each response has a correspondingly greater effect on the response percentage. Due to the teacher’s ambiguity around the digital tool’s efficacy, it is difficult to directly attribute improvements in engagement being due to the digital tools. However, as the frequency of practical work has remained constant then any improvement in engagement can be inferred as being from the use of the tools.

#### **6.4.5 Lesson Observation Phase 2**

##### **6.4.5.1 Lesson Observation Initial results**

Table 6.31 shows the initial results derived from the classroom observations in phase 2.

**Table 6. 31**  
*Lesson Observation Measurements Year 10 Phase 2*

Measurement Item	N <sup>a</sup>	Median	Mean, $\bar{x}$	Mode	SD, $\sigma$
Class Attentive to Instructions / Tasks	6	3.50	3.33	4.00	.82
Class Follow Instructions / Tasks	6	3.00	3.17	3.00	.41
Class Constructively Collaborate	6	3.00	3.17	3.00	.41
Class Organised Work Habits	6	3.00	3.00	3.00	.00
Class Work Carefully / Neatly	6	4.00	3.67	4.00	.52
Class Complete Assigned Tasks	6	3.00	2.83	3.00	.41
Class Work Willingly / Without Frustration	6	3.50	3.50	3.00 <sup>b</sup>	.55
Class Friendly / Respectful to Teacher	6	4.00	3.67	4.00	.52
Class Engages with Teacher	6	3.00	3.17	3.00	.41
Class Friendly / Respectful to Peers	6	4.00	3.83	4.00	.41
Class Interacts Appropriately with Peers Socially	6	4.00	3.83	4.00	.41
Class Interacts Appropriately with Peers Academically	6	3.00	3.17	3.00	.41
Class Engages with Peers	6	3.00	3.00	3.00	.00
Class General Work Ethic	6	3.00	3.22	3.00	.52
Class General Manners	6	4.00	3.83	4.00	.41
Class Positive Role Modelling	6	3.00	3.33	3.00	.52
Class Concern for Classroom Environment	6	3.00	3.33	3.00	.52

<sup>a</sup> the lesson observation focused on the same group of boys who were interviewed, hence  $n=6$

<sup>b</sup> denotes multiple mode exists. The lowest value is shown.

Using the  $\bar{x}$ , the initial lesson observation results in phase two can be inferred to be somewhere between average (3.00) and good (4.00), except class completes assigned tasks, where  $\bar{x} = 2.83$ , which is unsurprising for a low streamed class. Looking at the mode then all items are either average or good. The overall inference is that in this class the levels of all measurement items are above average tending towards good. Class having organised work habits, class interacting appropriately with peers socially and class engaging with peers are rated as average ( $\bar{x}=3.00$ ). Items that are just above average include being able to follow instructions, constructively collaborate, engaging with the teacher and interacting with peers appropriately academically ( $\bar{x} = 3.17$ ). Being respectful to their peers and general manners are rated as close to good ( $\bar{x} = 3.83$ ), which is potentially a reflection of increasing maturity, involvement with schoolwide programmes focusing on respect and relationships in year 10. The remaining measurement items are between average and good ( $\bar{x}$  ranging from 3.33 – 3.67). In all items the  $\sigma$  is less than the

scale unit boundary of 1.00. In most cases the  $\sigma$  is between .41 and .55 indicating that the responses in these items do not have a significant spread. There is an increase in the spread of responses for the class attentive to instructions, where the  $\sigma$  is .82, but this is still not overly significant.

#### 6.4.5.2 Lesson Observation Final Results

Table 6.32 shows the individual lesson observation items that were collated into the final scales.

**Table 6. 32**

*Lesson Observation Final Scales Year 10 Phase 2*

<b>Final Scale</b>	<b>Individual Items Within Final Scale</b>
Classroom Culture	Class Friendly / Respectful to Teacher Class Engages with Teacher Class Friendly / Respectful to Peers Class Interacts Appropriately with Peers Socially Class Interacts Appropriately with Peers Academically Class Engages with Peers Class General Manners Class Concern for Classroom Environment
Agency	Class Constructively Collaborates Class Organised Work Habits Class Works Carefully / Neatly Class Positive Role Modelling
Engagement	Class Attentive to Instructions / Tasks Class Follow Instructions / Tasks Class Completes Assigned Tasks Class Works Willingly / Without Frustration Class General Work Ethic

Table 6.33 details the relevant statistics for these final code scales.

**Table 6. 33**  
*Lesson Observation Results Final Scales Year 10 Phase 2*

<b>Final Scale</b>	<b>N<sup>a</sup></b>	<b>Mean, <math>\bar{x}</math></b>	<b>Mode</b>	<b>SD, <math>\sigma</math></b>
Classroom Culture	6	3.48	3.38	.25
Agency	6	3.29	3.00 <sup>b</sup>	.29
Engagement	6	3.23	3.40	.41

<sup>a</sup> *lesson observation focused on the same group of boys who were interviewed, hence n=6*

<sup>b</sup> *denotes multiple modes exist. The lowest value is shown*

### ***Classroom Culture***

It can be inferred from the lesson observation results at phase two that the classroom culture ( $\bar{x}$ = 3.48) can be rated as between average (3.00) and good (4.00).

### ***Agency***

The perception is that agency with a  $\bar{x}$  of 3.29 is also between average and good, but closer to average.

### ***Engagement***

Levels of engagement with a  $\bar{x}$  of 3.23 are also somewhere between average and good but closer to average.

The  $\sigma$  in all scales is < .50 indicating a small spread in the item scores.

## **6.5 Year 10 Comparison and Conclusions Phase 1 to Phase 2**

### ***6.5.1 Phase 1 and Phase 2 Vignettes***

The following vignettes at phase one and phase two are snapshots in time of perceptions from the teacher-researcher of the year 10 case study and provide an initial comparison between the phases. Details of the use of the digital tool/s is included in the phase 2 vignette and is from lesson observation memories and discussion with the relevant teacher.

#### ***Phase 1 Vignette***

This low streamed class exhibits many of the issues inherent in teaching and learning in such a class; reasons that have led to the students being streamed in such a class. This includes low levels of engagement, issues around attendance and lateness and preparedness to complete work, along with behaviours and relationships. At this phase, many students were turning up late to class with no equipment or resources, including lack of exercise books and pens and pencils. However, what was also evident was the wide range of student attitudes and behaviours. Some

boys were keen and prepared to learn, with others at the opposite end of the spectrum with the majority somewhere in the middle. Peer pressure is a factor in this class at this phase. However, this large cohort of students in the middle ground also provides the hope that with the right pedagogies that engage them more of this cohort will make more positive choices around engaging with learning and bring more of their peers with them.

### ***Phase 2 Vignette***

At phase two the perception when observing this class was that the classroom culture seemed to be positive, with respectful interactions between all stakeholders. Equally there seemed to be some positive agency occurring with more students making more positive choices. For example, not only did attendance seem to be better, so was punctuality; those students who were in attendance were on time. Even more positively, nearly all the students were prepared with books and pens and pencils regardless of the digital devices they were using in this lesson and were engaging with the work and attempting to complete it. Not only were they seeming to enjoy the learning activity they were listening to and following instructions, both written and verbal from the teacher. Overall, there seemed to be a positive vibe in the class. However, this was measured at one point in time.

During the lesson observation the teacher used Flipgrid as part of a learning activity about atomic structure. The teacher posted a short introductory video through the Flipgrid lesson to introduce the topic and instructions. The instructions were also written down with the video. The students had to prepare a short video of 60 seconds in which they shared information they had researched and been given through prepared resources about the structure of an atom. All student videos were shared in the Flipgrid classroom. In discussion with the teacher at the end of the lesson observation the ongoing plan was to view all student videos in a subsequent class. The teacher also discussed the ongoing use of Flipgrid as a video assessment tool for those students who are lacking in writing skills, a significant issue in this low streamed class. When discussing the use of Padlet the teacher discussed how it was implemented at the start of a topic to learn keywords and terms. For example, at the start of the atomic science topic key words and terms, such as atomic number, mass number, proton, electron, neutron, nucleus, were posted onto a collaborative, shared Padlet wall and students had to find out answers / definitions and post them under the key term / word. Responses were augmented with images and / or videos.

### ***6.5.2 Quantitative Coding Collated Findings***

#### ***Classroom Culture***

Table 6.34 shows the comparison of student results between phase one and phase two from the online surveys.

**Table 6. 34**  
*Student Results for Classroom Culture*

Final Category		N	Mean, $\bar{x}$	Mode	SD, $\sigma$	Cronbach's Alpha, $\alpha$
Classroom Culture	Phase 1	22	3.60	3.60 <sup>a</sup>	.95	.91
	Phase 2	12	3.93	3.50	.73	.73

<sup>a</sup> denotes multiple modes exist. The smallest value is shown

The results from the student surveys show that there has been a perceived increase in classroom culture ( $\bar{x}$  has increased by .33). Table 6.35 shows the comparison of teacher results between phase 1 and phase 2 from the online surveys.

**Table 6. 35**  
*Teacher Results for Classroom Culture*

Measurement Scale		Actual Value	Mean, $\bar{x}$	Mode
Classroom Culture	Phase 1	3.00	3.00	3.00
	Phase 2	3.33	3.33	3.33

n = 1 for the teacher results

The teacher results regarding classroom culture are like the student results, with an increase in classroom culture ( $\bar{x}$  has increased by .33) between the phases. These results potentially signpost a positive causal link between the digital tools, as part of learning activities and classroom culture.

### Agency

Table 6.36 shows the comparison of student results between phase one and phase two from the online surveys.

**Table 6. 36**  
*Student Results for Agency*

Final Category		N	Mean, $\bar{x}$	Mode	SD, $\sigma$	Cronbach's Alpha, $\alpha$
Agency	Phase 1	22	3.53	3.00	.90	.79
	Phase 2	12	3.98	4.00	.74	.77

From the students' perspective agency has increased, with the  $\bar{x}$  increasing by .45. Table 6.37 shows the comparison of student results between phase one and phase two from the online surveys.

**Table 6. 37**  
*Teacher Results for Agency*

Measurement Scale		Actual Value	Mean, $\bar{x}$	Mode
Agency	Phase 1	4.00	4.00	4.00
	Phase 2	4.00	4.00	4.00

n = 1 for the teacher results

Unlike the student results agency has remained unchanged between the phases, with no change in the  $\bar{x}$ . Although the student results would imply that there is a link between Padlet and Flipgrid's use in learning activities and agency, the teacher results make this more ambiguous and harder to state.

### **Engagement**

Table 6.38 shows the comparison of student results between phase 1 and phase 2 from the online surveys.

**Table 6. 38**  
*Student Results for Engagement*

Final Category		N	Mean, $\bar{x}$	Mode	SD, $\sigma$	Cronbach's Alpha, $\alpha$
Engagement	Phase 1	22	3.45	3.50	.69	.72
	Phase 2	12	4.00	3.67 <sup>a</sup>	.60	.72

<sup>a</sup> denotes multiple modes exist. The smallest value is shown

According to the student results engagement has increased with the  $\bar{x}$  going up by .55 between the phases, supporting the implication that there is a positive link between the digital tools, as part of learning activities and engagement, classroom culture and agency as is proposed in the model of engagement. Table 6.39 shows the comparison of teacher results between the two phases from the online surveys.

**Table 6. 39**  
*Teacher Results for Engagement*

Measurement Scale		Actual Value	Mean, $\bar{x}$	Mode
Engagement	Phase 1	4.00	4.00	4.00
	Phase 2	3.00	3.00	3.00

n = 1 for the teacher results

The teacher results are at variance with the student results, with engagement dropping, the  $\bar{x}$  has decreased by 1.00. Although this cannot be ignored it is worth remembering that this result is from a sample of one, and results from the qualitative coding as well as the classroom observations need to be considered.

### 6.5.3 Qualitative Coding Collated Findings

#### *Classroom Culture*

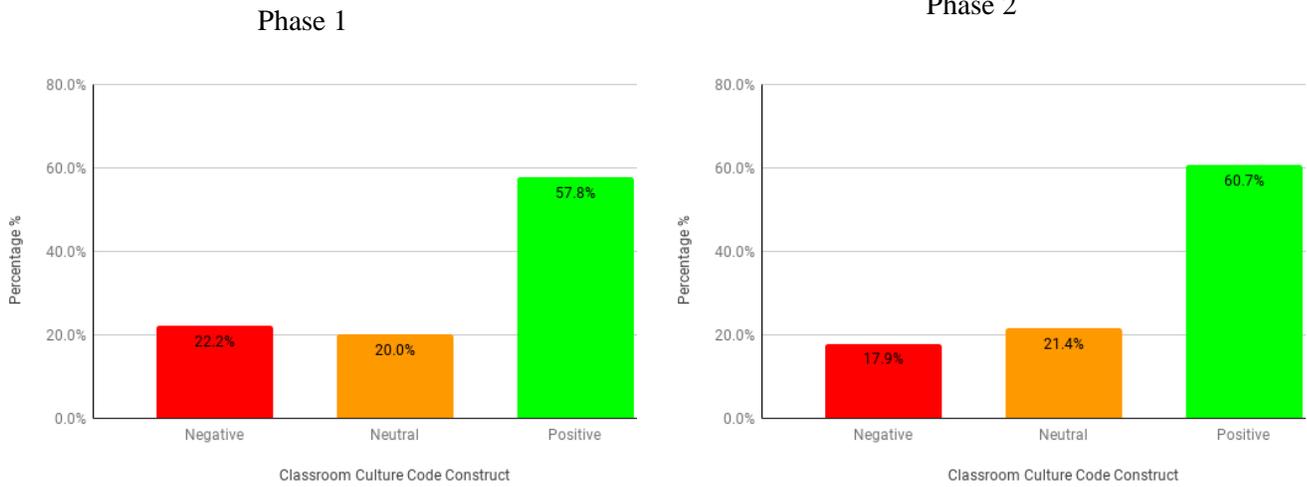
Table 6.40 summarises the qualitative coding findings from phase one and phase two, from both the student and teacher perspectives for the classroom culture codes; SCC (Student Classroom Culture) and TCC (Teacher Classroom Culture).

**Table 6. 40**  
*Qualitative Coding Findings Classroom Culture*

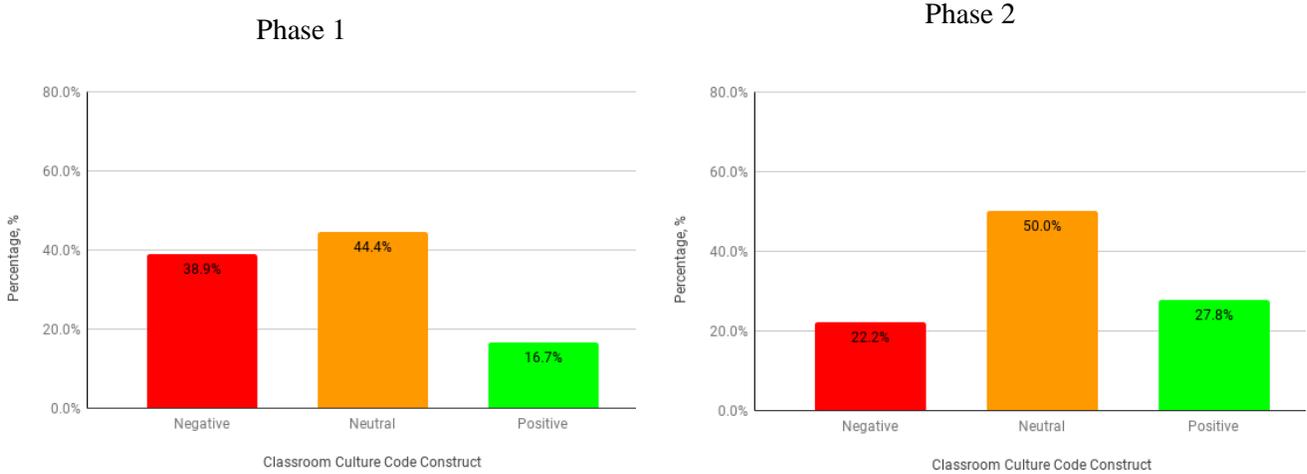
Code Descriptor		Negative, %	Neutral, %	Positive, %
SCC	Phase 1	22.2	20.0	57.8
	Phase 2	17.9	21.4	60.7
TCC	Phase 1	38.9	44.4	16.7
	Phase 2	22.2	50.0	27.8

Figures 6.14 and 6.15 show the phase one to phase two comparisons for student classroom culture and teacher classroom culture, respectively.

**Figure 6. 14**  
*Student Classroom Culture Year 10 Phase 1 to Phase 2 Comparison*



**Figure 6. 15**  
*Teacher Classroom Culture Year 10 Phase 1 to Phase 2 Comparison*



Mirroring quantitative results from the online surveys the inference is that classroom culture has improved. This is the case both from the students’ and teacher’s perceptions, although from the students’ perspective this increase is less marked, with an increase in positive responses of 2.9% and a drop in negative responses of 4.3%. From the teacher’s viewpoint the positive responses have increased by 11.1% from 16.7% at phase one to 27.8%, and even more significantly the negative responses have dropped by 16.7%. What is striking is the difference perceptions that the students and the teacher hold about the overall levels of classroom culture, in that the students hold a much more positive view both at phase one and phase two. Although by phase two if positive and neutral

responses are taken together then the difference in the overall is much smaller, leading to the inference that the implementation of Padlet and Flipgrid has potentially had a small positive effect on classroom culture.

Chi square tests were carried out to determine whether there was any correlation between the coding responses generated between the two phases for both the student and teacher responses. To recap the null hypothesis states that phase of the study and the final coding scale are independent of each other. The hypothesis can be rejected if the  $p$  value associated with the chi square test is  $< .05$ . Tables 6.41 and 6.42 show the chi-squared results for student classroom culture coding at phase one and two and the teacher classroom culture coding at phase one and phase two, respectively.

**Table 6. 41**

*Chi Square Computation Student Classroom Culture Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, $X^2$	Df	P
1	10	9	26	45	.20 <sup>a</sup>	2	.904
2	5	6	17	28			
Totals	15	15	43	73			
p = .05							
<sup>a</sup> 0 cells (0%) have expected count less than 5. The minimum expected count is 5.75							

Table 6.41 shows that  $X^2 = (2, N = 73) = .20, p = .90$ . This means that the null hypothesis cannot be rejected. The phase and the classroom culture levels from the student's perspective are independent, highlighting the difficulty in measuring classroom culture and the affect that Padlet and Flipgrid may have had on it.

**Table 6. 42***Chi Square Computation Teacher Classroom Culture Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, X <sup>2</sup>	Df	P
1	7	8	3	18	1.38 <sup>a</sup>	2	.502
2	4	9	5	18			
Totals	11	17	8	36			

p = .05

<sup>a</sup> 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.00

From table 6.42,  $X^2(2, N = 36) = 1.38$   $p = .502$ . The null hypothesis cannot be rejected. This means that the phase of the study and the classroom culture levels as perceived by the teacher are independent, highlighting potential difficulties around measuring classroom culture and linking any changes between the phases to the implementation of Padlet and Flipgrid.

### Agency

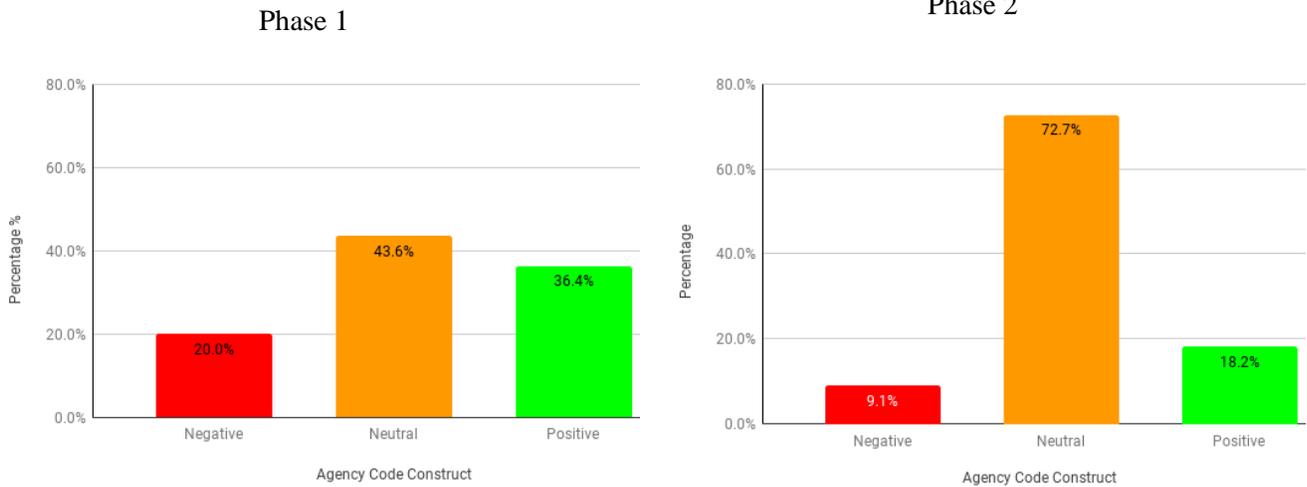
Table 6.43 summarises the qualitative coding findings from phase one and phase two, from both the student and teacher perspectives for the agency; SAY (Student Agency) and TAY (Teacher Agency).

**Table 6. 43***Qualitative Coding Findings Agency*

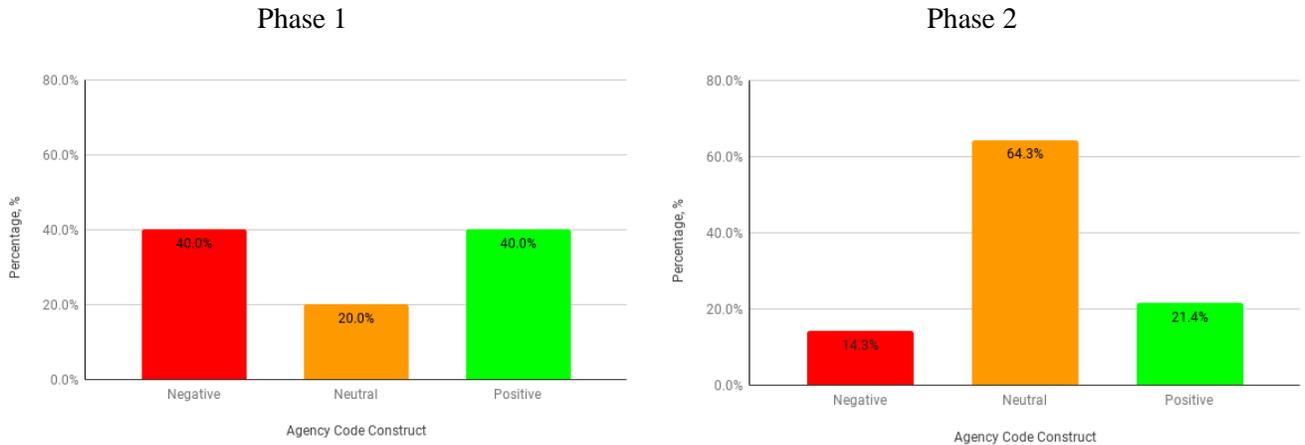
Code Descriptor		Negative, %	Neutral, %	Positive, %
SAY	Phase 1	20.0	43.6	36.4
	Phase 2	9.1	72.7	18.2
TAY	Phase 1	40.0	20.0	40.0
	Phase 2	14.3	64.3	21.4

Figures 6.16 and 6.17 show the phase one to phase two comparisons for student agency and teacher agency, respectively.

**Figure 6. 16**  
*Student Agency Year 10 Phase 1 to Phase 2 Comparison*



**Figure 6. 17**  
*Teacher Agency Year 10 Phase 1 to Phase 2 Comparison*



If the positive responses are looked at in isolation, then it would appear that both the students and the teacher believe that agency in the year 10 Case Study has fallen. Student results show a fall in positive responses of 18.2% with teacher results showing a similar drop of 18.6%. However, when the changes in neutral and negative responses are considered a different picture emerges. The student results show an increase in neutral responses of 29.1% and a fall in negative responses of 10.9% which implies that overall agency has become less negative and can be said to have increased. At phase one 80% of responses are either positive or neutral, whereas in phase 2 90.9% of responses are either positive or neutral. According to the teacher results neutral responses have increased by 44.3%

and at the same time negative responses have fallen by 25.7%. Overall, at phase one 60.0% of responses from the teacher were either positive or neutral, compared to 85.7% in phase two. These results are more in line with the quantitative results from the surveys and give more credence to a positive causal link between the implementation of the digital tools and agency.

Tables 6.44 and 6.45 show the chi square results for the agency coding responses at each phase from the perspective of the students and teacher, respectively.

**Table 6. 44**  
*Chi Square Computation Student Agency Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, X <sup>2</sup>	Df	P
1	11	24	20	55	3.11 <sup>a</sup>	2	.211
2	1	8	2	11			
Totals	12	32	22	66			
p = .05							
<sup>a</sup> 2 cells (33.3% have expected count less than 5. The minimum expected count is 2.00							

As can be seen in table 6.44,  $X^2(2, N = 66) = 3.11, p = .211 (p > .05)$ . The null hypothesis cannot be rejected, student agency levels and phase are independent variables. This highlights the difficulty in potentially measuring agency and what affects it.

**Table 6. 45**  
*Chi Square Computation Teacher Agency Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, X <sup>2</sup>	Df	P
1	4	2	4	10	4.73 <sup>a</sup>	2	.094
2	2	9	3	14			
Totals	6	11	7	24			
p = .05							
<sup>a</sup> 5 cells (83.3%) have expected count less than 5. The minimum expected count is 2.50							

As table 6.45 shows,  $X^2(2, N = 24) = 4.73, p = .094$ . The null hypothesis cannot be rejected. There is a probability that the phase and the teacher agency perceptions are independent. This again highlights the potential difficulties in measuring agency and the effect that Padlet and Flipgrid have had on it.

## Engagement

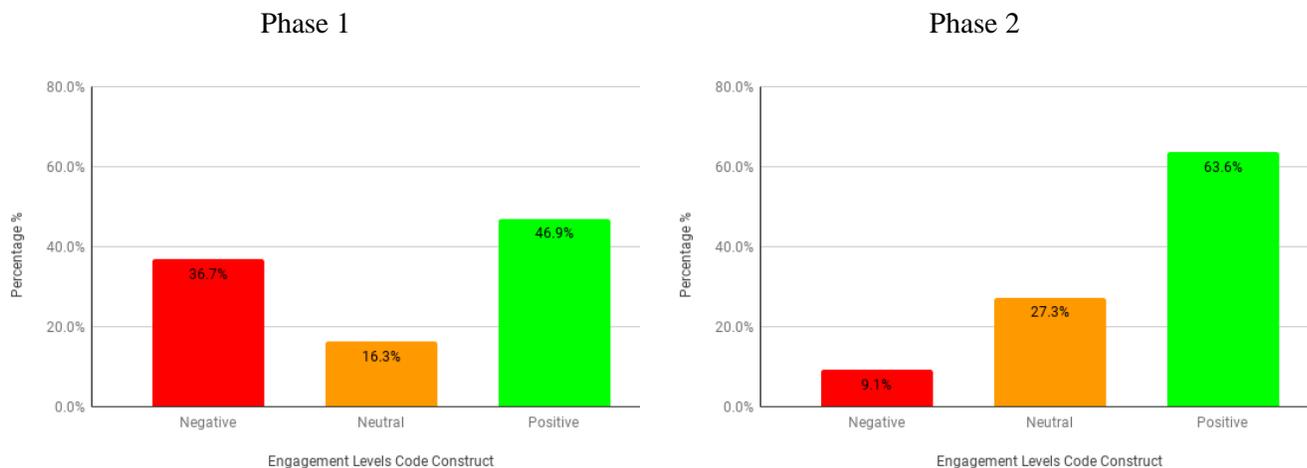
Table 6.46 summarises the qualitative coding findings from phase one and phase two, from both the student and teacher perspectives for the engagement levels codes; SEL (Student Engagement Levels) and TCC (Teacher Engagement Levels).

**Table 6. 46**  
*Qualitative Coding Findings Engagement*

Code Descriptor		Negative, %	Neutral, %	Positive, %
SEL	Phase 1	36.7	16.3	46.9
	Phase 2	9.1	27.3	63.6
TEL	Phase 1	20.0	40.0	40.0
	Phase 2	20.0	40.0	40.0

Figures 6.18 and 6.19 show the phase one to phase two comparisons for student engagement levels and teacher engagement levels, respectively.

**Figure 6. 18**  
*Student Engagement Levels Year 10 Phase 1 to Phase 2 Comparison*



The inference is that from the students' perspective engagement has increased with the implementation of the digital tools, mirroring the quantitative results from the student online survey results, if not the teacher survey results. Student positive responses have increased by 18.3% which when combined with a drop in negative responses of 28.0% shows a significant improvement.

To determine whether there was any potential significant difference between the engagement coding responses from the perspectives of the students and teacher chi square tests were carried out, as shown in tables 6.47 and 6.48, respectively.

**Table 6. 47**

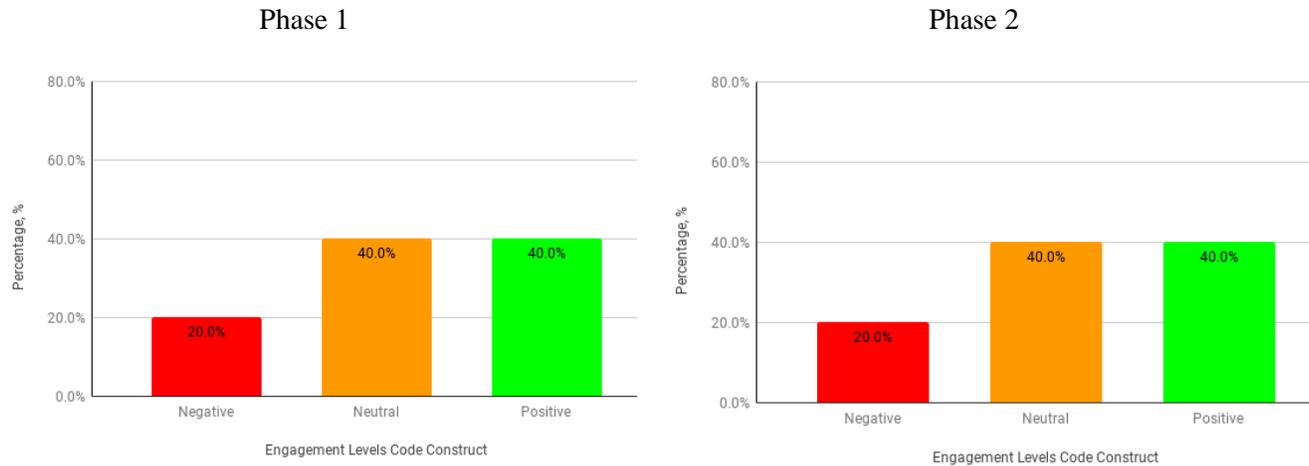
*Chi Square Computation Student Engagement Levels Phase Comparison*

<b>Phase</b>	<b>Classroom Culture Negative</b>	<b>Classroom Culture Neutral</b>	<b>Classroom Culture Positive</b>	<b>Totals</b>	<b>Chi Square, X<sup>2</sup></b>	<b>Df</b>	<b>P</b>
1	18	8	23	49	86.78 <sup>a</sup>	2	.000
2	2	6	14	22			
Totals	20	14	37	71			

p = .05

<sup>a</sup> 11cells (73.3%) have expected count less than 5. The minimum expected count is .39

Table 6.47 shows that  $X^2(2, N = 71) = 86.78$ ,  $p = .00$ . The null hypothesis can be rejected. There is a probability that there is a correlation between the phase of the study and the students' perceptions of levels of engagement, with changes being attributable to the implementation of the digital tools.

**Figure 6. 19***Teacher Engagement Levels Year 10 Phase 1 to Phase 2 Comparison*

Results are less clear from the teacher with no change in results between phase one and phase two. This makes it less clear about there a being a definite positive causal link between the implementation of the digital tools and engagement, from the perspective of the year 10 teacher. With more time this may become clearer. This points to both a limitation of this study, partly attributed to the impact COVID-19, and an implication for future study.

**Table 6. 48***Chi Square Computation Teacher Engagement Levels Phase Comparison*

Phase	Classroom Culture Negative	Classroom Culture Neutral	Classroom Culture Positive	Totals	Chi Square, $X^2$	Df	P
1	2	4	4	10	.00 <sup>a</sup>	2	1.000
2	1	2	2	5			
Totals	3	6	6	15			

p = .05

<sup>a</sup> 6 cells (100%) have expected count less than 5. The minimum expected count is 1.00

Table 6.48 shows that  $X^2(2, N = 15) = 0.00$ ,  $p = 1.00$ . The null hypothesis cannot be rejected. There is a probability that the phase of the study and the engagement levels from the perspective of the teacher are independent. It must also be borne in mind that the frequency in each cell is less than 5, which is not recommended for chi square calculations, due to increased sensitivity to distributions within cells (using Chi-Square Statistic in Research - Statistics Solutions, 2020), and the impact this has on the accuracy of significance values.

### 6.5.4 Lesson Observations Collated Findings

Table 6.49 summarises the quantitative coding findings from phase one and phase two for the classroom culture, agency, and engagement level codes from the classroom observations.

**Table 6. 49**  
*Statistics Lesson Observation Findings*

Final Scale Category		N	Mean, $\bar{x}$	Mode	SD, $\sigma$
Classroom Culture	Phase 1	6	2.69	2,50	.21
	Phase 2	6	3.48	3.38	.25
Agency	Phase 1	6	2.88	2.75	.26
	Phase 2	6	3.29	3.00	.29
Engagement	Phase 1	6	2.70	2.40	.28
	Phase 2	6	3.23	3.40	.41

#### *Classroom Culture*

Lesson observation results regarding classroom culture mirror the results from the online surveys as well as the qualitative coding, with an increase in the  $\bar{x}$  of .79 from phase one to phase two. This confirms the conclusion that the implementation of the two digital tools has had some positive effect on classroom culture in this case study, although other contributory factors cannot be ignored.

#### *Agency*

Agency has shown an increase according to the classroom observation, with an increase in the  $\bar{x}$  of .41 from phase one to phase two after the implementation of the tools. Overall, this result supports the results from the quantitative survey results and the qualitative coding, which help infer that agency has improved overall in this case study, and there has been a positive effect due to the implementation of the two digital tools.

#### *Engagement*

Engagement levels have also shown an increased with the  $\bar{x}$  increasing by .53 from phase one to phase two, giving support to the inference that there is a positive causal link between the two digital tools and engagement with learning activities. Looking at the results from all the sources of data collection this positive link is reinforced.

## 6.6 Summary

Chapter 6 examined the data collected from the online surveys and interviews at phase one and phase two from the perspective of the two key stakeholders and the teacher-researcher. An overall comparison of the results

from the three data sources at both phases was discussed, leading to the inference that although engagement levels have risen between the phases and can be attributed to the implementation of Padlet and Flipgrid the effects on classroom culture and agency are more ambiguous. Although there appears to be evidence that classroom culture and agency have improved marginally in the year 10 case study, overall, such results are not as clear as for the engagement construct with such changes being harder to attribute to the implementation of the two digital tools. Chapter 7 examines the two case studies and discusses some commonalities and differences.

## Chapter 7: Results Cross Case Analysis

*“The only people who see the whole picture are the ones who step outside the frame.”*

*Salman Rushdie*

### 7.1 Introduction

Results from the two case studies indicate that the implementation of Padlet and Flipgrid had a positive effect on student engagement, which increased between phase one and phase two. Looking at the proposed model of engagement (section 2.5.2, pp. 20-22) in which engagement is dependent on the learning environment and the interactions between teachers and students and learning activities, then it is apparent that that this model incorporates classroom culture and agency. Results from both case studies (chapters 5 and 6) indicate that this model has relevance, and engagement can be improved through positive interactions between learning activities and classroom culture and increasing agency.

However, the findings are not totally clear cut with commonalities and differences between the two case studies. It must also be borne in mind that there are significant differences between the two case studies, both regarding the student cohort and the respective teachers, which make direct comparisons difficult. The year 9 case study is a high streamed class whereas the year 10 case study is a low streamed class. Higher streamed students generally having higher levels of motivation and engagement with their learning. In addition, the two teachers involved are at opposite ends of the career spectrum, with the year 9 teacher being newly qualified and the year 10 teacher approaching retirement age.

### 7.2 Quantitative Statistics Online Surveys

#### 7.2.1 Classroom Culture

Results from the quantitative statistics show a difference between the year 9 and year 10 case studies. In the year 9 case study it can be inferred that classroom culture has worsened slightly between the phases. This is true from the perspectives of both key stakeholders. In the year 10 case study from the teacher’s perspectives the classroom culture has remained the same but from the students’ perspectives it can be inferred that classroom culture has improved, with an overall conclusion that classroom culture in the year 10 case study has improved slightly.

Paired samples t-test were carried out on classroom culture at both phases to highlight any differences between the two case studies. Table 7.1 shows the paired samples t-test for classroom culture as perceived by the students from the online surveys in the year 9 case study.

**Table 7. 1***Paired Samples t-Test and Effect Size Classroom Culture Student Online Surveys Year 9*

<b>Phase</b>	<b>No. Pairs</b>	<b>Mean, <math>\bar{x}</math></b>	<b>SD, <math>\sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>CI lower</b>	<b>CI upper</b>	<b>T</b>	<b>Sig, p</b>	<b>Cohen's d</b>
Phase 2	25	3.60	.60	-.18	.91	-.59	.19	-.10	.328	.27
Phase 1	25	3.78	.74							

\*p < .05

In the year 9 case study for classroom culture scale, a  $p$  value of .33 ( $> .05$ ) was computed, indicating that the null hypothesis cannot be rejected. It cannot be discounted that results are due to chance and other extraneous factors and are not significant in terms of the implementation of Padlet and Flipgrid. This conclusion is underlined by the Cohen's  $d$  effect size of .27. This is below Hattie's hinge point of .40, indicating a small effect size, leading to an inference that the implementation of Padlet and Flipgrid has had little to minimal effect on classroom culture in the year 9 case study. The qualitative coding data also points in this direction, with the overall assumption being that there is perhaps more ambiguity and difficulty in measuring and analysing classroom culture. As well as being more multidimensional with a greater range of contributory factors, such as schoolwide initiatives it is potentially more difficult to rate for students. Additionally, for classroom culture to develop more time is needed to develop relationships more fully, which this study did not have.

Table 7.2 shows the paired samples t-test data for the year 10 students' perceptions of classroom culture, from the online surveys, at phases one and two.

**Table 7. 2***Paired Samples t-Test and Effect Size Classroom Culture Student Online Surveys Year 10*

<b>Phase</b>	<b>No. Pairs</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Sd, <math>\Sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>CI lower</b>	<b>CI upper</b>	<b>T</b>	<b>Sig, p</b>	<b>Cohen's d</b>
Phase 2	12	3.96	.73	.53	1.03	-.13	1.18	1.76	.106	.65
Phase 1	12	3.43	.88							

\*p < .05

The  $T$  value of 1.76 results in a  $p$  value of .106 ( $> .05$ ), indicating the null hypothesis cannot be rejected. This is in line with the year 9 case study. However, it is still important to report the effect size, which is shown by the Cohen's  $d$  value of .65. This value is in excess of Hattie's hinge point of .40, indicating a medium effect. The inference being that the implementation of Padlet and Flipgrid has potentially improved the classroom culture from the perception of the year 10 students, in contrast to the year 9 case study where the effect size in this scale is below

.40. Such an inference reinforces the results from the online survey and qualitative coding, with the overall inference being that the year 10 students believe classroom culture has improved. The effect sizes would indicate that the implementation of the two digital tools has had a positive effect.

### 7.2.2. Agency

In the year 9 case study from the teacher's perspective agency has not changed, it is still good. Although there is a small improvement in agency from the students' perspective, the overall inference is that there has been no change in agency. It is still somewhere between average towards good. The pattern is similar in the year 10 case study, with there being no change from the teacher's perspective and a small upwards change from the students' perspectives.

Paired samples t-test were carried out for both case studies for agency for a better comparison. Table 7.3 shows the paired samples t-test data for the year 9 students' perceptions of agency, from the online surveys, at phases one and two.

**Table 7. 3**

*Paired Samples t-Test and Effect Size Agency Student Online Surveys Year 9*

Phase	No.	Mean,	Sd	Mean	SD	CI	CI	T	Sig,	Cohen's
	Pairs	$\bar{x}$	$\sigma$	difference	difference	lower	upper		p	d
Phase 2	25	3.50	.81	.25	1.18	-.23	.75	1.09	.286	.31
Phase 1	25	3.25	.78							

\*p < .05

The  $p$  value of .29 is in excess of .05. As the null hypothesis cannot be rejected, like the year 9 classroom culture scale, the inference is that any changes in the agency scale between the phases in the year 9 case study cannot be attributed to the implementation of the two digital tools. However as discussed in section 4.4.2.2 (pp. 48-57) this does not tell the whole story and it is important to relate the effect size, which as shown by Cohen's  $d$  is .31. This indicates a minimal effect on agency, leading to the inference that the implementation of Padlet and Flipgrid has had little to no effect, reinforcing the results from the online surveys and the qualitative coding. The overall inference from the students' perspectives in the year 9 case study is that there has been little change in agency. However, it is highly likely that the concept of agency is a new one and little understood by year 9 students.

Table 7.4 shows the paired samples t-test for agency in the year 10 Case Study, from the online surveys, at phases one and two.

**Table 7. 4***Paired Samples t-Test and Effect Size Agency Student Online Surveys Year 10*

<b>Phase</b>	<b>No. Pairs</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Sd, <math>\sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>CI lower</b>	<b>CI upper</b>	<b>T</b>	<b>Sig, p</b>	<b>Cohen's d</b>
Phase 2	12	3.98	.74	.56	.85	.03	1.11	2.32	.041	.85
Phase 1	12	3.42	.57							

\*p < .05

The p value of .04 (< .05) indicates that there is a probability that the null hypothesis can be rejected. The effect size of .85 indicates a medium to high effect size, leading to the inference that the implementation of Padlet and Flipgrid has had a positive effect on agency, from the perception of the year 10 students. This contrasts with the year 9 students where, from their perceptions, there was little to no effect on agency due to the implementation of Padlet and Flipgrid.

Such an inference reinforces the results from the online survey. The overall inference is that the year 10 students believe agency has improved. The effect size indicates that the implementation of the digital tools has had a positive effect, in contrast to the year 9 case study. Potentially this could be due to year 10 students having a greater understanding of agency, having been exposed to the concept when in year 9 with the collection of student voice in numerous surveys throughout the year. As this study has occurred near the start of the school year the year 9 students will not have had much experience with this.

It is worth noting that agency as argued by Reeve and Tseng (2012) is part of engagement, not separate, and is measured as part of an overall engagement scale. If this had been done in this study then any ambiguities within the agency construct would not be as evident; they would be incorporated into an overall engagement scale, which would show a positive effect for both case studies with regards to the quantitative analysis. This is illustrated in the following tables showing paired samples t-Tests for a combined agency – engagement scale for both the year 9 and year 10 case studies.

**Table 7. 5***Paired Samples t-Test and Effect Size Combined Agency – Engagement Year 9*

<b>Phase</b>	<b>No. Pairs</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Sd, <math>\sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>CI lower</b>	<b>CI upper</b>	<b>T</b>	<b>Sig, p</b>	<b>Cohen's d</b>
Phase 2	25	7.53	1.25	.82	2.02	-.01	1.66	2.04	.052	.59
Phase 1	25	6.71	1.53							

\*p < .05

As can be seen from this table, if the agency and engagement scales were combined then the  $\bar{x}$  in the year 9 case study from the students' perspective has increased by .82 with a medium effect size of .59.

**Table 7. 6***Paired Samples t-Test and Effect Size Combined Agency – Engagement Year 10*

<b>Phase</b>	<b>No. Pairs</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Sd, <math>\sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>CI lower</b>	<b>CI upper</b>	<b>T</b>	<b>Sig, p</b>	<b>Cohen's d</b>
Phase 2	12	7.98	1.31	1.19	1.61	.17	2.22	2.58	.026	.95
Phase 1	12	6.79	1.19							

\*p < .05

As can be seen from table 7.6 if the agency and engagement scales were combined in the year 10 case study then the  $\bar{x}$  from the students' perspective has increased by 1.19 with a large effect size of .95.

### 7.2.3 Engagement

In the year 9 case study overall engagement has improved, from the perspective of both stakeholders. In the year 10 case study the students' results also indicate an increase in engagement. Although there is a decrease in engagement from the viewpoint of the teacher, it can be inferred that engagement has increased, particularly bearing in mind the size of the respective samples ( $n(\text{teacher}) = 1$ ). Paired samples t-test were carried out from engagement at phase 1 and phase 2 from data from the student online surveys. Table 7.7 shows the results from the year 9 student online surveys.

**Table 7. 7***Paired Samples t-Test and Effect Size Engagement Levels Student Online Surveys Year 9*

<b>Phase</b>	<b>No. Pairs</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Sd, <math>\sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>CI lower</b>	<b>CI upper</b>	<b>T</b>	<b>Sig, p</b>	<b>Cohen's d</b>
Phase 2	25	4.03	.55	.57	1.02	.15	.99	2.78	.010	.76
Phase 1	25	3.46	.90							

\*p < .05

The p value of .01 (< .05) indicates a probable statistical difference and the null hypothesis can be rejected. This can be attributed to the implementation of Padlet and Flipgrid, with all other teaching and learning factors being constant throughout the study period. This significance is highlighted with an effect size, shown by the Cohen's d, of .76, leading to the inference that from the year 9 students' perceptions the implementation of Padlet and Flipgrid has caused an increase in engagement levels.

Table 7.8 shows the paired samples t-tests for the engagement scale results from the year 10 student online surveys at phases one and two.

**Table 7. 8***Paired Samples t-Test and Effect Size Engagement Levels Student Online Surveys Year 10*

Phase	No. Pairs	Mean, $\bar{x}$	Sd, $\sigma$	Mean difference	SD difference	CI lower	CI upper	T	Sig, p	Cohen's d
Phase 2	12	4.00	.60	.62	.82	-1.15	-.11	2.65	.023	.99
Phase 1	12	3.38	.65							

\*p < .05

The p value of 0.02 (< .05) indicates that there is a probable statistical difference in the two samples, leading to the rejection of the null hypothesis. This can be attributed to the implementation of Padlet and Flipgrid, being the only intervention. The effect size, as given by Cohen's d, is .99. From this it can be inferred that there has been a large effect on engagement, due to the implementation of Padlet and Flipgrid in the year 10 case study. This underlines the inference that has already been made that the year 10 case study students believe that engagement has been affected positively. This is in common with the inference from the year 9 case study, which also had an effect size in excess of .40. However, the students' perception in the year 10 case study is that engagement has been affected more by the implementation of the two digital tools, as illustrated by the higher effect value.

### 7.3 Qualitative Coding Results

#### 7.3.1 Classroom Culture

Looking at the qualitative coding results in the year 9 case study both students and the teacher perceptions around classroom culture are aligned, with both stakeholders believing it has worsened. Although both stakeholders' perceptions in the year 10 case study are also in alignment, in contrast to the year 9 case study, they believe classroom culture has improved.

In the year 9 case study with both stakeholders feeling the classroom culture has become worse it can be inferred that both the teacher and the students, in general perceive, that relationships and levels of respect along with behavioral issues haven't improved, and in some cases have deteriorated. The inference is that the implementation of Padlet and Flipgrid has not improved the culture. Several factors may contribute to such perceptions, unrelated to the digital tools. This is this class' first term in secondary school and it takes time for classroom cultures and relationships to develop. This can be exacerbated when students are new to the dynamics of secondary education, with different classes and teachers, as well as to each other. In addition, the teacher is potentially concentrating more on classroom management and culture at the start of the year and giving less leeway to any negative behaviours, which is potentially causing more frustration for both stakeholders exacerbating negative feelings. With time it would be expected that once both stakeholders find the right balance then there will be less focus on these issues and classroom culture will improve.

In the years 10 case study both stakeholders believe the classroom culture has improved, especially the teacher. Not only are the year 10 students more aware of what is expected they know each other and the school dynamics and environment that much better than the year 9 students, with some of them being in the same class in the previous year. Potentially it would have taken them less time to develop relationships and routines in contrast to the year 9 students. It could also be inferred from the teacher's perspective that because this is a low streamed class, expectations around relationships, respect and behaviour may be less compared to the year 9 teacher in the high streamed class, and any improvements would be viewed more positively. Even though the perceptions are that classroom culture has improved it is not possible to link this to the implementation of the digital tools definitively, although this cannot be ruled out. There are external factors that may have an additional positive effect on classroom culture, especially at year 10 with school initiatives, run through year 10 PE, focused on development of relationships. In addition, at this level of streamed class students who are excessively problematic are moved down into a homeroom setting, which can help improve classroom culture.

### *7.3.2 Agency*

Looking at the qualitative coding in the year 9 case study from the teacher's perspective agency has become more neutral overall. In contrast the students believe agency has improved, although this change is small. Overall, it can be inferred that there has been little change in agency. In the year 10 case study both the students' and teacher's perceptions have changed along similar lines. Although actual positive responses have dropped there is an overall shift upwards in agency. The overall inference is that agency has had a small change.

In the year 9 case study the different perceptions between the teacher and students are potentially linked to perceptions around classroom cultural factors, such as levels of respect, specifically to the teacher, and behavioural issues, leading the teacher to believe students are making more negative choices. It is possible that, in the teacher's perspective, this is overriding any positive choices students are making around engaging with learning activities and improvements in engagement that may be caused by the implementation of the digital tools. Conversely the students feel that agency has improved, and they are making more positive choices around academic work. Potentially they perceive that classroom culture and behaviours have not improved, indicating choices here are not so positive. From this it can be inferred that the digital tools may have a positive effect on students' educational choices.

The year 10 teacher also perceives neutral responses as having increased. The inference is that the year 10 teacher may be equating agentic choices with their perceptions around student actions around engagement and academic choices, as opposed to choices around relationships, respect and behavior as the teacher's perceptions around classroom culture in phase two are more positive. If this is the case, then it can be inferred that the teacher is reasonably neutral in their perceptions as to the efficacy of the digital tools in raising agency. However, this may

change with more exposure to the tools, especially if the implementation is done in a more collaborative manner in future.

The year 10 students' perceptions mirror the teacher's perceptions, with a significant increase in neutral responses. These perceptions are at variance with how the year 10 students perceive classroom culture and engagement at phase two, which they feel has improved in both cases. With an increase in classroom culture and engagement it could be inferred that agency has increased, as more positive choices are being shown resulting in better outcomes. However, the students in year 10 do not perceive agency as having improved in line with classroom culture and engagement, although it has not decreased significantly. Agency is potentially both more difficult for students to fully understand as well as measure.

### *7.3.3 Engagement*

Using this coding model, the inference is that student engagement has increased with the implementation of Padlet and Flipgrid in both case studies. In the year 9 case study this is particularly pronounced, especially from the perspective of the students. From these results it can be inferred that there is a positive link between the implementation of Padlet and Flipgrid and engagement, as there has been no other intervention in teaching and learning. With better engagement the inference would be that classroom culture and agency would also increase. Better and more worthwhile interactions with learning activities arising from more positive choices should lead to better behaviour and relationships. In this heuristic coding model these links are not explicitly clear in all cases from both stakeholders.

In the year 10 case study from the teacher perspective there is no change at all between phases one and two. It can be inferred that the teacher potentially has neutral perceptions around the efficacy of the digital tools. However, from the students' perspectives there is a significant shift in engagement to a much more positive factor in the classroom, with the inference being that the students have a positive belief in the efficacy of the digital tools.

## **7.4 Quantitative Statistics Lesson Observations**

### *7.4.1 Classroom Culture*

Classroom culture in both case studies has shown an increase when viewed through the prism of the classroom observations, with a bigger rise in the year 9 case study. Due to the small sample size (n=6) paired samples t-tests were not carried out on data from phases one and two. However, the effect size was determined, which is shown in table 7.9.

**Table 7. 9**  
*Effect Size Classroom Culture Lesson Observation Year 9*

Phase	n	Mean, $\bar{x}$	Sd, $\sigma$	Mean difference	SD difference	Cohen's d
Phase 2	6	3.60	.27	1.08	.09	4.71
Phase 1	6	2.52	.18			

According to Cohen's d (4.71) the effect size on classroom culture between phase one to phase two is large. It must be borne in mind that these measurements were from the perspective of the teacher researcher at two points in time, and not from the stakeholders involved in the case study on an ongoing basis. When looked at alongside the other data collection results it also highlights the potential difficulty in definitively measuring classroom culture and the effect on it due to one intervention, in this case the digital tools.

Table 7.10 shows the effect size for the classroom culture in the year 10 case study measured from the lesson observations at phases one and two.

**Table 7. 10**  
*Effect Size Classroom Culture Lesson Observations Year 10*

Phase	N	Mean, $\bar{x}$	Sd, $\sigma$	Mean difference	SD difference	Cohen's d
Phase 2	6	3.48	.25	.79	.04	3.42
Phase 1	6	2.69	.21			

The effect size of 3.42 indicates that the implementation of Padlet and Flipgrid has had a significant effect on classroom culture in the year 10 case study. Again, the caveat is that this measurement arises from the perspective of the teacher researcher from two points in time. It must also be borne in mind the difficult in ascribing this increase to the implementation of the digital tools only. This large effect on classroom culture is in common with the year 9 case study, although the effect is less pronounced in the year 10 case study.

#### 7.4.2 Agency

Agency has improved between phases one and two in both case studies. In the year 9 case study there has been a bigger increase in agency when viewed through the prism of the lesson observations, as shown by the difference in effect sizes.

Table 7.11 shows the effect size from the perspective of the lesson observation data for agency in the year 9 case study between phases one and two.

**Table 7. 11**  
*Effect Size Agency Lesson Observations Year 9*

<b>Phase</b>	<b>n</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Sd, <math>\sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>Cohen's d</b>
Phase 2	6	3.50	.35	.83	.09	2.91
Phase 1	6	2.67	.20			

The effect size of 2.91 indicates that there is a significant effect on agency between phases one and two in the year 9 case study. From the perspective of the teacher researcher, it can be inferred that the implementation of the two digital tools has positively affected agency in the year 9 case study. Table 7.12 shows the effect size for the year 10 students' perceptions of agency from the lesson observations.

**Table 7. 12**  
*Effect Size Agency Lesson Observations Year 10*

<b>Phase</b>	<b>N</b>	<b>Mean, <math>\bar{x}</math></b>	<b>Sd, <math>\sigma</math></b>	<b>Mean difference</b>	<b>SD difference</b>	<b>Cohen's d</b>
Phase 2	6	3.29	.29	.41	.03	1.49
Phase 1	6	2.88	.26			

The effect size of 1.49, is large. This is a commonality with the year 9 case study, although the effect size is not as large. Like all effect sizes measured from the lesson observations the caveat is that these measurements were at two points in time from an external researcher.

This effect can be attributed to the implementation of Padlet and Flipgrid between phases one and two as there were no other intervention. Such tools have seemingly led to students making more positive choice, increasing agency, between the two phases, as observed in the lesson observations. The smaller effect size in the year 10 case study also reinforces the view from the classroom observations that agency increased more in the year 9 case study.

#### **7.4.3 Engagement**

Engagement in both case studies has also increased when viewed through the prism of the lesson observation, with a larger increase in the year 9 case study, as highlighted by the different effect sizes. Table 7.13 shows the effect size for engagement from the lesson observations for the year 9 case study.

**Table 7. 13***Effect Size Engagement Levels Lesson Observations year 9*

Phase	N	Mean, $\bar{x}$	Sd, $\Sigma$	Mean difference	SD difference	Cohen's d
Phase 2	6	3.57	.39	.97	.22	1.89
Phase 1	6	2.60	.61			

The magnitude of the effect on engagement between phases one and two in the year 9 case study is 1.89, which is a large effect size. From this it can be inferred that there has been a positive link between the digital tools and engagement. Table 7.14 shows the effect size on engagement on the year 10 case study.

**Table 7. 14***Effect Size Engagement Levels Lesson Observations Year 10*

Phase	N	Mean, $\bar{x}$	Sd, $\sigma$	Mean difference	SD difference	Cohen's d
Phase 2	6	3.23	.41	.53	.55	1.51
Phase 1	6	2.70	.28			

As can be seen from table 7.14 the effect size is .151, indicating a large observable effect on student engagement in the year 10 case study. This increase in engagement as highlighted by the effect size is a little less than that indicated in the year 9 case study. This improvement in engagement levels can be attributed to the implementation of Padlet and Flipgrid.

## 7.5 Additional Findings

When measuring the teachers in this study against the TPACK model (Section 3.3.1, pp. 37-39) there are some shortcomings that directed the implementation of the digital tools. In simple terms the teachers in this study have the content knowledge, especially at the year level this study is looking at. They also have a range of pedagogical knowledge, with one teacher having been in the profession for a considerable time. Whilst the other teacher is at the beginning of their career they have been exposed to pedagogical theories and practice throughout their teacher training and first few year's teaching. However, in the context of digital tools their pedagogical knowledge base is developing and is at an early stage. Although the teachers in this study context are well versed in using technologies, such as google apps, and the social contexts of students and the wider community, due to being participants in various school programmes aimed to enhance these areas, their overall knowledge of digital pedagogies is weak. Such shortfalls not only fall into the pedagogical content knowledge sphere but also can be identified in other spheres of this TPACK model (Mishra, 2018).

Deficits lie in Technological Knowledge, or effective use of a range of digital technologies and how to integrate them into teaching and learning, leading to shortfalls in Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK) and TPACK overall. In addition, there is also a lack of knowledge of certain aspects of XK, specifically the type and range of digital tools available. In simple terms teacher self-efficacy in integrating digital tools are not well developed.

## **7.6 Contextual Education Implications**

Looking at the overall results from both case studies engagement has had an overall increase between phases one and two. The only direct intervention into teaching and learning within the two case studies between the two measurement phases was the teachers' implementation of Padlet and Flipgrid, so it can be inferred that there was a causal link between student engagement and the use of the two digital tools. As this positive link was apparent in both case studies, although less so in the year 10 case study, especially from a teacher's perspective, this strengthens the inference being made. This in turns give more credence to the deduction that there is a potential benefit across curriculum areas within this study context.

The starting point for this deduction is that the students believe their engagement has been increased during this research, and these students are the common denominator across all curriculum areas. If they believe that these two digital tools are helping with engagement levels in science, then it can be deduced that they will help in other subject areas. After all the use of these two tools in this science study was not designed in a way to be subject specific, concentrating on the subject matter; they were used in a more generic manner, which can be replicated across curricula. The intention was to use more relevant tools that the students felt were more a reflection of their likes and wants, with the aim of helping to develop agency and classroom culture as part of the model of engagement used in this study. However, the results around classroom culture and agency are less clear, with less certainty around whether the implementation of the digital tools has had any impact here, which raises caution and provides a caveat in the overall deduction around cross curricula benefits.

Another caveat is around staff, which raises implications around staff willingness and ability to implement the tools. Not only does this point to where staff fit into the TPACK model but also how they can be encouraged and upskilled in the use of digital tools and technologies so it can become an integral part of educational pedagogical practice in this context, and potentially further. This points to potential further research areas.

## **7.7 Reliability and Validation of Results**

Using multiple methods and compiling an audit trail help with reliability by validating results. This study used triangulation by collecting data with three methods: interviews, online surveys, and lesson observations. The interviews led to qualitative coding. The online surveys led to some extra qualitative coding as well as numerical data which was used for some simple quantitative analysis. The lesson observations also produced numerical data which was also quantitatively analysed. In this way not only were the two key stakeholder perspectives – the teachers

and students – used, but an additional perspective, that of the external teacher researcher, was also part of data collection. By collating data from all data collection methodologies into the same final scales – classroom culture, agency, and engagement to align with the proposed engagement model consistency was applied across the data sets further adding to reliability. Data has been compiled into the appendices which act as an audit trail, which Cresswell & Miller (2000) argue help in increasing the trustworthiness of the findings.

When using quantitative statistics, data needs some sort of validation, especially when measurement items are grouped together into constructs. This was the case in this study where several measurement items were grouped into the final scales. In order to determine the reliability of such groupings, to determine the similarities in the measurement items Cronbach's alpha is used. This was done in this study.

## **7.8 Summary**

Chapter 7 discussed some similarities and differences which arose from the analysis of all data collection methodologies, within and across the two cases. Although results from both case studies indicate that engagement was affected positively by the implementation of the two digital tools there were differences around how large the effect was. The effects of the two digital tools on classroom culture and agency also differed, with both constructs being harder to measure and attribute to the implementation of the two digital tools. Chapter 8 will discuss the overall findings in relation to previous research and conclusions, limitations and recommendations resulting from this study.

## Chapter 8: Discussion, Conclusions, Implications and Future Recommendations

*“We know what we are, but know not what we may be,”*

*William Shakespeare*

### 8.1 Introduction

This chapter outlines the key findings of this research in relation to the literature, and how they were affected by the implementation of the digital tools. Findings are discussed under three key themes, which are related to this study’s proposed engagement model. These are:

1. Classroom culture
2. Agency
3. Engagement

Overall conclusions in relation to the research questions are then given. This is followed by identified limitations and recommendations in the context of this study and for future research.

### 8.2 Classroom Culture

#### *8.2.1 Complexities in Measurement*

A key focus of this study was that classroom culture is an important factor in affecting student engagement. The engagement model proposed that engagement was dependent on the interactions in classrooms built on learning activities and classroom culture. Classroom culture is built on the development of relationships, or relatedness (Furrer & Skinner, 2003; Levin, 2009; Niemiec & Ryan, 2009; Squire et al., 2003). As Ferguson and Patrick (2012) argue inclusiveness and collaboration between teachers and learners can foster engagement. Although undertaking a study in a maths setting, Sharrock & Rubenstein (2019) found that creating collaborative classroom cultures can increase the likelihood of student engagement. This has potential resonance in a science setting. Such research emphasises the importance of relational and collaborative aspects of classroom culture. Classroom culture incorporates the educational values around teaching and learning that teachers and students hold. Cavanagh et al. (2003) highlight the interactions between teachers and students in socially constructivist paradigms, leading to the development of positive classroom cultures. This can influence student learning and attainment. Definitions around what classroom culture is led to the development of the data collection methodologies and final scales. For classroom culture this included relational developments, both student to student (peer respect) and student to teacher, behaviour levels and expectations, both student self-expectations and teacher expectations for students.

This is akin to Cavanagh et al.’s (2004, p. 258) multi factor model in which “group attitudes and behaviours towards learning; group attitudes and behaviours towards interaction with peers; teacher attitudes and behaviour towards students and instruction, and parent attitudes and behaviours towards child and teacher” comprise

classroom culture. However, in this study the role of parents, and the wider school community, was assumed to be implicit.

The proposed engagement model highlights that classroom culture is an important construct in fostering engagement. Rubie-Davies et al. (2010) argue this when discussing the link between teachers having high expectations for students and improved achievement. Similarly, Boland et al. (2001) highlight the importance of classroom culture in improving engagement and educational attainment when arguing that improvements in learning outcomes occurred due to changes in classroom culture. Such research highlights the multidimensional aspect of classroom culture, along with the inherent difficulties in measuring it. Classroom culture changes are also explicitly linked to changes in engagement levels due to teaching and learning interventions. The results in this study would seem to support this research.

### *8.2.2 Discussion and Findings*

In this study results around classroom culture, its link to engagement and whether it was affected by the implementation of Padlet and Flipgrid were inconclusive and not mirrored in both case studies. It wasn't possible to infer that classroom culture was definitively linked to engagement. Likewise, it cannot be inferred that the implementation of the two digital tools had a noticeable effect on classroom culture. To recap, in the year 9 case study (chapter 5) the overall inference was that there was little change in classroom culture between phase one and two. However, engagement was seen to increase from the perspective of the students and teachers, as well as from the lesson observation. Results from the online surveys and the qualitative coding show negligible changes. The overall inference, if any, is that a small drop from both stakeholder perspectives occurred, although the lesson observation was at variance with this. The year 10 case study (chapter 6) shows a small overall positive effect from the perspective of both stakeholders from all data collection methods, including the lesson observations. Again, it is important to bear in mind the potential limitation of the lesson observation data. It is from the viewpoint of an external teacher researcher and collected data at two specific points in time. As such it only provides a snapshot of the classroom environment and culture (Peoples et al., 2014).

Notwithstanding the different dynamics of the two case studies the results indicate the potential difficulties and differences in measuring classroom culture effectively. It is a multifaceted construct open to a range of influences. This study used several measurement items to try and measure classroom culture constructs. These included student - student and student - teacher relationships; behaviour levels and expectations, both student self-expectation and teacher - student expectations. Cavanagh et al. (2004) identified 108 items when measuring classroom culture. They also identified difficulties in using Likert Scales, due to lack of contiguity in scale items. This led to the development of a Rasch Model to measure classroom culture. This model measured classroom environment and classroom outcomes equally on the same scale as opposed to measuring them separately (Cavanagh et al., 2004). The advantages of analysis, due to the creation of interval level scales, invariant items, and

sample independence, when using a Rasch model when applied to classroom culture were also argued by Peoples et al. (2014). Such use of Likert scales, although combined into final interval scales may have muddied the waters with classroom culture results. Cavanagh et al. (2004) also found dichotomies and lack of correlation between behaviour expectations and collaborative and caring relationships and how teachers influence classroom culture. This leads to inconsistencies and differences in how stakeholders rate classroom culture and how it is viewed. This was evident in the year 10 case study where students' perceptions of classroom culture were more positive than the teacher's perspective at both phases.

Technology use is important in developing classroom cultures (Dunleavy & Milton, 2009; Willms et al., 2009). This helped formulate the rationale for implementing the two digital tools into learning activities and how they may affect classroom culture and engagement levels. However, there is little actual research that shows this link explicitly, which can be attributed to the complexity of classroom culture as well as the range of external factors influencing it. For example, in this study there are a range of school wide and curriculum initiatives that are directed at classroom culture through relational development, such as Tu Whānau and Tu Tane. This makes it difficult to pinpoint any causal link between the use of the digital tools and classroom culture in both case studies. Tu Whānau is a school programme that focuses on the new intake of year 9 students and their family, with the goal "to improve student achievements through strong vibrant relationships with parents, families and whānau" ([gisboyshigh.school.nz/parents-whanau/tu-whanau](http://gisboyshigh.school.nz/parents-whanau/tu-whanau)). Tu Tane is a programme run through year 10 PE/Health. This initiative focuses on identity, values, relationships, and students' places in the world and has reduced detentions rates, suspensions and raised NCEA participation rates ([beehive.govt.nz/sites/default/files/PMEEA-the-finalists.pdf](http://beehive.govt.nz/sites/default/files/PMEEA-the-finalists.pdf)).

Dunleavy & Milton (200) argue effective learning is dependent on student-teacher relationships that support development of adolescents' social and emotional competencies. This does not happen without time and effort, both on the part of teachers and students. It takes time to develop classroom routines and relationships (De Nobile et al., 2017; Noam, 2013) and ultimately positive democratic and inclusive classroom cultures where collaboration and social aspects of learning (Ferguson-Patrick, 2012) are core classroom interactions. This is even more of a challenge at secondary level where teachers are dealing with more students and classes. In the context of this study teachers have 5 different classes, with anything between 25 – 30 students per class. Due to the time constraints of this study these factors are potentially contributing, particularly when measuring classroom culture in both case studies.

Data collection was carried out in term one so any relationships between the teachers and students were in their infancy. This was particularly true for the year 9 students who were new to the school and therefore had never met their teacher. A number of these students would also not know each other. In contrast the year 10 students had better developed peer to peer relationships having spent a year in school already. Although they were new to the teacher some of them may have had interactions with the teacher in the previous year. These initial differences between the case studies may be the major reason for any differences in the measurable changes in classroom culture

between the case studies. For example, although the year 9 students initially perceived classroom culture as being higher than the year 10 students by phase two this perception was different. Year 9 students felt it had dropped whilst the year 10 students felt it had improved. This was also mirrored by teacher perceptions in both case studies.

Another related factor is that teachers need to understand what classroom culture is and develop and introduce pedagogies that explicitly develop positive cultures. As Supovitz and Turner (2000, p. 963) argue “staff development lies at the heart of nearly every educational effort to improve student achievement.” In their study around professional development and inquiry-based teaching and learning in science education they found that teachers with little relevant professional development reported worse classroom cultures. It was harder to positively influence classroom culture than change teaching practice. 80 hours were needed to significantly change teacher practice as opposed to 160 hours to significantly change classroom culture (Supovitz & Turner, 2000).

Such findings have potential resonance with this study’s findings. There was a lack of any significantly observable changes in classroom culture. There was also difficulty in linking any changes to the implementation of the two digital tools, especially in the year 9 case study. Data collection and measurements of classroom culture took place in term one. At this stage no organised schoolwide professional development had been undertaken by either case study teacher. In addition, the teacher in the year 9 case study was a newly qualified teacher with less experience and exposure to ongoing PL. In comparison the year 10 case study teacher could draw on more experience and development when implementing and developing classroom routines and cultures at the start of the year. This could account for the perceived greater improvement in classroom culture from both this teacher’s perspective as well as the students.

Although a small amount of direct PL was provided in how to implement and use the two digital tools this was nowhere near 80 hours, let alone 160 hours. It was enough for the teachers to be able to implement the two digital tools into learning activities. However, it was not enough to allow them to confidently utilise the tools in collaboration with the students in an inclusive, collaborative, or co-constructivist approach (tki.org.nz). Such a lack of professional development can potentially be seen as contributing to the overall lack of a noticeable improvement in classroom culture during this study, particularly in the year 9 case study.

## **8.3 Agency**

### *8.3.1 Complexities in Measurement*

Agency is closely linked to classroom culture (Rector-Aranda & Raider-Roth, 2015), and engagement (Reeve, 2013). Increased agency happens through acquisition of intellectual and social capital. This is developed through engagement in relevant learning activities which facilitate better social, political, and economic choices (Dunleavy & Milton, 2009), and best happens in social settings in which participation is a collective and collaborative process built on relationships (Arnold & Clarke, 2014; Goulart & Roth, 2010). Pacansky-Brock (2017) argues that implementing digital tools and technology into pedagogy makes education more relevant which can

help increase agency. This concept helped underpin the choice of the digital tools used in this study, as did the fact that the tools chosen are collaborative in nature, which helps develop relationships and social education.

In order to measure agency one of the key constructs is student voice (Dunleavy & Milton, 2009; Rector-Aranda & Raider-Roth, 2015; Reeve & Tseng, 2011; Zimmerman & Shunk, 2011). This helped with the construction of the agency scales used in this study. These scales measured perceived levels of student voice; levels of collaboration; enjoyment of subject; whether digital tools helped with this; expectations (both self and teacher) and any changes in levels of voice, collaboration and the perceived effect of the tools. Like classroom culture, the number of measurement items indicate the complexity and difficulty in measuring agency. This supports research by Zeiser et al. (2018). They found that agency surveys did not always perform equally well across subgroups, be they subject or class. In addition, there was a lack of research and understanding into what constitutes effective teacher pedagogies aimed at raising agency as a standalone construct. Such arguments help explain the lack of discernible changes in the agency scale measurements, in both case studies in this research. Zeiser et al. (2018) found little overall change in agency over a whole school year, so it is perhaps not surprising that there was little change in the two case studies in this research, which took place during one term.

### *8.3.2 Discussion and Findings*

These arguments around agency highlight that it is closely linked to the development of social, inclusive, and democratic classroom cultures (Ferguson-Patrick, 2012). The underlying assumption being that improvements in agency lead to improvements in classroom culture and vice versa. This reciprocal link between agency and classroom culture is a key foundation of the engagement model that this study uses. If this link is valid then it would be expected that the agency scale results would be similar to the classroom culture scale results for both case studies. In broad terms it can be argued that this is shown in this study, especially from the perspective of the two key stakeholders. The lesson observation results are different and show an increase. However, as already pointed out these results provide a snapshot in time only (Peoples et al., 2014; Scherzinger & Wettstein; 2019), and may potentially be more prone to researcher bias, due to investment in the study. Although Scherzinger and Wettstein (2019) argue that participants behaviour is potentially affected by the presence of an external observer who may also have a lack of awareness of the classroom dynamics regarding relationships and interactions, changes in the environment may be visible to an external researcher that the actual participants may miss. As Praetorius et al. (2012) argue this can potentially allow for a more 'objective' external perspective. This was something I tried to mediate. As I was not teaching either class and did not know the students involved there was no emotional investment in them, which, potentially facilitated a greater degree of objectivity. In addition, the lesson observation findings were shared with the relevant teachers through member checking to ensure accuracy, mitigating any potential sources of bias.

Overall, like the classroom culture results the agency results are inconclusive. The link between any change in agency and the implementation of the digital tools is unclear. Although it could be argued in the year 9 case study that the classroom culture results show a decrease the overall change is minimal, which the agency results mirror. From the teacher's perspective there is no change (the teacher still perceives agency to be good) and from the students' perspectives there is an overall slight improvement, but again this is minimal. It can be argued that the year 10 case study results for agency are even more closely aligned with the year 10 classroom culture results from the stakeholder's perspectives. The overall perspective is a slight upward shift in agency (no change according to the teacher and a small improvement according to the students), mirroring the classroom culture results. What is interesting is that although the changes are small, in both case studies the students perceive there is a small increase, even though the teacher does not. The external lesson observation results support the student results, showing an increase. This mirrors research by Scherzinger and Wettstein (2019) who argue that students and observers have observational advantages over teachers, who have to also must manage complex classroom environments.

All this points to the idea, in this study, that implementing Padlet and Flipgrid may not have affected agency. For students, for example, agency has the potential to be affected both positively and negatively when implementing digital tools (Parson & Adhikari, 2016). Although some students engaged with digital tools, others find them a distraction, making it easier to be off task. Instead, such tools need to be implemented as part of effective, planned pedagogies with a purpose (Dunleavy & Milton, 2009; Levin, 2009; Wright, 2010). Ideally this is done in collaborative inclusive and social environments (Harris et al., 2016), over longer time periods. As Zeiser et al. (2018) argue more time is needed to investigate changes in agency, with specific and directed professional development being needed, as is the case for the classroom culture construct.

## **8.4 Engagement**

### *8.4.1 Complexities in Measurement*

Looking at the proposed model of engagement the links between the implementation of the two digital tools, classroom culture, the related concept of agency, and engagement is inconclusive. However, the results from both case studies show a causal link between learning activities and overall levels of engagement. Engagement levels were found to have risen, reinforcing the argument made by Shernoff et al. (2016) that teachers can affect engagement through changes in the learning environment. In this case the change in learning activities was the implementation of Padlet and Flipgrid. This highlights the positive link between effective pedagogical implementation of digital tools and improved engagement and potential outcomes as argued by Donaldson et al. (2017).

To recap, in the year 9 case study overall engagement was found to have increased from the perspective of both the students and the teacher, as well as from the lesson observation. In the year 10 case study although the teacher's perspective from the online surveys was that there was a small drop in engagement, their perceptions from

the qualitative coding were unchanged. The students' perceptions in the online surveys were that engagement had increased significantly. This significant improvement was also apparent in the student qualitative data and was reinforced from the lesson observation results.

As outlined in section 2.6 (pp. 22-25) a range of measurement tools have been developed to measure student engagement both at the macro (whole school) and micro (classroom) level focusing on various aspects of the engagement meta construct. This study used a micro level approach where measurement items focused more on aspects of emotional, cognitive, and social engagement. This was shown when collecting student voice on their perceived levels of engagement prior to the intervention; students' perceptions on whole class engagement; whether they felt learning activities were interesting and the digital tools helped. Such an instrument resembles tools used by Reeve and Tseng (2011) and Wang et al., (2014) amongst others, where student voice, as per agency was an important component of measurement (Yazzie-Mintz, 2006). However, this study also measured engagement from other perspectives (teacher and lesson observation). This follows the argument that for best results a range of tools and perspectives should be used (Cavanagh, 2015; Fredricks & McColskey, 2012). These focused on relational aspects of engagement where observations are key (Pianta et al., 2012), including students' attentiveness, ability to follow instructions and complete tasks, willingness to engage with the activities and their general work ethic.

Where the engagement tool differed in parts from that used by Reeve and Tseng (2011) was regarding measuring behaviour. Behavioural levels have often been a key measurement indicator for engagement as part of scales that have concentrated on easier to measure and quantify social and academic indicators (Archambault et al., 2009; Finn, 1989; Hospel et al., 2016, Reschly & Christenson, 2012). However, this study measured behaviour levels as part of the separate classroom culture scale, along with relational aspects. This has perhaps made it harder to measure and notice any changes in classroom culture as a standalone construct and highlights the links between classroom culture and engagement. Any small changes in behaviour levels, if included in in the overall engagement scale, would not have changed levels of engagement between both phases in either case study. Although the perception was that behaviour deteriorated in the year 9 case study and at worst remained the same in the year 10 case study, such changes were small.

In contrast to agency being measured as part of overall engagement scales (Mameli & Passini, 2018; Reeve, 2013; Reeve & Tseng; 2011), the agency aspects of engagement were measured in a separate agency scale. If the agency scale had been combined with the engagement scale, then the ambiguous agency results would not be evident. Instead, they would be incorporated into an overall engagement scale, which would still indicate an increase in engagement due to the implementation of the two digital tools (refer to Table 7.5, p. 165 and Table 7.6, p. 166 for details).

#### *8.4.2 Discussion and Findings*

From the overall findings of the engagement results the inference can be made that implementing Padlet and Flipgrid into teaching and learning activities has helped raise engagement. This reinforces arguments made by researchers including Harris (2011), Livingstone (2012) and Donaldson et al. (2017). By using digital technologies, education becomes more relevant and contextual for students, helping to meet future needs (Taylor & Parsons, 2011). Collaboration is increased as is student-centered (Pacansky-Brock, 2017; Rogers & Price, 2008; Wright, 2010) and inquiry learning (ERO, 2012). Aspects of collaborative and student-centered learning are key constructs underpinning the model of engagement in this study and the part that classroom culture plays.

Another key consideration in this study was whether the digital tools would help engagement. Both the teachers and the students were asked to reflect on this factor. With increased belief comes greater buy in. Digital tools and technology need to be introduced to students as educational tools, not just used for the sake of it (Harris et al., 2016). The more belief that teachers have in the efficacy of the tools the more likely they are to gain traction and help with engagement. This obviously points towards implications around the need for further support and staff PL. This was more an issue with the year 10 teacher, who due to many years spent teaching is potentially more formulaic in teaching, sticking to what has worked in the past.

Allied to this is the potential issue that without the necessary support and TPACK any preconceived ideas and biases around digital tools may be exacerbated. If this is in a negative way it could lead to negative experiences in teaching and learning, both for teachers and students, making it harder to believe in their efficacy and importance. The flip side is that with increased support and better TPACK then not only are teacher experiences with digital tools improved, so are students. This is highlighted by the year 10 case study teacher, who received a little more PL and support with using Flipgrid as opposed to Padlet, when stating that “Flipgrid was great for a lot, and some very self-conscious students put smiley faces over their face (needed anonymity)” and “Flipgrid has real potential, I will use it again.” This also raises the importance of using a range of digital tools to complement existing teaching and learning activities in different situations and circumstances. The year 9 case study teacher highlighted this when stating they would use the digital tools “not as the sole tool but as one of the many tools.” This perhaps highlights that digital tools are not the panacea and cure all for student engagement. They can be of assistance when used judiciously as part of effective teaching and learning programmes in TEL environments, underpinned by well-developed PCK that incorporates technological efficacy (Ertmer et al., 2012; Jimoyiannis, 2010; Mishra, 2018; Mishra & Koehler, 2008; Waight & Abd-El Khalick, 2012)

#### *8.4.3 Findings - Padlet and Flipgrid*

Overall findings from the study show that levels of engagement have risen between phase one and two. This can be attributed to the implementation of Padlet and Flipgrid as this had been the only intervention. Research into the efficacy of both these tools is nascent but this study helps highlight some of the previous research into their

effect on engagement. Although such research has not been at secondary school level science teaching and learning, there may be transferability due to the nature of the tools. These tools can help raise particular constructs that make up engagement, including those in the model used in this study, built on relational development and classroom culture, agency and learning activity interactions.

Padlet, for example, has been shown to improve collaboration (Dembo & Bellow, 2013; Gasmi & Thomas, 2017; Md Deni & Zainal, 2018), alongside relational development (Garnham & Betts, 2018), and social aspects of engagement. Increases in social aspects of engagement have also been linked to Flipgrid (Fuchs, 2014) as has the relational aspect (Green & Green, 2018). The use of Padlet and Flipgrid potentially show improvements in such measurement items in this study, although shifts are not large. Looking at the quantitative data from the online surveys, levels of collaboration between the phases stayed the same from the perspectives of the year 9 students ( $\bar{x}$  = 3.42 at phase 1 and 3.43 at phase 2). However, from the perspective of the year 10 students' levels of collaboration increased with the  $\bar{x}$  increasing, by .20, from 3.55 to 3.75 between the phases. More significantly from the perspectives of the year 9 students results for whole class engagement, a social construct, increased, as they did in the year 10 case study. The  $\bar{x}$  increased by .73, from 3.16 to 3.89 in the year 9 case study, and by .39, from 3.36 to 3.75, in the year 10 case study. Flipgrid has been shown to facilitate and improve student voice (Kompar, 2018) – a key construct in agency – which this study also highlights. In both case studies from the students' perspectives, levels of voice rose between phase 1 and phase 2. The  $\bar{x}$  increased by .47, from 2.92 to 3.39 in the year 9 case study and by .77, from 3.23 to 4.00 in the year 10 case study. Students in both case studies also perceived that learning activities had become more engaging and interesting, perhaps due to more relevant and contextual learning and experiences. This points to the positive effect that Padlet and Flipgrid had in raising engagement. In the year 9 case study the  $\bar{x}$  in this category rose by .31, from 3.40 to 3.71, and in the year 10 case study by .61, from 3.81 to 4.42.

## 8.5 Conclusions

### 8.5.1 Research Questions

This research study evolved from an interest in the perceived lack of student engagement, in science and other curriculum areas. This is an issue that is widespread, not confined to New Zealand. The research questions arose from the overall aim of the research. This was to investigate whether student engagement in general science (year 9 and 10) can be positively impacted by implementing two generic collaborative digital tools (Padlet and Flipgrid) into teaching and learning. The research questions are repeated below:

1. Does the implementation of Padlet and Flipgrid have any effect on student engagement?
2. Does the implementation of Padlet and Flipgrid have any effect on classroom cultures and relationships in the context of this research?

3. Does the implementation of Padlet and Flipgrid have any effect on student agency in the context of this research?

Summarised conclusions will be provided to these research questions below.

***Does the implementation of Padlet and Flipgrid have any effect on student engagement?***

Results from this study indicate that the implementation of Padlet and Flipgrid influenced student engagement. In both case studies engagement was seen to increase between phases one and two. In this study's model of engagement, built on models developed by Skinner et al. (2009) and Cavanagh et al. (2008) amongst others, engagement is a mutualism between classroom culture, built on relational development and increasing agency, and involvement in learning activities. Changes in learning activities led to improvements in engagement. These changes in learning activities, or teacher practice, involved the implementation of Padlet and Flipgrid. Change in teaching practice has been shown to be an agent in increasing engagement (Finn & Zimmer, 2012; Fredricks et al. 2016). As the changes in learning activities involved the use of generic digital tools the results from this study give credence to the idea that there are potential further educational implications, such as transferability across curriculum areas, through implementing these two tools.

***Does the implementation of Padlet and Flipgrid have any effect on classroom cultures and relationships in this context?***

As the analysis shows this was more difficult to answer. It cannot be concluded that there was a direct link between the implementation of Padlet and Flipgrid and changes in classroom culture. Looking at the model of engagement, although there was little noticeable change in classroom culture and relationships, overall engagement levels did increase. As discussed in section 8.2.1 it is difficult to measure classroom culture, due to the complexities involved as well as the time needed for changes to manifest. Some of the items used to measure classroom culture in this study can, and have been, measured directly under engagement in previous research.

***Does the implementation of Padlet and Flipgrid have any effect on Student agency in this context?***

Like the effect of Padlet and Flipgrid on classroom culture, the agency effects were not noticeable and difficult to measure, as discussed in sections 8.3.1 and 8.4.1. Looking at the model of engagement, although not an explicit construct, agency is closely linked to classroom culture (Ferguson-Patrick, 2012). It is also an important construct of engagement (Reeve & Tseng, 2011). Although it cannot be concluded that there was a direct link between the implementation of Padlet and Flipgrid and changes in agency there is more of an implied link. By making better choices and engaging with more interesting learning activities students are slowly starting to develop agency.

### *8.5.2 Context Specific Conclusions*

Although overall engagement levels have risen in this study several considerations arise from the engagement model. In this model the reciprocal interactions between students and teachers as they interact with learning activities and build relationships was seen as a key facet of student engagement, built on collaborative practices (Patrick et al., 2007; Reeve, 2009; Reschly & Christenson, 2012; Wylie & Hodgen, 2012). This is particularly relevant in this study context where such co-constructivist practices lead to inclusive classroom cultures (tki.org.nz). In this way engagement levels are raised by acting through social aspects (Ferguson-Patrick, 2012).

However, this aspect of implementing Padlet and Flipgrid was not developed in this study. There was little reciprocity between the students and teachers. Even though students felt that their levels of voice had risen, actual voice was not sought on how to better implement Padlet and Flipgrid. There was little to no feedback from the students to the teachers in either case study allowing for student input into how the tools were implemented. Similarly, any increases in collaboration were not student to teacher, but only student to student. Due to this, regardless of the difficulties inherent in measuring classroom culture, true democratic inclusive cultures with more equality in the power dynamics in the classrooms were not arrived at. If this had been achieved, then engagement levels may have risen further. The possible reasons that such co-construction didn't take place are multifold and may include the time aspect of this study as well as teacher confidence, inbuilt biases, and skills in implementing pedagogies designed to achieve this.

## **8.6 Limitations**

There are several limitations of this study that must be considered.

### *8.6.1 Time*

This is perhaps the foremost limitation, as data was only collected over a period of approximately 9 weeks, or one credit period. This timeframe was shortened by the spread of Covid-19 and school lockdowns in New Zealand. It takes time for teachers to become confident with content knowledge and devise effective learning activities (Reschly & Christenson, 2019). Due to the relatively short study period, it cannot be discounted that any gains in engagement would be short lived due to, potentially, the novelty of the new digital tools in learning activities. Therefore, gains in this context cannot definitively be concluded to be long term in nature.

It takes time to implement digital tools into learning activities effectively to maximise any increases in engagement, classroom culture, relational development, and agency. It also takes time to upskill, supported by professional development, and increase efficacies with digital tools. Lack of time and increased workload is a recognised barrier to teachers when implementing new practices (Reeves, 2012; Wylie, 2013). Quality professional development takes time (Fullan, 1991) and needs to be a balance of theory and practice allowing teachers the opportunity and time to apply new learning to practice (Timperley et al., 2007). The teachers in this study weren't

highly confident and versed in implementing digital technologies into teaching and learning. With better professional development and support, their skills and confidences may have increased further leading to better implementation into learning activities. In conclusion it cannot be discounted that with greater knowledge and efficacy, through better ongoing professional development, greater increases in engagement, classroom culture and agency may have been possible.

The time of the school year that data was collected may also have had an effect. Data was collected in term one at the start of the year when perhaps, both students and teachers are more motivated and enthusiastic, as opposed to later in the school year. Although there has been considerable research into teacher enthusiasm and motivation with evidence linking enthusiasm to positive student attitudes (Keller et al., 2016; Lazaridis et al, 2019) which underpin engagement, much of the evidence around whether teachers, and students, are more motivated and enthusiastic at the start of the year is anecdotal. It certainly seems to be that way in this study context with fatigue, both physical and emotional, seeming to increase throughout the year, negatively impacting teacher enthusiasm. As Keller et al. (2016) argue although teacher enthusiasm is complex and bound up in beliefs and self-efficacy it can be affected through emotional exhaustion, vary daily, and be dependent on a teacher's career position. From this there is some likelihood that if data collection was at a different time of the year results may have been different.

#### *8.6.2 Digital Tool Integration and Lack of Self-Efficacy*

The teachers' lack of self-efficacy in utilising digital technologies into learning activities was a major consideration in deciding what tools to implement and how to do so and is a limitation in this study. Both teachers were lacking, and still are, in some of the required TPACK knowledges (Mishra, 2008; Mishra & Koehler, 2005) to successfully integrate technology fully. For this reason, Padlet and Flipgrid – simple generic digital tools – were chosen, along with the development of a theoretical model to be used to help in implementing these tools. The model proposed that with some professional development and ongoing support the teachers' efficacies in implementing and using the tools to leverage learning activities would increase. With increasing use and feedback, including self-reflection and student voice, self-efficacies would increase further. In this way learning activities incorporating the digital tools would, in theory improve.

However, it is unclear whether this occurred in any great depth. Some initial PL was provided as the tools were new to the teachers, as well as students. Although there was some ongoing support and PL it was basic, and this is an issue. Directed professional development and ongoing support are vital for new initiatives to succeed (Burtonshaw-Gunn, 2009; Gregory & Kuzmich, 2007; Timperley et al., 2007). This lack of ongoing supportive PL, along with the time issues and increased workload in integrating the digital tools may have led to a less than optimal integration. This may have negated the overall effects.

### 8.6.3 Data Measurement

As discussed in sections 8.2.1., 8.3.1 and 8.4.1 the measurement of the data has its own inherent limitations. There are inherent complexities involved in measuring classroom culture and agency constructs, as well as engagement. Although this study measured classroom culture, agency, and engagement separately there is debate as to whether they should be measured as standalone constructs, together or part of engagement scales, due to the interaction of all three domains. In this study peer interactions, or relationships were included in a classroom culture scale. However, Mameli and Passini (2018) included peer interactions as part of an expanded quantitative agentic engagement scale building on the work of Reeve and Tseng's original agentic engagement scale. According to Mameli and Passini (2018) this improved and expanded scale included peer interactions that go beyond the transactional teacher-student model to students challenging instructional activities through questioning. As Mameli et al. (2015, p. 561) state "the distribution of voices enriches the classroom possibilities to be engaged in triadic or multiple interactions, which several scholars consider as significant opportunities for discussions and learning." All of which supports a shift to collaborative and inclusive classroom cultures. This highlights limitations in how classroom culture, agency and engagement were measured as separate scales in this study. If the scales in this study were constructed differently potentially results may have been different.

Mameli and Passini (2018) also argue that quantitative measurements may be better for measuring agentic engagement. Although some quantitative analysis was carried out most of the measurements were qualitative from the perceptions of the key stakeholders. Not only is qualitative research "a long hard road, with elusive data on one side and stringent requirements for analysis on the other" (Berg & Lune, 2012, p. 4), but it can also omit contextually important issues with a focus on interpreting individuals' experiences (Silverman, 2010; Wilson, 2014). Additionally, the assumption is that although all participant responses are subjective, they are given honestly and individually. This is not so much of a potential issue with the two teachers, who were operating in separate silos (case studies). However, there is the possibility that not all students took the interviews and surveys seriously. Responses, especially in the surveys which were carried out as whole class activities, may have been influenced by peer relationships. Potentially this may have led to less than accurate responses in some cases.

## 8.7 Recommendations

The findings, conclusions and limitations discussed in the preceding sections in this chapter have led to the following recommendations. Recommendations have been separated relevant for practice (contextual) and future research.

### 8.7.1 Recommendations for Practice

The following recommendations are relevant in the context of this study. A start would be to share the overall findings with teaching staff highlighting that engagement increased in both of the different streamed science

classes, at year 9 and 10. The caveat here being the short-term nature of the research and the lack of measurable educational outcomes. In response to this it is recommended that implementation of digital tools as part of teaching and learning be measured over a longer period.

This evidence can highlight to teachers that implementing digital tools can improve engagement, and potentially classroom culture and agency. Although the genie that is digitalisation in education is well and truly out of the lamp, there is still a resistance to digital education, and use of digital tools and apps, held by some teachers in this context. This is especially true for those who have been teaching for a longer time. This resistance needs to be addressed. Levin (2009) makes this point when arguing that teachers' beliefs around learning, teaching and technology must change if TEL is to be maximised. Such resistance to changes in practice, be it use of new digital tools is nothing new in education (Timperley et al., 2007). Harvey and Broyles (2010) argue it is often a natural reaction, and it can be viewed as a fear of change (Curtis, 2005; Genet, 2013). In order to address this, teachers need support (Avidov-Ungar & Forkosh-Baruch, 2018). Regardless of whether it is due to lack of confidence in new pedagogies, lack of perceived time and / or increased workload, seeing that a change to practice has merit due to it being evidence-based can help with teachers becoming committed and willing to invest the time needed (Good, 2008). As Mitchell (2008, p. 1) states evidence-based practices are “clearly specified teaching strategies that have been shown in controlled research to be effective in bringing about desired outcomes in a delineated population of learners.”

However, teachers gaining an understanding of the possible benefits arising from implementing digital tools as part of learning activities is not enough. As discussed in sections 8.5.2 (p. 184) and 8.6.3 (p. 186) teachers need the confidence and efficacy to implement tools effectively. To do this there needs to be ongoing supportive professional development aimed at increasing teachers technological pedagogical content knowledge, as outlined in the TPACK (Mishra, 2018; Mishra & Koehler, 2005) or TPASK (Jimoyiannis, 2010) model. As Mishra and Koehler (2005) argue for technology rich teaching to be effective teachers need to develop understanding and abilities that incorporate all components of the model: technology, pedagogy & content. This is difficult due to the complexities of the model as outlined by Cox (2008), alongside the difficulties inherent in devising effective worthwhile professional development that meets the needs of teachers (van den Bergh et al., 2015) throughout the whole school.

In this context it is recommended a more simplified model be used to enhance teacher's efficacies in implementing digital tools, that provides practical based activities. Initially this should be at a department, or curriculum level, facilitating the development of a CoP (Lave & Wenger, 1991). As Timperley et al. (2007) argue when too much time is spent on theory at the expense of applying learning to practice professional development is seen as ineffective and lacking. Such a model as outlined in figure 3.7 (p. 39), that starts to see the implementation as more of a collaborative and even informal process between teachers, as well as teachers and students may be a

start. In this way practices end up aligning with collaborative and co-constructivist approaches as set out by the MOE (NZ), ultimately leading to the propagation of democratic inclusive classroom cultures.

### *8.7.2 Recommendations for Future Research*

This study has highlighted the fact that engagement, classroom culture and agency, although related, are complex constructs. There are particular difficulties evident in measuring classroom culture and agency as standalone constructs. Related to this is the short-term nature of this study. This did not provide the opportunity to determine whether any changes were long term in nature, as well as perhaps not allowing enough time for the intervention to become fully embedded into practice. Due to this, changes may not have been potentially as big as possible. As Fullan (2016) argues change in practice take time. This leads to a recommendation to carry out a similar longitudinal study. In this way more effective implementation of the digital tools can be facilitated. Alongside this longer-term measurement can take place, including researching and trialing improvements in how classroom culture and agency may better be evaluated as part of the engagement model.

This study and literature also highlight the fact that engagement can be positively impacted through changes in practice, with the implementation of digital technologies being one such key intervention. Students, for the most part, are well versed in using technology. Technology is pervasive and seemingly only going to become more so. It is important that education reflects societal norms more and utilises students' prior knowledge and skills in a collaborative constructivist way, promoting inclusive classroom cultures and relatedness, in which TEL is facilitated. Relatedness is the interplay and interaction in dynamic learning environments (Furrer & Skinner, 2003). There is an implication here that students are vital in creating an appropriate classroom culture conducive to learning, through relational development, or relatedness.

There are several key criteria that effectively promote positive classroom cultures. These include high expectations for all, provision of relevant and contextual and interdisciplinary learning as part of learning climates, and the assessment of by both students and teachers - *AfL* - where appropriate competence-based feedback is given (Hattie, 2012). According to Willms et al. (2009) *AfL* was an effective strategy in increasing student engagement, especially when students were given the opportunity to collaborate on assessment criteria with their teachers. *AfL* or formative assessment, is a process by which assessment information is used by teachers to adjust their teaching strategies, and by students to adjust their learning strategies (TKI.org.nz).

*AfL* can be promoted with digital tools (Birenbaum et al., 2011; Fredricks et al., 2016), highlighting the importance that digital tools and *AfL* can, and should play, in effective teaching and learning and the link between them. Technological tools on their own may not be the panacea to improved achievement and motivation. They need to be implemented in support of effective teaching and learning strategies that are contextual, social, and collaborative in nature, based on constructivism and connectivism, for example. Implementation needs to be underpinned by teachers' believing in the transformative role that technology can play.

This, then provides another recommendation for future study, bringing together engagement, classroom culture and use of digital tools focused on a teaching and learning activity: *AfL*. As effective *AfL* is seen as a key factor in raising engagement and classroom culture how can *AfL* be made more effective and authentic through use of digital tools and apps? More specifically how can teachers be best supported to implement technology to aid *AfL* and what digital tools and apps may enhance *AfL*?

## **8.8 Last Words**

As stated in the introduction this study was conceived due to the lack of engagement, perceived and actual, that teachers in this study context discussed on a regular basis. Alongside this was the move, not only in NZ but worldwide to a more technologically immersed education experience. This led to thinking of practices, utilising TEL, that could potentially lead to improvements in engagement, benefitting teachers and students in a reciprocal, and ultimately collaborative way. Hopefully, some of the findings in this study can, and will, help in this regard.

Through this research process I feel that I have developed as both a teacher and a researcher. I have much more appreciation and knowledge around what makes up engagement, along with the concepts of classroom culture and agency, and how they can potentially be improved. It was also pleasing to see that some of the findings in this study do mirror previous research in the literature and this has demonstrated the importance of being able to link research, including through the literature, to practice, which is of importance to improving practice.

## References

- Allen, I., & Seaman, C. (2007). Likert Scales and data analyses. *Quality Progress*, 40(7), 64-65.
- Altman, D. G., & Bland, J. M. (2005). Standard deviations and standard errors. *British Medical Journal, (Clinical Research Ed.)*, 331(7521) 903.. <https://doi.org/10.1136/bmj.331.7521.903>
- Ananiadou, K. and M. Claro (2009), “21st Century Skills and Competences for New Millennium Learners in OECD Countries”, *OECD Education Working Papers*, 41, OECD Publishing. <http://dx.doi.org/10.1787/218525261154>
- Appleton, J. J., Christenson, S. L., & Furlong, M. J. (2008). Student engagement with school: Critical conceptual and methodological issues of the construct. *Psychology in the Schools*, 45(5), 369-386.
- Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the student engagement instrument. *Journal of School Psychology*, 44(5), 427-445.
- Archambault, I., Janosz, M., Fallu, J.-S., & Pagani, L. S. (2009). Student engagement and its relationship with early high school dropout. *Journal of Adolescence*, 32(3), 651-670.
- Arnold, J., & Clarke, D. J., (2014). What is 'agency'? Perspectives in science education research. *International Journal of Science Education*, 36(5), 735-754.
- Australian Code for the Responsible Conduct of Research (2018). National Health and Medical Research Council, Australian Research Council and Universities Australia. Commonwealth of Australia, Canberra.
- Avidov-Ungar, O., & Forkosh-Baruch, A. (2018). Professional identity of teacher educators in the digital era in light of demands of pedagogical innovation. *Teaching and Teacher Education*, 73, 183-191.
- Balanskat, A., Blamire, R., & Kefala, S. (2006). The ICT impact report: A review of studies of ICT impact on schools in Europe (Brussels, European Schoolnet).
- Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, 37,122-147.
- Bandura, A. (2001). Social cognitive theory: An agentic perspective. *Annual Review of Psychology* 52,1-26.
- Barrow, L. H. (2006). A brief history of inquiry: From Dewey to standards. *Journal of Science Teacher Education*, 17(3), 265-278.
- Barton, A., & Tan, E. (2010). We be burnin'! Agency, identity, and science learning. *Journal of the Learning Sciences*, 19(2), 187-229. <https://doi.org/10.1080/10508400903530044>
- Baxter, P., & Jack, S. (2008). Qualitative case study methodology: Study design and implementation for novice researchers. *The Qualitative Report*, 13(4), 544-559.
- Becker, L. (2020). Effect Size (ES) | Effect Size Calculators. <https://lbecker.uccs.edu/effect-size>
- Berg, B. L., & Lune, H. (2012). *Qualitative research methods for the social sciences (8th ed.)*. Pearson Education, NY, NY 10013.

- Bergmann, J., & Sams, A. (2014). *Flipped learning: Gateway to student engagement*: International Society for Tech in Education. Eugene, OR, Washington, D.C.
- Bialo, E. R., & Sivin-Kichala, J. S., (1996). The effectiveness of technology in schools: A summary of recent research. *SLMQ* 25, (1)
- Birenbaum, M., Kimron, H., & Shilton, H. (2011). Nested contexts that shape assessment for learning: School-based professional learning community and classroom culture. *Studies in educational evaluation*, 37(1), 35-48.
- Bishop, R., & Berryman, M. (2006). *Culture speaks: Cultural relationships and classroom learning*. Wellington, New Zealand: Huia Press.
- Bishop, R., Berryman, M., Cavanagh, T., & Teddy, L. (2009). Te kotahitanga: Addressing educational disparities facing Māori students in New Zealand. *Teaching and teacher education*, 25(5), 734-742.
- Bishop, R., Berryman, M., Tiakiwai, S., & Richardson, C. (2003). Te Kōtahitanga: The experiences of year 9 and 10 Māori students in mainstream classrooms. *Report to the Ministry of Education. New Zealand: Ministry of Education*.
- Boland, T., Cavanagh, R. F., & Dellar, G. B. (2001, December). Evaluation of school restructuring intended to create a middle schooling culture. Paper presented at the annual conference of the Australian Association for Research in Education, Fremantle, Australia.
- Bolstad, R., Gilbert, J., McDowall, S., Bull, A., Boyd, S. & Hipkins, R. (2012). Supporting future-oriented learning and teaching: A New Zealand perspective. *New Zealand Council for Educational Research. Report to the Ministry of Education*, 2012. <http://www.educationcounts.govt.nz/publications>
- British Educational Research Association [BERA] (2018) *Ethical Guidelines for Educational Research*, fourth edition, London. <https://www.bera.ac.uk/researchers-resources/publications/ethicalguidelines-for-educational-research-2018>
- Bronfenbrenner, U., & Morris, P. (2007). *The Bioecological Model of Human Development*. In Handbook of Child Psychology. Editors, Damon, W., & Lerner, R.M. John Wiley & Sons, Inc.
- Bronfenbrenner, U. (1994). Ecological models of human development. In Husen, T. & Postlethwaite, N.T., (Eds.), *International encyclopedia of education* (2nd ed.) 3, 1643–1647. Oxford, England: Pergamon Press/Elsevier Science.
- Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nurture reconceptualised in developmental perspective: A bioecological model. *Psychological Review*, 101(4), 568-586.
- Brophy, J., and Good, T. (1986), Teacher behaviour and student achievement. In *Handbook of research on teaching*, Wittrock, M.C., 3, .328-375.
- Brown, S. (2018). Best Practices in 21st Century Learning Environments: A Study of Two P21 Exemplar Schools. In Lee, J. Capellino, T. & Greenberg, J., (Eds.): *ProQuest Dissertations Publishing*.

- Bryant, J., & Bates, A. J. (2015). Creating a constructivist online instructional environment. *TechTrends*, 59(2), 17-22.
- Bryson, C., & Hand, L., (2007) The role of engagement in inspiring teaching and learning, *Innovations in Education and Teaching International*, 44 (4), 349-362, DOI: [10.1080/14703290701602748](https://doi.org/10.1080/14703290701602748)
- Burtonshaw-Gunn, S. (2009). *The Essential Management Toolbox*. John Wiley & Sons.
- Cavanagh, R. (2015). A unified model of student engagement in classroom learning and classroom learning environment: one measure and one underlying construct. *Learning Environments Research*, 18(3), 349-361. doi:10.1007/s10984-015-9188-z
- Cavanagh, R., Romanoski, J., Giddings, G., & Dellar, G. (2003). Application of rasch model and traditional statistics to develop a measure of primary school classroom learning culture. *Annual Conference of The Australian Association for Research in Education*:
- Cavanagh, R.F., Kennish, P., & Sturgess, K. (2008). Development of theoretical frameworks to inform measurement of secondary school student engagement with learning. *Paper presented at the annual international conference of the Australian Association for Research in Education, Brisbane*.
- Cavanagh, R. F., & Waugh, R. F. (2004). Secondary school renewal: The effect of classroom learning culture on educational outcomes. *Learning Environments Research*, 7(3), 245-269.
- Cavanaugh, C., Dawson, K. & Ritzhaupt, A. (2011). An Evaluation of the conditions, processes, and consequences of laptop Computing in K-12 classrooms. *Journal of Educational Computing Research*, 45(3), 359-378.
- Cemalcilar, Z. (2010). Schools as socialisation contexts: Understanding the impact of school climate factors on students' sense of school belonging. 59(2), 243-272.
- Christenson, S. L. (2012). *Handbook of Research on Student Engagement*. Edited by Christenson, S.L., Reschly, A.L. & Wylie, C., Boston, MA: Boston, MA: Springer USA
- Cohen, L, Manion, L, & Morrison, K. (2011). *Research methods in education* (6<sup>th</sup> ed.). Abingdon, Oxon: Routledge.
- Collins, A. (1988). Cognitive apprenticeship and instructional technology (Technical Report 6899): *BBN Labs Inc*. Cambridge, MA.
- Conrads, J., Rasmussen, M., Winters, N., Geniet, A., Langer, L., Bacigalupo, M., & Punie, Y. (2017). Digital education policies in Europe and beyond. *JRC Science for policy report*.
- Cothran, D. J., & Ennis, C. D. (2000). Building bridges to student engagement: Communicating respect and care for students in urban high schools. *Journal of Research & Development in Education*, 33(2), 106-117.
- Cox, S. (2008). A conceptual analysis of technological pedagogical content knowledge. *ProQuest Dissertations Publishing*.
- Creswell, J. W., & Miller, D. L. (2000). Determining Validity in Qualitative Inquiry. *Theory into Practice*, 39(3), 124-130.

- Crosnoe, R. (2000). Friendships in childhood and adolescence: The life course and new directions. *Social Psychology Quarterly*, 63, 377–391.
- Crosnoe, R. (2001). Academic orientation and parental involvement in education during high school. *Sociology of Education*, 74(3), 210-230.
- Crosnoe, R., Johnson, M. K., & Elder, G. H. (2004). Intergenerational bonding in school: The behavioral and contextual correlates of student-teacher relationships. *Sociology of Education*, 77(1), 60-81.
- Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper Perennial
- Cuban, L. & Tyack, D.B. (1995) *Tinkering toward utopia: A century of public-school reform*. Cambridge Mass: Harvard University Press
- Curtis, P. (2005). Report reveals teachers' fear of classroom technology. The Guardian. [Http://www.guardian.co.uk/education/2020/feb/7/schools.news](http://www.guardian.co.uk/education/2020/feb/7/schools.news)
- Dabbagh, N., & Kitsantas, A. (2012). Personal learning environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *Internet and Higher Education*, 15, 3-8.
- Darling-Hammond, L., Flook, L., Cook-Harvey, C., Barron, B., & Osher, D. (2019). Implications for educational practice of the science of learning and development. *Applied Developmental Science*, 1-44.
- De Nobile, J., Arthur-Kelly, M., & Lyons, G. (2017). Positive learning environments: Creating and maintaining productive classrooms. Australia: *Cengage Learning Australia*
- DeBerg, A. (2016). Students as producers and collaborators: exploring the use of padlets and videos in MFL teaching. In Gorla, C., Speicher, O. & Stolhans, S, (Eds) *Innovative language teaching and learning at university: enhancing participation and collaboration* (59-64). Dublin. Research-publishing net. <https://research-publishing.net/book?10.14705/rpnet.2016.9781908416322>
- Dembo, S. E., & Bellow, A. S. (2013). *Untangling the Web: 20 Tools to Power Up Your Teaching*. Corwin Press.
- Desforges, C., & Abouchar, A., (2003). The impact of parental involvement, Parental support and family education on pupil achievement and adjustment: *A Literature Review, Department of Education and Skills*.
- Donaldson, L., Matthews, A., Walsh, A., Brugha, R., Manda-Taylor, L., Mwpasa, V., & Byrne, E. (2017). Collaborative tools to enhance engagement in a blended learning master's programme. *AISHE-J: The All-Ireland Journal of Teaching and Learning in Higher Education*, 9(1), 2921-29217.
- Doumen, S., Verschueren, K., Buyse, E., Germeijs, V., Luyckx, K., & Soenens, B. (2008). Reciprocal relations between teacher-child conflict and aggressive behavior in kindergarten: A three-wave longitudinal study. *Journal of Clinical Child & Adolescent Psychology*, 37(3), 588-599.
- Dunbar, L. (2019). When responses cannot be written down: Video submission possibilities in the music classroom. *General Music Today*, 32(3), 29-30.

- Dunleavy, J., & Milton, P. (2009). *What did you do in school today? Exploring the concept of student engagement and its implications for teaching and learning in Canada*. Toronto: Canadian Education Association (CEA), 1-22.
- Durlak, J. A. (2009). How to select, calculate, and interpret effect sizes. *Journal of Pediatric Psychology*, 34(9), 917-928. Edinburgh University Press.
- EdTech Staff (2018). A brief history of the evolution of classroom technology [#Infographic]. [online] *Technology Solutions That Drive Education*.
- Effect Size Calculator. (2020). [https://memory.psych.mun.ca/models/stats/effect\\_size.shtml](https://memory.psych.mun.ca/models/stats/effect_size.shtml)
- Effect Size Calculators. (2020). <https://effect-size-calculator.herokuapp.com/>
- Ellerbrock, C., Abbas, B., DiCicco, M., Denmon, J., Sabella, L., & Hart, J. (2015). Relationships the fundamental R in education: Teachers must create caring communities for the adolescents in their classrooms. *Phi Delta Kappan*, 76(9), 665-719
- Ellis, D. (2015). Using Padlet to increase student engagement in lectures. In Jefferies, A., & Cubric, M. (Eds). *ECEL2015-14th European Conference on e-Learning, ECEL2015. Edition: Illustrated* 195-198. Academic Conferences and publishing limited, 2015.
- Emerson, L., Fear, J., Fox, S., and Sanders, E. (2012). Parental engagement in learning and schooling: Lessons from research. *A report by the Australian Research Alliance for Children and Youth (ARACY) for the Family-School and Community Partnerships Bureau*: Canberra.
- England, S. (2017). Tech for the Modern EFL Student: Collaborate and Motivate with Padlet. *Accents Asia*, 9(2), 56-60.
- Ero.govt.nz, (2012). The three most pressing issues for New Zealand's education system, revealed in latest ERO report - Education Review Office. <http://www.ero.govt.nz/About-Us/News-Media-Releases2/The-three-most-pressing-issues-for-New-Zealand-s-education-system-revealed-in-latest-ERO-report>
- ERO (2016). *ERO-Strategic-Intentions-2016-2021.pdf*. <https://www.ero.govt.nz/assets/Uploads/ERO-Strategic-Intentions-2016-2021.pdf>
- Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. *Computers & education*, 59(2), 423-435.
- Fan, W., & Williams, C. M. (2010) The effects of parental involvement on students' academic self-efficacy, engagement and intrinsic motivation, *Educational Psychology*, 30:(1), 53-74.
- Ferguson-Patrick, K. (2012). Developing an inclusive democratic classroom "in Action" through cooperative learning. Australian Association for Research in Education.
- Filsecker, M., & Kerres, M. (2014). Engagement as a volitional construct: a framework for evidence-based research on educational games. *Simulation & Gaming*, 45, 450e470.
- Finn, J. D. (1989). Withdrawing from school. *Review of Educational Research*, 59(2), 117-142.

- Finn, J. D., & Zimmer, K. S. (2012). Student engagement: What is it? Why does it matter? In Christenson, S.L., Reschly, A.L., & Wylie, C. (Eds.), *Handbook of research on student engagement* 97–131. Springer Science + Business Media.
- Fredricks, J. A., & McColskey, W. (2012). *The measurement of student engagement: A comparative analysis of various methods and student self-report instruments*.
- Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: potential of the concept, state of the evidence. *Review of Educational Research*, 74(1), 59-109.
- Fredricks, J. A., Filsecker, M., & Lawson, M. A. (2016). Student engagement, context, and adjustment: Addressing definitional, measurement, and methodological issues. In *Learning and Instruction* 43, 1-4.
- Fredricks, J., McColskey, W, Manweiler, J., Mordica, J., Montrosse-Moorhead, B., & Mooney, K. (2011). Measuring student engagement in upper elementary through high School: A description of 21 instruments. issues and answers. *REL 2011 098*. Regional Educational Laboratory Southeast.
- Fuchs, B. (2014) "The writing is on the wall: Using padlet for whole-class engagement" *Library Faculty and Staff Publications*. 240. [https://uknowledge.uky.edu/libraries\\_facpub/240](https://uknowledge.uky.edu/libraries_facpub/240)
- Fullan, M. (2001). *The new meaning of educational change*. New York: Teachers College Press.
- Fullan, M. (2016). *The New Meaning of Educational Change, Fifth Edition*. New York: Teachers College Press
- Fullan, M. G. (1991). *The meaning of educational change*. In Fullan, M.G., *The new meaning of educational change* 30-46. New York: Teachers College Press.
- Furrer, C., & Skinner, E. (2003). Sense of relatedness as a factor in children's academic engagement and performance. *Journal of Educational Psychology*, 95(1), 148-162.
- Gaffney, M. (2010). *Enhancing teachers' take-up of digital content: Factors and design principles in technology adoption* (pp. 164-171). Education Services Australia Limited.
- Garnham, W. A., & Betts, T. (2018). The padlet project: Transforming student engagement in foundation year seminars. *Compass: Journal of Learning and Teaching*, 11(2).
- Gasmi, A. A., & Thomas, M. (2017). Academic writing in the flipped EFL classroom: A case study on student engagement in Oman. In Loucky, J., & Ware, J., (Eds.), *Flipped Instruction Methods and Digital Technologies in the Language Learning Classroom* 232-251. Hershey, PA: IGI Global.
- Genet, D. (2013). Teachers' fear of technology-How does it impact the classroom? In McBride, R. & Searson, M. (Eds.), *Proceedings of SITE 2013--Society for Information Technology & Teacher Education International Conference* 1309-1314. New Orleans, Louisiana, United States: Association for the Advancement of Computing in Education (AACE).
- Gibb, S. J., Fergusson, D. M., & Horwood, L. J. (2008). Effects of Single-Sex and Coeducational Schooling on the Gender Gap in Educational Achievement. *Australian Journal of Education*, 52(3), 301–317.
- Gillies, R. (2015). *Enhancing classroom-based talk. Blending practice, research, and theory*. Routledge.

- Gillies, R. M. (2014). Developments in classroom-based talk. *International Journal of Educational Research*, 63(C), 63-68.
- Glaser, J., & Laudel, G. (2013). Life with and without coding: Two methods for early-stage data analysis in qualitative research aiming at causal explanations. *Forum: Qualitative Social Research* 14(2).
- Golafshani, N. (2003). Understanding reliability and validity in qualitative research. *The Qualitative Report*, 8(4), 597-606.
- Gonzales, P., Williams, T., Jocelyn, L., Roey, S., Kastberg, D., & Brenwald, S. (2008). Highlights from TIMSS 2007: Mathematics and science achievement of U.S. fourth-and eighth-grade students in an international context. Washington, DC: *National Center for Education Statistics*.
- Good, T. (2008). *21st century education* (1st ed.). Los Angeles: SAGE Publications.
- Goulart, M. I. & Roth, W-M., (2010). Engaging young children in collective curriculum design. *Cultural Studies of Science Education*. 5. 533-562. 10.1007/s11422-009-9196-3.
- Green, T., & Green, J. (2018). Flipgrid: Adding voice and video to online discussions. *Linking Research and Practice to Improve Learning A publication of the Association for Educational Communications & Technology*, 62(1), 128-130.
- Greenwood, C. R., Delquadri, J. & Hall, R.V., (1984). Opportunity to respond and student academic achievement. *In Behaviour analysis in education*, pp 55-88, Heward, W., Heron, T., Hill, D. & Trap-Porter, J (Eds). Columbus, OH, Merrill.
- Gregory, G., & Kuzmich, L. (2007). *Teacher teams that get results: 61 strategies for sustaining and renewing professional learning communities*. Crowin Press.
- Grissom, R. J., & Kim, J, J. (2005). *Effect sizes for research: A broad practical approach*. Mahwah, NJ: Erlbaum.
- Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In Denzin, N. K., & Lincoln, Y. S. (Eds.), *Handbook of qualitative research* 105-117. Thousand Oaks, CA: Sage.
- Hagel, P., Carr, R., & Devlin, M. (2012). Conceptualising and measuring student engagement through the Australasian Survey of Student Engagement (AUSSE): a critique. *Assessment & Evaluation in Higher Education*, 37(4), 475-486.
- Hamilton, L. a. (2013). *Using case study in education research / Lorna Hamilton & Connie Corbett-Whittier*: Los Angeles: SAGE.
- Hammersley, M., & Traianou, A. (2012). *Ethics in qualitative research: Controversies and contexts*. London: SAGE Publications Ltd
- Hancock, K., & Zubrick, S. (2015). *Children and young people at risk of disengagement from school*. Perth, W.A. Commissioner for Children and Young People, Western Australia.
- Harasim, L. (2017). *Learning theory and online technologies*. Taylor and Francis.

- Hargreaves, A. (2000). Mixed emotions: teachers' perceptions of their interactions with students. *Teaching and Teacher Education*, 16(8), 811-826.
- Harris, L. (2011). Secondary teachers' conceptions of student engagement: Engagement in learning or in schooling?. *Teaching and Teacher Education*, 27(2), 376-386.
- Harris, A & Goodall, J (2008) Do parents know they matter? Engaging all parents in learning, *Educational Research*, 50 (3), 277-289.
- Harris, J., Al-Bataineh, M., & Al-Bataineh, A. (2016). One to one technology and its effect on student academic achievement and motivation. *Contemporary Educational Technology*, 7(4), 368-381
- Hartnell-Young, E., & Vetere, F. (2008). A means of personalising learning: Incorporating old and new literacies in the curriculum with mobile phones. *Curriculum journal*, 19(4), 283-292.
- Harvey, T. R., & Broyles, E. A. (2010). *Resistance to change: a guide to harnessing its positive power*. [Http://ebookcentral.proquest.com](http://ebookcentral.proquest.com)
- Hattie, J. (2009). *Visible learning: a synthesis of over 800 meta-analyses relating to achievement*. Hattie, J. A. C., London; New York: Routledge.
- Hattie, J. A. C. (2012). *Visible Learning for Teachers: Maximising Impact on Learning*. London: Routledge.
- Hedges, L. V., & Hedberg, E. C. (2007). Intraclass correlation values for planning group-randomized trials in education. *Educational Evaluation and Policy Analysis*, 29, 60–87.
- Helsper, E. J. (2012). A corresponding fields model of digital inclusion. *Communication Theory*, 22(4), 403-426.
- Henrie, C. R., Halverson, L. R., & Graham, C. R. (2015). Measuring student engagement in technology-mediated learning: A review. *Computers & Education*, 90, 36-53.
- Herrington, J., & Oliver, R. (2000). An instructional design framework for authentic learning environments. *Educational Technology Research and Development*, 48(3), 23-48.
- Hoover-Dempsey, K. V., & Sandler, H. M. (1995). Parental involvement in children's education: Why does it make a difference? *Teachers College Record*. 97, (2), 310-331.
- Horvath, J., Lodge, J., & Hattie, J. (2016). *From the laboratory to the classroom: Translating science of learning for teachers*. Milton: Routledge.
- Hospel, V., Galand, B., & Janosz, M. (2016). Multidimensionality of behavioural engagement: Empirical support and implications. *International Journal of Educational Research*, 77(C), 37-49.
- <https://www.beehive.govt.nz/sites/default/files/PMEEA-the-finalists.pdf>
- <https://www.education.govt.nz/school/funding-and-financials/resourcing/operational-funding/school-decile-ratings/>. (2019).
- <https://www.gisboyshigh.school.nz/parents-whanau/tu-whanau>
- <https://www.inclusive.tki.org.nz/guides/developing-an-inclusive-classroom-culture/>
- <https://www.socscistatistics.com/tests/chisquare2/default2.aspx>

- Hudson, L. A., & Ozanne, J. L. (1988) Alternative ways of seeking knowledge in consumer research, *Journal of consumer research*, 14, 508-521
- Jamieson, S. (2004). Likert scales: how to (ab) use them. *Medical Education*, 38(12), 1217-1218.
- Jimerson, S. R., Campos, E., & Greif, J. L. (2003). Toward and understanding of definitions and measures of school engagement and related terms. *California School Psychologist*, 8, 7-27.
- Jimoyiannis, A. (2010). Designing and implementing an integrated technological pedagogical science knowledge framework for science teachers' professional development. *Computers & Education*, 55(3), 1259-1269.
- Johnson, L., McHugh, S., Eagle, J., & Spires, H. (2019). Project-based inquiry (PBI) global in kindergarten classroom: Inquiring about the world. *Early Childhood Education Journal*, 47(5), 607-613.
- Johnson, M. K., Crosnoe, R., & Elder, G. H., Jr. (2001). Students' attachment and academic engagement: The role of race and ethnicity. *Sociology of Education*, 74(4), 318.
- Keeley, B. E., & Little, C. E. (2017). The state of the world's children 2017: Children in a digital world. *United Nations Children (Ed.): UNICEF*.
- Keller, M. M., Hoy, A. W., Goetz, T., & Frenzel, A. C. (2016) Teacher enthusiasm: Reviewing and redefining a complex construct. *Educ Psychol Rev*, 28, 743–769. <https://doi.org/10.1007/s10648-015-9354-y>
- King, K. P. (2002). Educational technology professional development as transformative learning opportunities. *Computers & Education*, 39(3), 283-297. [https://doi.org/10.1016/S0360-1315\(02\)00073-8](https://doi.org/10.1016/S0360-1315(02)00073-8)
- Klehr, M. (2012). Qualitative Teacher Research and the Complexity of Classroom Contexts. *Theory into Practice*, 51(2), 122-128.
- Klem, A. M., & Connell, J. P. (2004). Relationships matter: Linking teacher support to student engagement and achievement. *Journal of School Health*, 74(7), 262-273.
- Klemencic, M., (2017). From student engagement to student agency: Conceptual considerations of European policies on student-centered learning in higher education. *Higher Education Policy*. 30. 69-85. [10.1057/s41307-016-0034-4](https://doi.org/10.1057/s41307-016-0034-4).
- Kompar, F. (2018). "Mile deep" digital tools. *Teacher Librarian*, 45(3), 66-71.
- Krause, K. (2005). 'Engaged, inert or otherwise occupied? Deconstructing the 21st century undergraduate student. In: *Sharing Scholarship in Learning and Teaching: Engaging Students*. University of Melbourne.
- Kuh, G. D. (2009). The national survey of student engagement: Conceptual and empirical foundations. *New directions for institutional research*, (141), 5-20. <https://doi.org/10.1002/ir.283>
- La Rue, F., UN Human Rights Council. United Nations (2011), Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression, [http://www2.ohchr.org/english/bodies/hrcouncil/docs/17session/A.HRC.17.27\\_en.pdf](http://www2.ohchr.org/english/bodies/hrcouncil/docs/17session/A.HRC.17.27_en.pdf).
- Larson, R., Csikszentmihalyi M. (2014) The Experience Sampling Method. *Flow and the Foundations of Positive Psychology*. Springer, Dordrecht.

- Lave, J., & Wenger, E. (1991). *Situated learning*. Cambridge, Cambridge University Press
- Lazaridis, R., Gaspard, H., & Dicke, A. (2019). Dynamics of classroom motivation: Teacher enthusiasm and the development of math interest and teacher support. *Learning and Instruction, 160*, 126-137.
- Lee, J.-S., (2014). The relationship between student engagement and academic performance: Is it a myth or reality? *The Journal of Educational Research, 107*. 177-185.
- Lei, H., Cui, Y., & Chiu, M. M. (2018). The relationship between teacher support and students' academic emotions: A meta-analysis. *Frontiers in Psychology, 8*, 2288-2288.
- Lemov, D. (2015). *Teach like a champion 2.0: 62 techniques that put students on the path to college. (2<sup>nd</sup> Edition)*. San Francisco: Jossey-Bass.
- Lenhard, W., & Lenhard, A. (2016). Calculation of effect Ssizes. [https://www.psychometrica.de/effect\\_size.html](https://www.psychometrica.de/effect_size.html). Dettelbach (Germany). Psychometrica.
- Leonard, D. C. (2002). *Learning theories, A to Z*. Westport, Conn.: Westport, Conn.: Oryx Press.
- Levin, T. (2009). Re-culturing beliefs in technology: Enriched classrooms. In Tan, L., Wee Hin, T. W., & Subramaniam, R. (Eds.), *Handbook of research on new media literacy at the K-12 Level: Issues and challenges* (pp.144-166). Hershey, PA: IGI Global.
- Levin, B. B., & Schrum, L. (2013). Using systems thinking to leverage technology for school improvement: Lessons learned from award-winning secondary Schools/Districts. *Journal of Research on Technology in Education, 46*(1), 29-51.
- Liamputtong, P. (2009). Qualitative data analysis: conceptual and practical considerations. *Health Promotion Journal of Australia, 20*(2), 133-139.
- LibGuides: SPSS Tutorials: Paired Samples t Test. (2020). <https://libguides.library.kent.edu/SPSS/PairedSamplestTest>
- Lindgren, R., & McDaniel, R. (2012). Transforming online learning through narrative and student agency. *Journal of Educational Technology & Society, 154* (4), 344-355.
- Linnenbrink-Garcia, L., Rogat, T., & Koskey, K. (2011). Affect and engagement during small group instruction. *Contemporary Educational Psychology, 36*, 13-24.
- Livingstone, S. (2012). Critical reflections on the benefits of ICT in education, *Oxford Review of Education, 38* (1), 9-24.
- Mameli, C., & Passini, S. (2018). Development and validation of an enlarged version of the student agentic engagement scale. *Journal of Psychoeducational Assessment, 37*(4), 450-463.
- Mameli, C., Mazzoni, E., & Molinari, L. (2015). Patterns of discursive interactions in primary classrooms: An application of social network analysis. *Research Papers in Education, 30*, 546-566.
- Mango, O. (2019). Students' perceptions and attitudes toward the use of flipgrid in the language classroom. In Graziano, K. (Ed.), *Proceedings of Society for Information Technology & Teacher Education International*

- Conference* (pp. 1970-1973). Las Vegas, NV, United States: *Association for the Advancement of Computing in Education (AACE)*.
- Martin, A. J. (2007). Examining a multidimensional model of student motivation and engagement using a construct validation approach. *British Journal of Educational Psychology*, 77, 413–440.
- Martin, J. (2016). The grammar of agency: Studying possibilities for student agency in science classroom discourse. *Learning, Culture and Social Interaction*, 10, 40-49.
- McKnight, K., O'Malley, K, Ruzic, R., Horsley, M, K., Franey, J. J.& Bassett, K, (2016) Teaching in a digital age: How educators use technology to improve student learning, *Journal of Research on Technology in Education*, 48, (3), 194-211,
- McLeod, S. A. (2019). What does effect size tell you? Simply Psychology: <https://www.simplypsychology.org/effect-size.html>
- Md Deni, A. R., & Zainal, Z. I. (2018). Padlet as an educational tool: Pedagogical considerations and lessons learnt. (pp. 156-162). *ICTEC*. <https://doi.org/10.1145/3290511.3290512>
- Milatz, A., Lüftenegger, M., & Schober, B. (2015). Teachers' relationship closeness with students as a resource for teacher wellbeing: A response surface analytical approach. *Frontiers in Psychology*, 6, 1949.
- Ministry of Education. (2014). Intent Ministry of Education: Statement of intent 2014-2018. <https://education.govt.nz/assets/Documents/Ministry/Publications/Statements-of-intent/2014SOI.pdf>
- Mishra, P., & Koehler, M. (2008). Introducing technological pedagogical content knowledge. *Teachers College Record*. 9.
- Mishra, P. (2018). Revised version of TPACK image. <https://punyamishra.com/2018/09/10/the-tpack-diagram-gets-an-upgrade/>
- Mitchell, D. (2008). *What really works in special and inclusive education: Using evidence-based teaching strategies*. Abingdon, Oxon: Routledge.
- Mohr, M. (1996). Ethics and standards for teacher research: drafts and decisions. *Research in Language and Learning: Reports From a Teacher Research Seminar*. Fairfax: Northern Virginia Writing Project, George Mason University.
- Montalvo, G. P., Mansfield, E. A., & Miller, R. B. (2007). Liking or disliking the teacher: Student motivation, engagement and achievement. *Evaluation & Research in Education*, 20(3), 144-158.
- Newmann, F. M. E., Wehlage, G. G., & Lamborn, S. D. (1992). *Student engagement and achievement in American secondary schools. The significance and sources of student engagement*, Newmann, F. M. E. (1992). Teachers College Press. New York, NY, 10027
- Niemi, P., & Hotulainen, R. (2015). Enhancing students' sense of belonging through school celebrations: A study in Finnish lower-secondary schools. *International Journal of Research Studies in Education*, 4(5).

- Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom: Applying self-determination theory to educational practice. *Theory and Research in Education*, 7(2), 133-144.
- Noeth, R. J., & Volkov, B. B. (2004). Evaluating the Effectiveness of Technology in Our Schools. ACT Policy Report. *American College Testing ACT Inc.*
- Noam, G. G. (2013). *Teacher-student relationships: Toward personalized education: New directions for youth development, number 137*. Wiley, Germany.
- Nunnally, J. C. & Bernstein, I.H. (1994) The assessment of reliability. *Psychometric Theory*, 3, 248-292
- Obi, S., Obiakor, F., & Graves, J. (2016). Technology plus diversity is equal to innovation: Making education work. *Journal of Education Research*, 10(1), 1-10
- O'Dwyer, L. M., Russell, M., & Bebell, D. J. (2004). Identifying teacher, school and district characteristics associated with elementary teachers' use of technology: A multilevel perspective. *Education Policy Analysis Archives*, 12(48).
- OECD. (2016), Trends shaping education 2016, OECD Publishing, Paris. [Http://dx.doi.org/10.1787/trends\\_education\\_2016-en](http://dx.doi.org/10.1787/trends_education_2016-en).
- OECD. (2018). The future of education and skills Education 2030. The future we want. OECD Publishing, Paris. [https://www.oecd.org/education/2030/E2030%20Position%20Paper%20\(05.04.2018\).pdf](https://www.oecd.org/education/2030/E2030%20Position%20Paper%20(05.04.2018).pdf)
- OECD. (2019). New technologies and 21st century children: Recent trends and outcomes. OECD Education Working Paper No. 179. Graafland, J. [Http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/WKP%282018%2915&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/WKP%282018%2915&docLanguage=En)
- OECD. (2005). Are students ready for a technology-rich world? What PISA tells us. Programme for International Student Assessment (p. 138). Paris, France: Organisation for Economic Co-operation and Development.
- Osterman, K.F. (2010) Teacher practice and students' sense of belonging. In: Lovat T., Toomey R., Clement N. (eds) *International research handbook on values education and student wellbeing*. Springer, Dordrecht
- Paavola, S., Lipponen, L., & Hakkarainen, K. (2004). Models of innovative knowledge communities and three metaphors of learning. *Review of Educational Research* 74(4), 557-576.
- Pacansky-Brock, M. (2017). *Best Practices for Teaching with Emerging Technologies (2nd ed.)*. Routledge.
- Painter, J. (2011). Autonomy, competence, and intrinsic motivation in science education: A self-determination theory perspective.
- Parson, D., & Adhikari, J. (2016). Bring your own device to secondary school: The perceptions of teachers, students and parents. *Electronic Journal of E-Learning*, 14(1), 66.
- Patrick, H., Ryan, A. M., & Kaplan, A. (2007). Early adolescents' perceptions of the classroom social Environment, motivational beliefs, and engagement. *Journal of Educational Psychology*, 99(1), 83-98.
- Patton, M.Q. (2002). *Qualitative research and evaluation methods (3rd ed.)*. Thousand Oaks: Sage

- Pedretti, E., Mayer-Smith, J., & Woodrow, J. (1998). Technology, text, and talk: Students' perspectives on teaching and learning in a technology-enhanced secondary science classroom. *Science Education*, 82(5), 569-589.
- Peoples, S. M., O'Dwyer, L. M., Wang, Y., & Brown, J. J. (2014) Development and application of the elementary school science classroom environment scale (ESSCES): Measuring student perceptions of constructivism within the science classroom. *Learning Environ Res* 7, 49–73.
- Pianta, R.C., Hamre B.K., Allen J.P. (2012). Teacher-student relationships and engagement: Conceptualizing, measuring, and improving the capacity of classroom interactions. In: Christenson S., Reschly A., Wylie C. (eds) *Handbook of Research on Student Engagement*. Springer, Boston, MA.
- Pittaway, S. M. (2012). Student and staff engagement: Developing an engagement framework in a faculty of education. *Australian Journal of Teacher Education*, 37(4), 37.
- Praetorius, A.-K., Lenske, G., & Helmke, A. (2012). Observer ratings of instructional quality: Do they fulfil what they promise? *Learning and Instruction*, 6, 387–400.
- Prain, V., Cox, P., Deed, C., Dorman, J., Edwards, D., Farrelly, C., Keeffe, M., Lovejoy, V., Mow, L., Sellings, P., Waldrup, B. & Yager, Z. (2013). Personalised learning: Lessons to be learnt. *British Educational Research Journal*, 39(4), 654-676.
- Price, P., Jhangiani, R., & Chiang, I. (2015). *Research Methods in Psychology* BC Campus, Canada, <http://doer.col.org/handle/123456789/5600>
- Ravet, J. (2007). Making sense of disengagement in the primary classroom: A study of pupil, teacher and parent perceptions. *Research Papers in Education*, 22(3), 333-362.
- Rector-Aranda, A., & Raider-Roth, M. (2015). 'I finally felt like I had power': student agency and voice in an online and classroom-based role-play simulation. *Research in Learning Technology*, 23.
- Reeve, J. (2012) A Self-determination theory perspective on student engagement. In: Christenson S., Reschly A., Wylie C. (eds) *Handbook of research on student engagement*. Springer, Boston, MA.
- Reeve, J. (2009). *Understanding motivation and emotion (5th ed.)*. Hoboken, NJ: Wiley.
- Reeve, J. (2013). How students create motivationally supportive learning environments for themselves: The concept of agentic engagement. *Journal of Educational Psychology*, 105(3), 579-595.
- Reeve, J., & Tseng, C.-M. (2011). Agency as a fourth aspect of students' engagement during learning activities. *Contemporary Educational Psychology*, 36(4), 257-267.
- Reeves, D. (2012). *Transforming professional development into student results*. Alexandria, Va.: ASCD.
- Reschly, A.L., Christenson S.L. (2012) Jingle, jangle, and conceptual haziness: Evolution and future directions of the engagement construct. In: Christenson S., Reschly A., Wylie C. (eds) *Handbook of research on student engagement*. Springer, Boston, MA
- Reschly, A. L., Christenson, S. L. (2019). *Handbook of student engagement interventions: Working with disengaged students*. United Kingdom: Elsevier Science.

- Rogers, Y., & Price, S. (2008). The role of mobile devices in facilitating collaborative inquiry in situ. *Research and Practice in Technology Enhanced Learning*, 3(3), 209-229.
- Roorda, D. L., Koomen, H. M. Y., Spilt, J. L., & Oort, F. J. (2011). The influence of affective teacher–student relationships on students’ school engagement and achievement: A meta-analytic approach. *Review of Educational Research*, 81(4), 493-529.
- Roser, M., Ritchie, H., & Ortiz-Ospina, E. (2019). <https://ourworldindata.org/internet>
- Roth, W.-M., & Tobin, K. (2001). The implications of co-teaching/cogenerative dialogue for teacher evaluation: Learning from multiple perspectives of everyday practice. *Journal of Personnel Evaluation in Education*, 15, 7-29.
- Rubie-Davies, C. M., Peterson, E., Irving, E., Widdowson, D., & Dixon, R. (2010). Expectations of achievement: student teacher and parent perceptions. *Research in Education*, 83(1), 36-53.
- Rudduck, J. (2007). Student voice, student engagement, and school reform. In: Thiessen D., Cook-Sather A. (eds) *International handbook of student experience in elementary and secondary school*. Springer, Dordrecht
- Ruzek, E. A., Hafen, C. A., Allen, J. P., Gregory, A., Mikami, A. Y., & Pianta, R. C. (2016). How teacher emotional support motivates students: The mediating roles of perceived peer relatedness, autonomy support, and competence. *Learning and instruction*, 42, 95-103.
- Scherzinger, M., & Wettstein, A. (2019). Classroom disruptions, the teacher–student relationship and classroom management from the perspective of teachers, students, and external observers: a multimethod approach. *Learning Environments Research*, 22(1), 101-116.
- Schussler, D. L. (2009). Beyond content: How teachers manage classrooms to facilitate intellectual engagement for disengaged students. *Theory into Practice*, 48(2), 114-121.
- Schwandt, T. A. (1997). *Qualitative inquiry: A dictionary of terms*. Thousand Oaks, CA: Sage
- Scotland, J. (2012). Exploring the philosophical underpinnings of research: Relating ontology and epistemology to the methodology and methods of the scientific, interpretive, and critical research paradigms. *English Language Teaching*, 5(9).
- Sharrock, D., & Rubenstein, R. (2019). *Student–centered practices for student mathematical agency and engagement*. *Handbook of Student Engagement Interventions*, 151-168. Academic Press
- Shernoff, D. J., Csikszentmihalyi, M., Schneider, B., & Shernoff, E. S. (2003). Student engagement in high school classrooms from the perspective of flow theory. *School Psychology Quarterly*, 18(2), 158-176.
- Shernoff, D. J., Kelly, S., Tonks, S. M., Anderson, B., Cavanagh, R. F., Sinha, S., & Abdi, B. (2016). Student engagement as a function of environmental complexity in high school classrooms. *Learning and Instruction*, 43(C), 52-60.
- Silverman, D. (2010). *Qualitative research*. London: Sage.

- Sinclair, G. B. (2009). Is Larry Cuban right about the impact of computer technology on student learning? *Nawa: Journal of Language & Communication*, 3(1), 46- 54.
- Singh, K., Granville, M., & Dika, S. (2002). Mathematics and science achievement: Effects of motivation, interest, and academic Eengagement. *The Journal of Educational Research*, 95(6), 323-332.
- Siry, C. A., & Lang, D. E. (2010). Creating participatory discourse for teaching and research in early childhood science. *Journal of Science Teacher Education*, 21(2), 149-160.
- Sivin-Kachala, J., & Bialo, E. (2000). Research report on the effectiveness of technology in schools (7th ed.). Washington, DC: *Software and Information Industry Association*
- Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. *Educational and Psychological Measurement*, 69, 493–525.
- Smeets, E. (2005). Does ICT contribute to powerful learning environments in primary education?. *Computers & Education*, 44(3), 343-355.
- Spilt, J., Koomen, H., & Thijs, J. (2011). Teacher wellbeing: The importance of teacher–student relationships. *Educational Psychology Review*, 23(4), 457-477. <https://doi.org/10.1007/s10648-011-9170-y>
- Squire, K. D., Makinster, J. G., Barnett, M., Luehmann, A. L., & Barab, S. L. (2003). Designed curriculum and local culture: Acknowledging the primacy of classroom culture. *Science Education*, 87(4), 468-489.
- Stake, R. E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Stevens, S. S. (1946). On the theory of scales of measurement. *Science, New Series*, 103(2684), 677-680.
- Stobaugh, R. R., & Tassell, J. L. (2011). Analyzing the degree of technology use occurring in pre-service teacher education. *Educational assessment, evaluation and accountability*, 23(2), 143-157.
- Supovitz, J. A., & Turner, H. M. (2000). The effects of professional development on science teaching practices and classroom culture. *Journal of Research in Science Teaching*, 37(9), 963-980.
- Swan, K., van 'T Hooft, M., Kratcoski, A., & Schenker, J. (2007). Ubiquitous computing and changing pedagogical possibilities: Representations, conceptualizations and uses of knowledge. *Journal of Educational Computing Research*, 36(4), 481–515.
- Tan, L. W. H., & Subramaniam, R., (2009). *Handbook of research on new media literacy at the K-12 level: issues and challenges*. Ed. Tan Wee Hin, L. T. W., & Subramaniam. R. Hershey, Pa.: Hershey, Pa.: IGI Global.
- Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, (2). 53. [10.5116/ijme.4dfb.8dfd](https://doi.org/10.5116/ijme.4dfb.8dfd)
- Taylor, L., & Parsons, J. (2011). Improving student engagement. *Current Issues in Education*, 14(1).
- Technology / The New Zealand Curriculum / Kia ora - NZ Curriculum Online. (2019). [Http://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum/Technology](http://nzcurriculum.tki.org.nz/The-New-Zealand-Curriculum/Technology)

- Thomson, S. (2015). Policy insights Australian students in a digital world. *Australian Council for Educational Research, 3*.
- Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). *Best evidence synthesis iterations (BES) on professional learning and development*. Wellington, NZ: Ministry of Education.
- Toshalis, E., & Nakkula, M. (2012). Motivation, engagement, and student voice. *The Education Digest, 78*(1), 29-35.
- Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for life in our times*, Jossey-Bass, San Francisco, CA.
- Underwood, J. D. M. (2009). British Educational Communications and Technology Agency. The impact of digital technology: A review of the evidence of the impact of digital technologies on formal education. <http://dera.ioe.ac.uk/id/eprint/10491>
- University of Melbourne. (2007). Nine principles guiding teaching and learning: The framework for a first-class university teaching and learning environment.
- Using chi-square statistic in research - Statistics Solutions. (2020). <https://www.statisticssolutions.com/using-chi-square-statistic-in-research/>
- Van den Bergh, L., Ros, A., & Beijjaard, D. (2015). Teacher learning in the context of a continuing professional development programme: A case study. *Teaching and Teacher Education, 47*, 142-150.
- Van Gasse, N. (2014). An exploratory study of teachers' uses of data to understand students' cognitive and affective engagement.
- van Uden, J. M., Ritzen, H., & Pieters, J. M. (2013). I think I can engage my students. Teachers' perceptions of student engagement and their beliefs about being a teacher. *Teaching and Teacher Education, 32*, 43-54.
- van Uden, J. M., Ritzen, H., & Pieters, J. M. (2014). Engaging students: The role of teacher beliefs and interpersonal teacher behavior in fostering student engagement in vocational education. *Teaching and Teacher Education, 37*(C), 21-32.
- Vaske, J., & Beaman, J., & Sponarski, C. (2016). Rethinking internal consistency in Cronbach's Alpha. *Leisure Sciences, 1-11*.
- Vibert, A., & Shields, C. (2003). Approaches to student engagement: Does ideology matter? *McGill Journal of Education, 38*(2), 221-240
- Voelkl, K. E. (1995). School warmth, student participation, and achievement. *Journal of Experimental Education, 63*(2), 127-138.
- Wade, W., Rasmussen, K., & Fox-Turnbull, W. (2013). Can technology be a transformative force in education? Preventing school failure, *Alternative Education for Children and Youth, 57* (3), 162-170, DOI:[10.1080/1045988X.2013.795790](https://doi.org/10.1080/1045988X.2013.795790)

- Waight, N., & Abd-El-Khalick, F. (2012). Nature of technology: Implications for design, development, and enactment of technological tools in school science classrooms. *International Journal of Science Education* 34. 1-31.
- Waight, N., & Abd-El-Khalick, F. (2007). The impact of technology on the enactment of “inquiry” in a technology enthusiast's sixth grade science classroom. *Journal of Research in Science Teaching*, 44(1), 154-182.
- Walsh, S. (2013). *Classroom discourse and teacher development*. Edinburgh University Press.
- Walsham, G., (2006). Doing interpretive research. *European Journal of Information Systems*, 15(3), 320.
- Wang, M. T., & Fredricks, J. A. (2014). The reciprocal links between school engagement, youth problem behaviors, and school dropout during adolescence. *Child Development*, 85(2), 722-737.
- Wang, M.-T., Willett, J. B., & Eccles, J. S. (2011). The assessment of school engagement: Examining dimensionality and measurement invariance by gender and race/ethnicity. *Journal of School Psychology*, 49(4), 465-480.
- Wang, Z., Bergin, C., & Bergin, D. A. (2014). Measuring engagement in fourth to twelfth grade classrooms: The classroom engagement inventory. *School Psychology Quarterly*, 29(4), 517-535.
- Wellborn, J. G., & Connell, J. P. (1987). *Manual for the Rochester Assessment Package for Schools*. Rochester, NY: University of Rochester
- Wilms, J. D., Friesen, S., & Milton, P. (2009). What did you do in school today? Transforming classrooms through social, academic, and intellectual engagement. (First National Report) Toronto: *Canadian Education Association*.
- Wilson, A. (2014). Being a practitioner: An application of Heidegger’s phenomenology. *Nurse Researcher*, 21(6), 28-33.
- Wolters, C. A., & Taylor, D. J. (2012). A self-regulated learning perspective on student engagement. In Christenson, S. L., Reschly, A. L., & Wylie, C. (Eds.), *Handbook of research on student engagement* (pp. 635–651). New York: Springer.
- Woodward, L. J., Fergusson, D. M., & Horwood, L. J. (1999). Effects of single-sex and coeducational secondary schooling on children’s academic achievement. *Australian Journal of Education*, 43(2), 142-156.
- Wright, N. (2010). e-Learning and implications for New Zealand schools: a literature review. *New Zealand Education Research Council*. Report to the Ministry of Education, 2010. <http://www.educationcounts.govt.nz/publications>
- Wylie, C. (2013). Secondary schools in 2012: Main findings from the NZCER national survey. Wellington, N.Z.: *New Zealand Council for Educational Research*.
- Wylie, C., & Hodgen, E. (2012). Trajectories and patterns of student engagement: Evidence from a longitudinal study. In Christenson, S. L., Reschly, A. L., Wylie, C. (Eds.), *Handbook of research on student engagement*. (pp. 585–599). New York: Springer.

- Yarbro, J., McKnight, K., Elliott, S., Kurz, A., & Wardlow, L. (2016). Digital instructional strategies and their role in classroom learning. *Journal of Research on Technology in Education*, 48(4), 274-289.
- Yazzie-Mintz, E. (2007). Voices of students on engagement: A report on the 2006 high school survey of student engagement. *Center for Evaluation and Education Policy, Indiana University*.
- Yin, R. K. (2003). *Case study research: Design and methods (3rd ed.)*. Thousand Oaks, CA: Sage.
- Zeiser, K., Scholz, C., & Cirks, V. (2018). Maximizing Student Agency: Implementing and Measuring Student-Centered Learning Practices. *American Institutes for Research*.
- Zeni, J. (2001). *Ethical issues in practitioner research*. Teachers College Press, New York, NY.
- Zimmerman, B. J. (2011). Motivational sources and outcomes of self-regulated learning and performance. In B. J. Zimmerman, B. J., & Schunk, D. H., (Eds.), *Handbook of self-regulation of learning and performance* (pp. 49– 64). New York: Routledge.
- Zyngier, D. (2008). (Re)conceptualising student engagement: Doing education not doing time. *Teaching and Teacher Education*, 24(7), 1765-1776.

## Appendices

### Appendix 1 Informed Information Letter and Consent Forms

#### *Appendix 1.1. Informed Information Letter*

##### **Background to consent**

I am undertaking research into whether teacher use of two digital tools (Padlet and Flipgrid) can positively impact on student engagement leading to better student outcomes. The title of the proposed research is **Digital Tools and Engagement: An Evaluation Whether Collaborative and Generic Tools can Positively Affect Classroom Culture, Agency and Engagement in Junior Science in a New Zealand Boys' High School**. The keywords that underpin the proposed study are: *Engagement, digital tools, Padlet, Flipgrid, teacher practice, classroom culture, relationships, agency*.

To undertake this research, I intend to use two general science classes, one at year 9 and one at year 10, in the mid-stream bands, to reflect the more general student body. The research timeframe is approximately 1 term (10 weeks) and will involve the following:

- 1 lesson observation per class at the start of the research period, midway through the research period and at the end of the research period, meaning there will be 3 observations in total per class.
- An online survey (google form) for students in both classes to complete, as well as a separate online survey (google form) for the classroom teachers to complete. Again, this will be done three times aligned with the lesson observations.
- One to one interview with a selected sample of students (n = 6 per class), chosen in consultation with the classroom teachers; as well as interviews with the classroom teachers. The interviews will be carried out three times in line with the surveys and observations.

##### **Additional information**

- All data will be securely stored on password protected professional and personal online accounts, as well as Curtin University's R drive
- Participants, if they request, will be supplied with an overview of the findings of the research.
- The school will also be provided with a full copy of the research and thesis.

**Digital tools and engagement: An evaluation whether collaborative and generic tools can positively affect classroom culture, agency, and engagement in junior science in a New Zealand Boys' High School.**

[jamesv@gisboyshigh.net](mailto:jamesv@gisboyshigh.net) / [peter.vandenbroek@postgrad.curtin.edu.au](mailto:peter.vandenbroek@postgrad.curtin.edu.au)

## Appendix 1.2 Informed Consent Form Students (observations and online surveys)

Human Research Ethics Office  
Consent Form



Engagement and Technology

### CONSENT FORM: STUDENT PARTICIPATION

HREC Project Number:	71331
Project Title:	Digital Tools and Engagement: An Evaluation Whether Collaborative and Generic Tools can Positively Affect Classroom Culture, Agency and Engagement in Junior Science in a New Zealand Boys' High School
Chief Investigator:	Dr Martin Cooper Secondary Programme Coordinator   School of Education Faculty of Humanities
Student researcher:	<i>James Van den Broek</i>
Version Number:	7
Version Date:	12 FEB 2019

- I have read (*or had read to me*) the accompanying information statement version 7 listed above, and I understand its contents.
- I believe I understand the purpose, extent, and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of the Information Statement and Consent Form.

Participant Name	
Participant Signature	
Parent / guardian name (if applicable)	

Parent / guardian signature (if applicable)	
Date	

Declaration by researcher: I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent, and possible risks of their involvement in this project.

Researcher Name	
Researcher Signature	
Date	

*Note: All parties signing the Consent Form must date their own signature.*

### **IMPLIED CONSENT**

- I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent, and possible risks of my involvement in this project and I voluntarily consent to take part.

[jamesv@gisboyshigh.net](mailto:jamesv@gisboyshigh.net) / [peter.vandenbroek@postgrad.curtin.edu.au](mailto:peter.vandenbroek@postgrad.curtin.edu.au)

*Appendix 1.3 Informed Consent Form Students (observations, online surveys, interviews)*

Human Research Ethics Office  
Consent Form



Engagement and Technology

**CONSENT FORM: STUDENT PARTICIPATION**

HREC Project Number:	71331
Project Title:	Digital Tools and Engagement: An Evaluation Whether Collaborative and Generic Tools can Positively Affect Classroom Culture, Agency and Engagement in Junior Science in a New Zealand Boys' High School
Chief Investigator:	Dr Martin Cooper Secondary Programme Coordinator   School of Education Faculty of Humanities
Student researcher:	<i>James Van den Broek</i>
Version Number:	7
Version Date:	12 FEB 2019

- I have read (*or had read to me*) the accompanying information statement version 7 listed above, and I understand its contents.
- I believe I understand the purpose, extent, and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of the Information Statement and Consent Form.

Participant Name	
Participant Signature	

Parent / guardian name (if applicable)	
Parent / guardian signature (if applicable)	
Date	

Declaration by researcher: I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent, and possible risks of their involvement in this project.

Researcher Name	
Researcher Signature	
Date	

*Note: All parties signing the Consent Form must date their own signature.*

### **IMPLIED CONSENT**

Please insert the following tick box at the top of your questionnaire.

- I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent, and possible risks of my involvement in this project and I voluntarily consent to take part.
- I do     I do not    consent to being audio-recorded

[jamesv@gisboyshigh.net](mailto:jamesv@gisboyshigh.net) / [peter.vandenbroek@postgrad.curtin.edu.au](mailto:peter.vandenbroek@postgrad.curtin.edu.au)

*Appendix 1.4 Informed Consent Form Teacher Participants*

Human Research Ethics Office  
Consent Form



Engagement and Technology

**CONSENT FORM: TEACHER**

HREC Project Number:	71331
Project Title:	Digital Tools and Engagement: An Evaluation Whether Collaborative and Generic Tools can Positively Affect Classroom Culture, Agency and Engagement in Junior Science in a New Zealand Boys' High School
Chief Investigator:	Dr Martin Cooper Secondary Programme Coordinator   School of Education Faculty of Humanities
Student researcher:	<i>James Van den Broek</i>
Version Number:	7
Version Date:	12 FEB 2019

- I have read the accompanying information statement version 7 listed above and I understand its contents.
- I believe I understand the purpose, extent, and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of the Information Statement and Consent Form.

Participant Name	
Participant Signature	
Date	

Declaration by researcher: I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent, and possible risks of their involvement in this project.

Researcher Name	
Researcher Signature	
Date	

*Note: All parties signing the Consent Form must date their own signature.*

**WITH IMPLIED CONSENT**

Please insert the following tick box at the top of your questionnaire.

- I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent, and possible risks of my involvement in this project and I voluntarily consent to take part.

- I do     I do not    consent to being audio-recorded

[jamesv@gisboyshigh.net](mailto:jamesv@gisboyshigh.net) / [peter.vandenbroek@postgrad.curtin.edu.au](mailto:peter.vandenbroek@postgrad.curtin.edu.au)

*Appendix 1.5 Informed Consent Form Gatekeeper (Principal)*

Human Research Ethics Office  
Consent Form



Engagement and Technology

**CONSENT FORM: PRINCIPAL**

HREC Project Number:	<i>71331</i>
Project Title:	Digital Tools and Engagement: An Evaluation Whether Collaborative and Generic Tools can Positively Affect Classroom Culture, Agency and Engagement in Junior Science in a New Zealand Boys' High School
Chief Investigator:	Dr Martin Cooper Secondary Programme Coordinator   School of Education Faculty of Humanities
Student researcher:	<i>James Van den Broek</i>
Version Number:	<i>7</i>
Version Date:	<i>12 FEB 2019</i>

- I have read the accompanying information statement version 7 listed above and I understand its contents.
- I believe I understand the purpose, extent, and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of the Information Statement and Consent Form.

Participant Name	
Participant Signature	
Date	

Declaration by researcher: I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent, and possible risks of their involvement in this project.

Researcher Name	
Researcher Signature	
Date	

*Note: All parties signing the Consent Form must date their own signature.*

**WITH IMPLIED CONSENT**

Please insert the following tick box at the top of your questionnaire.

- I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent, and possible risks of my involvement in this project and I voluntarily consent to take part.

[jamesv@gisboyshigh.net](mailto:jamesv@gisboyshigh.net) / [peter.vandenbroek@postgrad.curtin.edu.au](mailto:peter.vandenbroek@postgrad.curtin.edu.au)

**Appendix 1.6 Informed Consent Head of Department**

Human Research Ethics Office  
Consent Form



Engagement and Technology

**CONSENT FORM: HEAD OF DEPARTMENT**

HREC Project Number:	71331
Project Title:	Digital Tools and Engagement: An Evaluation Whether Collaborative and Generic Tools can Positively Affect Classroom Culture, Agency and Engagement in Junior Science in a New Zealand Boys' High School
Chief Investigator:	Dr Martin Cooper Secondary Programme Coordinator   School of Education Faculty of Humanities
Student researcher:	James Van den Broek
Version Number:	7
Version Date:	12 FEB 2019

- I have read the accompanying information statement version 7 listed above and I understand its contents.
- I believe I understand the purpose, extent, and possible risks of my involvement in this project.
- I voluntarily consent to take part in this research project.
- I have had an opportunity to ask questions and I am satisfied with the answers I have received.
- I understand that this project has been approved by Curtin University Human Research Ethics Committee and will be carried out in line with the National Statement on Ethical Conduct in Human Research (2007).
- I understand I will receive a copy of the Information Statement and Consent Form.

Participant Name	
Participant Signature	
Date	

Declaration by researcher: I have supplied an Information Letter and Consent Form to the participant who has signed above, and believe that they understand the purpose, extent, and possible risks of their involvement in this project.

Researcher Name	
Researcher Signature	
Date	

*Note: All parties signing the Consent Form must date their own signature.*

**WITH IMPLIED CONSENT**

Please insert the following tick box at the top of your questionnaire.

- I have received information regarding this research and had an opportunity to ask questions. I believe I understand the purpose, extent, and possible risks of my involvement in this project and I voluntarily consent to take part.

[jamesv@gisboyshigh.net](mailto:jamesv@gisboyshigh.net) / [peter.vandenbroek@postgrad.curtin.edu.au](mailto:peter.vandenbroek@postgrad.curtin.edu.au)

## Appendix 2 Ethics Approval



Curtin University

Research Office at Curtin

- report submitted on completion of the project
5. Personnel working on this project must be adequately qualified by education, training and experience for their role, or supervised
  6. Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, that bears on this project
  7. Changes to personnel working on this project must be reported to the Human Research Ethics Office
  8. Data and primary materials must be retained and stored in accordance with the [Western Australian University Sector Disposal Authority \(WAUSDA\)](#) and the [Curtin University Research Data and Primary Materials policy](#)
  9. Where practicable, results of the research should be made available to the research participants in a timely and clear manner
  10. Unless prohibited by contractual obligations, results of the research should be disseminated in a manner that will allow public scrutiny; the Human Research Ethics Office must be informed of any constraints on publication
  11. Approval is dependent upon ongoing compliance of the research with the [Australian Code for the Responsible Conduct of Research](#), the [National Statement on Ethical Conduct in Human Research](#), applicable legal requirements, and with Curtin University policies, procedures and governance requirements
  12. The Human Research Ethics Office may conduct audits on a portion of approved projects.

### Special Conditions of Approval

Nil

**This letter constitutes low risk/negligible risk approval only.** This project may not proceed until you have met all of the Curtin University research governance requirements.

Should you have any queries regarding consideration of your project, please contact the Ethics Support Officer for your faculty or the Ethics Office at [hrec@curtin.edu.au](mailto:hrec@curtin.edu.au) or on 9266 2784.

Your application was reviewed through the Curtin University Low risk review process.

The review outcome is: **Approved.**

Your proposal meets the requirements described in the National Health and Medical Research Council's (NHMRC) *National Statement on Ethical Conduct in Human Research (2007)*.

Approval is granted for a period of one year from **09-Oct-2019** to **08-Oct-2020**. Continuation of approval will be granted on an annual basis following submission of an annual report.

Personnel authorised to work on this project:

Name	Role
Van den Broek, Peter	Student
Cooper, Martin	Supervisor

Approved documents:

Document

**Standard conditions of approval**

1. Research must be conducted according to the approved proposal
2. Report in a timely manner anything that might warrant review of ethical approval of the project including:
  - proposed changes to the approved proposal or conduct of the study
  - unanticipated problems that might affect continued ethical acceptability of the project
  - major deviations from the approved proposal and/or regulatory guidelines
  - serious adverse events
3. Amendments to the proposal must be approved by the Human Research Ethics Office before they are implemented (except where an amendment is undertaken to eliminate an immediate risk to participants)
4. An annual progress report must be submitted to the Human Research Ethics Office on or before the anniversary of approval and a completion

Yours sincerely



Amy Bowater  
Ethics, Team Lead

PDFTRON

## Appendix 3 Interview Questions

### Appendix 3.1 Student Interview Questions

**Table A3. 1**

*Students' Interview Phase 1*

Question Number	Question
1	How would you describe the classroom environment / culture in the class? <i>Prompts: behaviours / respect / communications</i>
2	How would you describe your relationships with your peers / classmates?
3	How would you describe your relationship with your teacher?
4	Do you enjoy this class and subject?
5	How would you rate your level of engagement with learning activities in this class?
6	Could anything be done to increase your engagement with learning activities in this class?

**Table A3. 2***Students' Interview Phase 2*

Question Number	Question
1	How would you describe the classroom environment / culture in the class now? Has it changed at all over the last few weeks? <i>Prompts: behaviours / respect / communications</i>
2	How would you describe your relationships with your peers / classmate? now? Has it changed at all over the last few weeks?
3	How would you describe your relationship with your teacher now? Has it changed at all over the last few weeks?
4	Do you enjoy this class and subject more now? Has it changed at all over the last few weeks?
5	How would you rate your level of engagement with learning activities in this class now? Has it changed at all over the last few weeks?
6	Can you tell me if the teacher's use of Padlet and Flipgrid has helped with your engagement with learning activities in this class? If so why?

*Appendix 3.2 Teacher Interview Questions*

**Table A3. 3**

*Teachers' Interview Phase 1*

Question Number	Question
1	How would you describe the classroom environment / culture in this class?
2	How would you describe your relationships with your students?
3	Do you enjoy teaching this class and subject?
4	Do you think the students in this class enjoy this subject and the learning activities?
5	How would you rate the students' levels of engagement with learning activities in this class?
6	You have agreed to use Padlet and Flipgrid for the next 10 weeks or so, do you believe these tools will have any effect on student engagement?

**Table A3. 4**

*Teachers' Interview Phase 2*

Question Number	Question
1	How would you describe the classroom environment / culture in this class now? Has it changed over the last few weeks?
2	How would you describe your relationships with your students now? Has there been a change in the last few weeks?
3	Do you enjoy teaching this class and subject now? Has this changed?
4	Do you think the students in this class enjoy this subject and the learning activities more now? Has there been any change?
5	How would you rate the students' levels of engagement with learning activities in this class now? Has there been any change?
6	Do you think that using Padlet and Flipgrid has led to any change in student engagement? Do you think these tools are worthwhile additions to your pedagogy?

## Appendix 4 Transcribed Interviews

### Appendix 4.1 Transcribed Student Interviews Year 9 Phase 1

**Table A4. 1**

*Student 1 Year 9*

Question Number	Response
1	Mm... it's pretty good.
2	Mm... Yeah, I think I get al.ong with others.
3	Mm... pretty good so far.
4	Yes.
5	Out of 10 or? 9.
6	No

**Table A4. 2**

*Student 2 Year 9*

Question Number	Response
1	I would say it's not the best, but sometimes can be alright... But there's some as you can see... some in there... some people writing the wrong answers on purpose... a shout on Instagram and stuff.
2	Alright I think... mm... yeah, it's alright.
3	Yeah, we get al.ong... I don't misbehave... I don't think.
4	Yes, I do.
5	I think 8.
6	Yes, more experiments.

**Table A4. 3***Student 3 Year 9*

Question Number	Response
1	Ah it's alright.
2	Ah good.
3	Mm... ah not very... like in between some days.
4	Ah... no.
5	Mm... out of 10? Mm... 6.
6	Make it like not boring... do it outside or something.

**Table A4. 4***Student 4 Year 9*

Question Number	Response
1	Mm... everyone is well respected... we can have a little bit of fun yet at the same time we have to do a little bit of work.
2	We all get along... we're all good friends.
3	Mm... it's good... she treats everyone the same no matter what.
4	Yes... mm... learn a lot of new things and stuff.
5	Good... my teacher makes sure I'm engaged at all times... same as my peers.
6	Mm... no not really

**Table A4. 5***Student 5 Year 9*

Question Number	Response
1	Mm... fun... mm... we like communicate good and all that and we show respect most of the time.
2	Mm... good... we joke around lots and have fun.
3	Alright... mm...
4	
5	Out of 10? Like eight and a half.
6	Mm... like more hands-on activities.

**Table A4. 6***Student 6 Year 9*

Question Number	Response
1	Yeah. (changed)...maybe behavior way. It's gotten a bit better
2	Nah... no change.
3	Not really.
4	Yes, most definitely.
5	No... no change... yes... same as last time.
6	Well, I've missed a couple of days... so I don't know really how to use them.

*Appendix 4.2 Transcribed Student Interviews Year 9 Phase 2*

**Table A4. 7**

*Student 1 Year 9*

Question Number	Response
1	Mm... I reckon it's good... and it's a good class... a fun class.
2	Mm... I think I'm really good mates with quite a few of them... the kids in the class
3	Ah, I don't really know... Ah, she teaches me and that's her job... I guess it's good.
4	Mm... yeah when we're doing experiments.
5	Mm... other kids not being annoying... doing stuff that distracts me.
6	

**Table A4. 8**

*Student 2 Year 9*

Question Number	Response
1	Mm... still the same.
2	Mm... no (no change).
3	Yes, it's gotten a little better.
4	The same.
5	Out of 10? Like 6 or 7.
6	Yes, makes it easier to like to understand how to do it and all that...yeah (improved engagement?)

**Table A4. 9***Student 3 Year 9*

Question Number	Response
1	Mm... still the same bit of cheekiness around but we still do the work and stuff.
2	Mm... alright... no, not really (change).
3	It's the same. Everyone gets stuck in and does their work... so it's alright.
4	Yes, I do... ah, it's more than last time.
5	Good solid 9 out of 10.
6	Mm... ah yeah, I would say so... more connected... easier to get on and just want to do it.

**Table A4. 10***Student 4 Year 9*

Question Number	Response
1	I reckon it's pretty good... yes (changed) for the better.
2	They're pretty good with everyone.
3	Yeah, they're good... same (change).
4	Yep.
5	From 1-10? I'd say about 8-9... Yes (got better).
6	A little bit... I don't know why I just like writing things down better on computers.

**Table A4. 11***Student 6 Year 9*

Question Number	Response
1	Mm... It's been better since people have started engaging more and not been annoying to miss and miss has got them to start listening.
2	Nah, well since we went to camp... I've had a lot better friendships with everyone.
3	I think it's got better.
4	Yep... got better.
5	Mm... better than before because now I'm listening instead of everyone talking and stuff.
6	Nah... oh yeah, they help with easier... it makes you not talk to your friends and stuff as you're writing... you just stay more engaged on what you're supposed to be working.

*Appendix 4.3 Transcribed Student Interviews Year 10 Phase 1*

**Table A4. 12**

*Student 1 Year 10*

Question Number	Response
1	Pretty alright... some people just start talking... some people just talking.
2	Pretty good.
3	Ah yeah... it's alright.
4	Yeah.
5	Out of 10? 8.
6	Nah.

**Table A4. 13**

*Student 2 Year 10*

Question Number	Response
1	Ah, yeah... it's kind of hectic but sometimes good at the same time.
2	Good.
3	Ugh... good.
4	Yes... ugh... very much so.
5	About 4... ugh... 5.
6	Nah.

**Table A4. 14***Student 3 Year 10*

Question Number	Response
1	I reckon like... um yeah... we share heaps of respect like.... most of us we zone out in class... most of us like most of us we are working but most of those people who work... usually they show respect to other people cos like since they are the ones who are hardworking, they think ah these guys just don't know that much so they just get up and all.
2	Well since I know most of them there is just a little bit of people who I don't know... it's just better if I can connect with them more.
3	If it was from 1 to 10...I would say about a 9.
4	Yeah because a Maths class we just write... but Sir's a different way of teaching... like talking... not a lot of writing... like he shows us.
5	From 1 to 10? I reckon about a 9... yes... because I sometimes zone out.
6	Mm... just for me to listen more and ask for help when I need it.

**Table A4. 15***Student 4 Year 10*

Question Number	Response
1	It's alright.
2	Pretty good.
3	Pretty good.
4	Yeah.
5	Mm... out of 10? Like 8.
6	Ugh... stop talking all the time... no.

**Table A4. 16***Student 5 Year 10*

Question Number	Response
1	Average.
2	Alright.
3	Good.
4	Yes and no... basically more to the yes.
5	Out of 10... probably 8.
6	Not that I would no... no.

**Table A4. 17***Student 6 Year 10*

Question Number	Response
1	Ugh... it's alright.
2	Ah... alright.
3	Ah... fine.
4	Ah... yes.
5	Out of 10? 7.
6	Yes... listen more and talk less.

*Appendix 4.4 Transcribed Student Interviews Year 10 Phase 2*

**Table A4. 18**

*Student 1 Year 10*

Question Number	Response
1	Ah... kind of... a bit different but still the same... ugh better.
2	Nah.
3	Still the same.
4	Ugh... sometimes... no.
5	Ah... 8.
6	No answer.

**Table A4. 19**

*Student 2 Year 10*

Question Number	Response
1	Mm... still the same.
2	Mm... still the same but some's changed... I've made more friends than before and got more engaging with the others as well.
3	Still the same.
4	Yep... yep.
5	Up to 9.
6	Nah no answer.

**Table A4. 20***Student 3 Year 10*

Question Number	Response
1	Yeah... a little bit... think we've got a little bit better... some people being a little bit iffy.
2	Yeah, made a tighter bond.
3	Yeah.
4	Yeah... could've been better but I wasn't here yesterday.
5	1-10... I would say about 9.
6	Mm... they're... Padlet books they're alright... it's just it makes them all tired and bored... sometimes... what we get told the book says it like way more detailed when we're trying to read it... we get lost what we're trying to do.

**Table A4. 21***Student 4 Year 10*

Question Number	Response
1	Nah... still pretty good.
2	Still pretty good... nah (no change).
3	Yeah... it's alright... nah (not changed).
4	Yeah... same.
5	Same.
6	Oh yeah... good (Padlet).

**Table A4. 22***Student 5 Year 10*

Question Number	Response
1	No (has it changed?).
2	Still good... no (any change?)
3	Still the same.
4	Same.
5	Probably 8.
6	Yes... I was away.

*Appendix 4.5 Transcribed Teacher Interview Year 9 Phase 1***Table A4. 23***Teacher Year 9*

Question Number	Response
1	I guess we're week 4 so really week 3 that we've been together... so, it's really quite new and maybe some of the boys have been on better behaviour than I might have been expecting down by week 10... and maybe a couple of boys still just pushing the boundaries... yeah but generally... generally a nice classroom culture.
2	Ah... still getting to know the boys... and probably a little bit easier to cope with some boys than others at the moment.
3	At the moment... yes... at the moment... yeah... they've been pretty good so far and not too many issues with the boys so.
4	Mm... they probably potentially find it a little bit easy with the introduction to science... have had one comment already... miss why do we have so many worksheets or why are we getting so many worksheets... but no one no one no one has been rude about or saying they are bored or anything.
5	Mm... we did we did something practical yesterday so the engagement there was pretty high...and they did tend to work quite well in groups a lot better than the last practical that we did... mm... yeah but maybe on an average... an average engagement.
6	I hope so...yeah... I think if used... mm... not as the sole tool but as one of the many tools... yeah... like maybe if they are on the computer or using digital 24/7... if they're learning... that's what they come to expect... and they start to complain and do other ways of learning... so yeah... but as one of the tools definitely.

*Appendix 4.6 Transcribed Teacher Interview Year 9 Phase 2***Table A4. 24***Teacher Year 9*

Question Number	Response
1	Mm... I think the classroom culture has got a little bit worse actually.... mm... but I think that's more because they sort of had their honeymoon period at the start and then they're really testing the waters... so just real little things like pens kept getting stolen and practicals... when we do practicals they're just not quite settled in with that yet either.
2	Mm... I guess with some of them yeah you can sort of hold a better conversation with them... mm... but others probably still more... so maybe sort of maybe just more of the same.
3	Mm... let me think... I think it depends on what we're doing... so when we, when we're doing practical stuff I have not enjoyed taking the class because that's when I've had to start raising my voice... because they just, they don't really work well in groups together because they haven't been able to chosen their groups... so they try and go off and go with the boys they are friends with... mm... or they are not listening to instructions... so... mm... I just feel like when we do practicals they start to get a little bit silly but when we do theory it's fine... when I've got stuff... when they do their like if we have writing... so for example today they were, they had to write out the practical before they did it... and so in that 10 or 15 minutes the class were silent because most of them were busy writing away... so that was that was really good.
4	I think they've enjoyed Padlet and I think they quite like seeing their... their own answers coming up and reading other answer... they have their... there hasn't been too many stupid answers coming on the screen which is good... a couple of things... oh who's written that or that sort of thing... but not too much and nothing nasty... like no nasty comments about other boys' work which is good... but I think they have enjoyed it and it has been quite good to... mm... to summarise what they... yeah what they're doing.
5	Mm... potentially I think they are doing a little bit more of an interesting topic and practical work as well... I haven't really asked them... from my own perceived view, I think they, I think so... it is still the same boys who answer the same questions... so I guess so maybe

the more confident boys, the boys who are actually listening, not put their hands up do... yes, the same sort of boys... so maybe I guess their level of engagement is good.

- 6 Mm... I'd like to continue using them a little bit more before giving a justified opinion... mm... the thing is sometimes I do an activity sort of like Padlet but a written way... and I find when we do that it's a very noisy lesson and it can get a little bit out of control... a post it box activity... so when groups they going to say a question and they write an answer on a piece of paper, and they're supposed to answer it as a group, and we go to the post office and pick up answers.... that can get really rowdy and noisy and takes a lot... could take half an hour just to answer 5 questions... whereas Padlet I guess is sort of a similar concept but a lot quicker... they can do it individually, or in pairs or in groups and... mm... can see everyone's answers rather than just picking up one or two, so I do things like that... mm... might try to continue using Padlet in that way... Thursday we're using Flipgrid... so should be interesting to see how that goes.
-

*Appendix 4.7 Transcribed Teacher Interview Year 10 Phase 1***Table A4. 25***Teacher Year 10*

Question Number	Response
1	Brand new class... mm huge variation in ability which means you've got some kids who are pretty focused and some kids who are a walking distraction or looking to be distracted... so we have a very very broad range of abilities and a very broad range of motivations.
2	Well, it's only a new class and I'm only starting... so effectively I'm boxing them into shape... one of the ways I am doing that we are into experiments straight away... I'm pretty much hands on and I'm as much as you can with the curriculum doing practicals.... so, in some respects we're starting the year and it's been broken too because they've been away on Tu Tane walks... they've been away for all sorts of other things... we've had sports days I've lost... there's been kind of a problem with no continuity, so that's another reason why they come in and sometimes half the class aren't there cos they're away with things... so, I'm doing a lot of practical based stuff... so the starting with the experiments now and that means others can catch up later on and also we're straight into it.
3	Mm... like I said... mm... they've just started... it's going to be a challenge... ah do I enjoy it? I love a challenge... Hehehe... it's me that way.
4	A variation... some are into shape... some don't want to... a good example... first time they ever walked in the room and four of five of them sat down facing the back of the class cos they're looking at their mates... so you've got a real low threshold for motivation anyway.
5	As I said same thing... very very varied... some are really listening to what you want to do, and others will spend quite a long time looking around or anything other than what we're doing... mm... yeah and that's the whole thing about getting them to do stuff.
6	Haven't seen them yet so I'm hoping so yeah... but that's... that's what we're here for/

*Appendix 4.8 Transcribe Teacher Interview Year 10 Phase 2*

**Table A4. 26**

*Teacher Year 10*

Question Number	Response
1	Mm... we've still that split... mm... and we're finding now for me they are a much more lower level than I thought they were... so we've got major issues of absenteeism... mm... an inability for a lot of kids to finish off what they've started... particularly we're working through scheme or curriculum some of them are really slow.
2	Still developing... mm... because basically we've had so many breaks and interruptions.so now... mm... I think it's kind of building, they're trusting me... I'm still very much hands on, still very experimentally based... ah we haven't done a huge amount of work on the computers... so yeah, it's still building.
3	I do yeah...I like the challenge... mm not changed.
4	Some do... some actually... ah... when I think about it there is one major change now... they walk into class... they get their books out, they get their objectives set up... almost to a man they do that quietly... so actually they come into class ready to start doing that... then yeah... I've just realised that now... I suppose that is a change.
5	Mm... changed? I'm pretty engaging anyway... and what I'll try and do is use stuff where they at... or use stuff they've got... or what I'm doing a lot of... they call that feed forward... but if we're doing stuff I'll try and make a link... later on... this year you're going to do this and this... so yeah... there is some stuff that they are part of.
6	No... haven't done it yet (Flipgrid)... look... I said we did one (Padlet) and what happened was so many of the kids giggled and laughed at what somebody else had written... it began a backwards banter about that rather than what they wanted to get out of the system... mm... and unfortunately at that stage I didn't have the ability to remove the posts that were inappropriate... we learnt something ourselves, didn't we? ( <i>Has subsequently done Flipgrid – commented in online survey</i> )



---

The teaching and learning activities are interesting and engaging.

	1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so				

Any comments?

We get to have a voice in teaching and learning.

	1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so				

Any comments?

We collaborate on learning activities.

	1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so				

Any comments?

---

**The final questions are around engagement in this class**

---

In general students are engaged with learning activities in this class.

	1	2	3	4	5	
Not at all	<input type="radio"/>	All the time				

Any comments?

In general, I am engaged with learning activities in this class.

	1	2	3	4	5	
Not at all	<input type="radio"/>	All the time				

Any comments?

Is there anything you think the teacher could do to increase your interest and engagement in completing learning activities?

Your teacher is going to use Padlet and Flipgrid as part of teaching and learning over the next few weeks. Have you used either of these digital tools before?

Yes

No

Maybe

Your teacher is going to use Padlet and Flipgrid as part of teaching and learning over the next few weeks. Do you think these digital tools will help improve engagement with teaching and learning in this class?

Yes

No

Maybe

---

Phase 1 Student Online Survey

***Appendix 5.2 Student Survey Phase 2***

The following table shows the online survey questions used for the students in phase two.

**Table A5. 2**

*Engagement Survey Students Phase 2*

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**The following questions are about classroom cultures**

---

Use the scale to rate the levels of respect shown in the classroom between you and your peers.

		1	2	3	4	5	
Very Poor	<input type="radio"/>	Very Good					

Any Comments?

Use the scale to rate the levels of respect shown in the classroom between the teacher and students.

		1	2	3	4	5	
Very Poor	<input type="radio"/>	Very Good					

Any Comments?

Use the scale to rate the levels of general behaviour shown in the classroom.

		1	2	3	4	5	
Very Poor	<input type="radio"/>	Very Good					

Any Comments?

Use the scale to show how much you think all students in class are engaged with learning activities in general.

		1	2	3	4	5	
Very Poor	<input type="radio"/>	Very Good					

Any Comments?

Use the scale to show how much you think you are engaged with learning activities in general.

		1	2	3	4	5	
Very Poor	<input type="radio"/>	Very Good					

Any Comments?

You have been using Padlet and Flipgrid in class over the last few weeks. Has the use of these digital tools led to an improvement in classroom relationships and culture?

		1	2	3	4	5	
Very Poor	<input type="radio"/>	Very Good					

---

**The following questions are about agency**

---

The teaching and learning activities are interesting and engaging

		1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so					

Any comments?

We get to have a voice in teaching and learning.

		1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so					

Any comments?

Has the use of Padlet and Flipgrid made teaching and learning more interesting?

	1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so				

Any comments?

Has the use of Padlet and Flipgrid given you any more voice in with teaching and learning activities?

	1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so				

Any comments?

Has the use of Padlet and Flipgrid increase collaboration in teaching and learning activities?

	1	2	3	4	5	
Not at all	<input type="radio"/>	Very much so				

Any comments?

---

**The final questions are around engagement in this class**

---

Overall, do you think student engagement with learning activities has increased due to using Padlet and Flipgrid?

Use the scale to below to show how effective you think the use of Padlet and Flipgrid has been in raising your engagement.

	1	2	3	4	5	
No change in	<input type="radio"/>	Large change				

Any comments?

---

Phase 2 Student Online Survey

**Appendix 5.3 Teacher Survey Phase 1**

The following table shows the online survey questions used for the classroom teachers in phase one.

**Table A5. 3**

*Engagement Survey Teachers Phase 1*

Use the scale to rate the levels of respect shown in the classroom between the students	1	2	3	4	5		
Very Poor	<input type="radio"/>	Very Good					
Any Comments?							
Use the scale to rate the levels of respect shown in the classroom from the students to you	1	2	3	4	5		
Very Poor	<input type="radio"/>	Very Good					
Any Comments?							
Use the scale to rate the levels of general behaviour shown in the classroom	1	2	3	4	5		
Very Poor	<input type="radio"/>	Very Good					
Any Comments?							
Use the scale to show how much you think students in class are engaged with learning activities in general.	1	2	3	4	5		
Very Poor	<input type="radio"/>	Very Good					
Any Comments?							
What have you been doing in an attempt to increase levels of engagement?							
What effect, if any, do you think using Padlet and Flipgrid will have on student engagement? Use the scale below to indicate this.		1	2	3	4	5	
Decrease engagement significantly		<input type="radio"/>	Increase engagement significantly				
Any comments?							

Phase 1 Teachers Online Survey

**Appendix 5.4 Teacher Survey Phase 2**

The following table shows the online survey questions used for the classroom teachers in phase one.

**Table A5. 4**

*Engagement Survey Teachers Phase 2*

Use the scale to rate the levels of respect shown in the classroom between the students now.	1	2	3	4	5		
Very Poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Good	
Any Comments?							
Use the scale to rate the levels of respect shown in the classroom from the students to you now.	1	2	3	4	5		
Very Poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Good	
Any Comments?							
Use the scale to rate the levels of general behaviour shown in the classroom now.	1	2	3	4	5		
Very Poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Good	
Any Comments?							
Use the scale to show how much you think students in class are engaged with learning activities in general now.	1	2	3	4	5		
Very Poor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Very Good	
Any Comments?							
What effect, if any, do you think using Padlet and Flipgrid has had up to now on student engagement? Use the scale below to indicate this.		1	2	3	4	5	
Decrease engagement significantly		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Increase engagement significantly
What effect, if any, do you think using Padlet and Flipgrid will have on student engagement? Use the scale below to indicate this.		1	2	3	4	5	
Decrease engagement significantly		<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Increase engagement significantly
Has the implementation of Padlet and Flipgrid been difficult for you?	<input type="radio"/> Strongly disagree	<input type="radio"/> Disagree	<input type="radio"/> Neutral	<input type="radio"/> Agree	<input type="radio"/> Strongly agree		
Any comments?							

*Appendix 5.5 Online Surveys Initial Data Phase 1*

**Table A5. 5**

*SPSS Output Year 9 Students Descriptive Statistics Phase 1*

	Peer Respect	Student Teacher Respect	Behaviour Levels	Teacher Expectations	Student Self Expectations	Whole Class Engagement
N Valid	25	25	24	25	25	25
Missing	0	0	1	0	0	0
Mean	4.1200	3.3200	3.4583	4.2400	3.9200	3.1600
Median	4.0000	4.0000	3.0000	4.0000	4.0000	3.0000
Mode	4.00	4.00	3.00	4.00	4.00	3.00
SD	.78102	1.06927	1.06237	.87939	1.22202	.89815
Range	2.00	4.00	4.00	4.00	4.00	4.00
Minimum	3.00	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00
	Individual Pupil Engagement	Learning Activities Engaging	Levels of Student Voice	Levels of Student Collaboration	General Student Engagement	
N Valid	25	25	25	24	25	
Missing	0	0	0	1	0	
Mean	3.6800	3.4000	2.9200	3.4167	3.6000	
Median	4.0000	4.0000	3.0000	3.0000	4.0000	
Mode	4.00	4.00	3.00	3.00	4.00	
SD	1.18040	.95743	1.28841	.88055	1.19024	
Range	4.00	4.00	4.00	3.00	4.00	
Minimum	1.00	1.00	1.00	2.00	1.00	
Maximum	5.00	5.00	5.00	5.00	5.00	

**Table A5. 6***SPSS Output Year 10 Students Descriptive Statistics Phase 1*

	Peer Respect	Student Teacher Respect	Behaviour Levels	Teacher Expectations	Student Self Expectations	Whole Class Engagement
N Valid	22	21	22	22	22	22
Missing	0	1	0	0	0	0
Mean	3.4545	3.6190	3.5000	3.7727	3.6818	3.3636
Median	4.0000	4.0000	4.0000	4.0000	4.0000	3.0000
Mode	4.00	4.00	4.00	4.00	5.00	3.00 <sup>a</sup>
SD	1.05683	1.07127	.85912	1.30683	1.24924	.90214
Range	4.00	4.00	3.00	4.00	4.00	3.00
Minimum	1.00	1.00	2.00	1.00	1.00	2.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00

	Individual Pupil Engagement	Learning Activities Engaging	Levels of Student Voice	Levels of Student Collaboration	General Student Engagement
N Valid	22	22	22	22	22
Missing	0	0	0	0	0
Mean	3.7727	3.8182	3.2273	3.5455	3.2273
Median	4.0000	4.0000	3.0000	4.0000	3.0000
Mode	4.00	3.00	3.00	3.00 <sup>a</sup>	4.00
SD	.92231	1.09702	1.02036	1.10096	1.02306
Range	4.00	4.00	4.00	4.00	4.00
Minimum	1.00	1.00	1.00	1.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00

<sup>a</sup> Multiple mode exists. The smallest value is shown.

*Appendix 5.6 Online Surveys Final Scales Reliability Data Phase 1*

**Table A5. 7**

*SPSS Output Year 9 Students Final Scales Reliability Phase 1*

		Classroom Culture	Agency	Engagement Levels
Case Processing Summary				
N	Valid	24	24	25
	Excluded	1	1	0
	Total	25	25	25
Percentage, %	Valid	96	96	100
	Excluded	4	4	0
	Total	100	100	100
Reliability Statistics				
Cronbach's Alpha		.764	.603	.876
Cronbach's Alpha based on standardised Items		.751	.616	.879
Items		5	5	4.00

**Table A5. 8**

*SPSS Output Year 9 Students Scale Item Statistics Classroom Culture Phase 1*

Item	Mean	Standard Deviation	N
Peer Respect	4.1667	.76319	24
Student Teacher Respect	3.3333	1.09104	24
Behaviour Levels	3.4583	1.06237	24
Teacher Expectations	4.2500	.89685	24
Student Self Expectations	3.8750	1.22896	24

**Table A5. 9***SPSS Output Year 9 Students Scale Item-Total Statistics Classroom Culture Phase 1*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Peer Respect	14.9167	11.732	.206	.193	.807
Student Teacher Respect	15.7500	8.109	.658	.513	.673
Behaviour Levels	15.6250	7.897	.730	.593	.645
Teacher Expectations	14.8333	9.623	.531	.341	.723
Student Self Expectations	15.2083	7.998	.559	.423	.716

**Table A5. 10***SPSS Output Year 9 Students Scale Item Statistics Agency Phase 1*

Item	Mean	Standard Deviation	N
Learning Activities Engaging	3.4167	.97431	24
Levels of Student Voice	2.8750	1.29590	24
Levels of Student Collaboration	3.4167	.88055	24

**Table A5. 11***SPSS Output Year 9 Students Scale Item-Total Statistics Agency Phase 1*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Learning Activities Engaging	6.2917	3.085	.485	.235	.409
Levels of Student Voice	6.8333	2.318	.430	.197	.513
Levels of Student Collaboration	6.2917	3.694	.362	.141	.577

**Table A5. 12***SPSS Output Year 9 Students Scale Item Statistics Engagement Levels Phase 1*

Item	Mean	Standard Deviation	N
Whole Class Engagement	3.1600	.89815	25
Individual Pupil Engagement	3.6800	1.18040	25
General Student Engagement	3.4000	.92187	25

**Table A5. 13***SPSS Output Year 9 Students Scale Item-Total Statistics Engagement Levels Phase 1*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Whole Class Engagement	10.6800	8.477	.706	.565	.855
Individual Pupil Engagement	10.1600	6.640	.812	.749	.809
General Student Engagement	10.4400	8.590	.663	.501	.868

**Table A5. 14***SPSS Output Year 10 Students Final Scales Reliability Phase 1*

		Classroom Culture	Agency	Engagement Levels
Case Processing Summary				
N	Valid	21	22	22
	Excluded	1	0	0
	Total	22	22	22
Percentage, %	Valid	95.5	100	100
	Excluded	4.5	0	0
	Total	100	100	100
Reliability Statistics				
Cronbach's Alpha		.910	.790	.724
Cronbach's Alpha based on standardised Items		.915	.791	.714
Items		5	3	4

**Table A5. 15***SPSS Output Year 10 Students Scale Item Statistics Classroom Culture Phase 1*

Item	Mean	Standard Deviation	N
Peer Respect	3.4762	1.07792	21
Student Teacher Respect	3.6190	1.07127	21
Behaviour Levels	3.4762	.87827	21
Teacher Expectations	3.7619	1.33809	21
Student Self Expectations	3.6190	1.22403	21

**Table A5. 16***SPSS Output Year 10 Students Scale Item-Total Statistics Classroom Culture Phase 1*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Peer Respect	14.4762	15.462	.817	.853	.881
Student Teacher Respect	14.3333	15.333	.842	.861	.876
Behaviour Levels	14.4762	17.662	.698	.540	.907
Teacher Expectations	14.1905	13.862	.792	.729	.889
Student Self Expectations	14.3333	14.733	.761	.657	.893

**Table A5. 17***SPSS Output Year 10 Students Scale Item Statistics Agency Phase 1*

Item	Mean	Standard Deviation	N
Learning Activities Engaging	3.8182	1.09702	22
Levels of Student Voice	3.2273	1.02036	22
Levels of Student Collaboration	3.5455	1.10096	22

**Table A5. 18***SPSS Output Year 10 Students Scale Item-Total Statistics Agency Phase 1*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Learning Activities Engaging	6.7727	3.994	.480	.271	.409
Levels of Student Voice	7.3636	3.671	.662	.601	.684
Levels of Student Collaboration	7.0455	3.093	.774	.660	.549

**Table A5. 19***SPSS Output Year 10 Students Scale Item Statistics Engagement Levels Phase 1*

Item	Mean	Standard Deviation	N
Whole Class Engagement	3.3636	.90214	22
Individual Pupil Engagement	3.7727	.92231	22
General Student Engagement	3.2273	1.02036	22
Individual Engagement	3.6818	.89370	22

**Table A5. 20***SPSS Output Year 10 Students Scale Item-Total Statistics Engagement Levels Phase 1*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Whole Class Engagement	10.6818	4.418	.642	.421	.586
Individual Pupil Engagement	10.2727	5.446	.318	.580	.769
General Student Engagement	10.8182	3.584	.787	.674	.469
Individual Engagement	10.3636	5.385	.357	.611	.746



**Table A5. 22***SPSS Output Year 10 Students Descriptive Statistics Phase 2*

	Peer Respect	Student Teacher Respect	Behaviour Levels	Whole Class Engagement	Individual Pupil Engagement	Tools Improved Classroom Culture
N Valid	12	12	12	12	12	11
Missing	0	0	0	0	0	1
Mean	3.9167	4.2500	3.8333	3.7500	4.0833	3.7273
Median	4.0000	4.0000	3.5000	3.5000	4.0000	4.0000
Mode	4.00	4.00 <sup>a</sup>	3.00	3.00	4.00	4.00
SD	.90034	.75378	.93744	.86603	.66856	1.10371
Range	2.00	2.00	2.00	3.00	2.00	4.00
Minimum	3.00	3.00	3.00	2.00	3.00	1.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00

	Learning Activities Engaging	Student Voice	Tools Made Learning Better	Tools Improved Student Voice	Tools Improved Collaboration	Tools Increase Engagement
N Valid	12	12	12	12	12	12
Missing	0	0	0	0	0	0
Mean	4.4167	4.0000	3.8333	3.9167	3.7500	4.1667
Median	4.5000	4.0000	4.0000	4.0000	4.0000	4.0000
Mode	5.00	4.00	4.00	4.00	4.00	4.00
SD	.66856	.95346	1.11464	1.16450	1.13818	.71744
Range	2.00	3.00	4.00	4.00	4.00	2.00
Minimum	3.00	2.00	1.00	1.00	1.00	3.00
Maximum	5.00	5.00	5.00	5.00	5.00	5.00

<sup>a</sup> Multiple mode exist. The smallest value is shown.

*Appendix 5.8 Online Surveys Final Scales Reliability Data Phase 2*

**Table A5. 23**

*SPSS Output Year 9 Students Final Scales Reliability Phase 2*

		Classroom Culture	Agency	Engagement Levels
Case Processing Summary				
N	Valid	28	28	26
	Excluded	0	0	2
	Total	28	28	28 <sup>a</sup>
Percentage, %	Valid	100	100	92.9
	Excluded	0	0	7.1
	Total	100	100	100
Reliability Statistics				
Cronbach's Alpha		.686	.855	.673
Cronbach's Alpha based on standardised Items		.689	.859	.677
Items		4	5	3
<sup>a</sup> Listwise deletion based on all variables in the procedure				

**Table A5. 24**

*SPSS Output Year 9 Students Scale Item Statistics Classroom Culture Phase 2*

Item	Mean	Standard Deviation	N
Peer Respect	4.2143	.68622	28
Student Teacher Respect	3.3571	.78004	28
Behaviour Levels	3.4286	.69007	28
Tools Improved Classroom Culture	3.2857	1.049906	28

**Table A5. 25***SPSS Output Year 9 Students Scale Item-Total Statistics Classroom Culture Phase 2*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Peer Respect	10.0714	4.069	.336	.116	.694
Student Teacher Respect	10.9286	3.254	.572	.348	.556
Behaviour Levels	10.8571	3.757	.463	.216	.630
Tools Improved Classroom Culture	11.0000	2.519	.556	.346	.574

**Table A5. 26***SPSS Output Year 9 Students Scale Item Statistics Agency Phase 2*

Item	Mean	Standard Deviation	N
Student Voice	3.3929	1.13331	28
Learning Activities Engaging	3.7143	.89679	28
Tools Improved Student Voice	3.3214	.94491	28
Tools Improved Collaboration	3.4288	1.10315	28
Tools Made Learning Better	3.5357	.83808	28

**Table A5. 27***SPSS Output Year 9 Students Scale Item-Total Statistics Agency Phase 2*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Student Voice	14.000	9.852	.614	.455	.844
Learning Activities Engaging	13.6787	11.041	.614	.469	.839
Tools Improved Student Voice	14.0714	10.365	.698	.588	.818
Tools Improved Collaboration	13.9643	9.147	.771	.657	.796
Tools Made Learning Better	13.8571	11.018	.681	.556	.825

**Table A5. 28***SPSS Output Year 9 Students Scale Item Statistics Engagement Levels Phase 2*

Item	Mean	Standard Deviation	N
Whole Class Engagement	3.9231	.69936	26
Individual Pupil Engagement	4.2308	.71036	26
Tools Increased Engagement	3.8846	.76561	26

**Table A5. 29***SPSS Output Year 9 Students Scale Item-Total Statistics Engagement Levels Phase 2*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Whole Class Engagement	8.1154	1.548	.478	.284	.589
Individual Pupil Engagement	7.8077	1.362	.587	.357	.443
Tools Increased Engagement	8.1538	1.495	.404	.181	.691

**Table A5. 30***SPSS Output Year 10 Students Final Scales Reliability Phase 2*

		Classroom Culture	Agency	Engagement Levels
Case Processing Summary				
N	Valid	11	12	12
	Excluded	1	0	0
	Total	12	22	12
Percentage, %	Valid	91.7	100	100
	Excluded	8.3	0	0
	Total	100	100	100
Reliability Statistics				
Cronbach's Alpha		.733	.765	.715
Cronbach's Alpha based on standardised Items		.763	.724	.716
Items		4	5	3

**Table A5. 31***SPSS Output Year 10 Students Scale Item Statistics Classroom Culture Phase 2*

Item	Mean	Standard Deviation	N
Peer Respect	3.8182	.87386	11
Student Teacher Respect	4.1818	.75076	11
Behaviour Levels	3.7273	.90453	11
Tools Improved Classroom Culture	3.7273	1.10371	11

**Table A5. 32***SPSS Output Year 10 Students Scale Item-Total Statistics Classroom Culture Phase 2*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Peer Respect	11.6364	4.855	.482	.710	.697
Student Teacher Respect	11.2727	4.818	.634	.752	.628
Behaviour Levels	11.7273	3.618	.882	.800	.445
Tools Improved Classroom Culture	11.7273	5.018	.250	.653	.859

**Table A5. 33***SPSS Output Year 10 Students Scale Item Statistics Agency Phase 2*

Item	Mean	Standard Deviation	N
Learning Activities Engaging	4.4167	.66856	12
Student Voice	4.0000	.95346	12
Tools Made Learning Better	3.8333	1.11464	12
Tools Improved Student Voice	3.9167	1.16450	12
Tools Improved Collaboration	3.7500	1.13818	12

**Table A5. 34***SPSS Output Year 10 Students Scale Item-Total Statistics Agency Phase 2*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Learning Activities Engaging	15.500	12.273	.175	.386	.812
Levels of Student Voice	15.9167	12.447	.027	.668	.868
Tools Made Learning Better	16.0833	8.992	.900	.988	.569
Tools Improved Student Voice	16.0000	7.091	.821	.978	.601
Tools Improved Collaboration	16.1667	7.061	.857	.954	.587

**Table A5. 35***SPSS Output Year 10 Students Scale Item Statistics Engagement Levels Phase 2*

Item	Mean	Standard Deviation	N
Whole Class Engagement	3.7500	.86603	12
Individual Pupil Engagement	4.0833	.66856	12
Tools Increased Engagement	4.1667	.71774	12

**Table A5. 36***SPSS Output Year 10 Students Scale Item-Total Statistics Engagement Levels Phase 2*

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected- Item Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Whole Class Engagement	8.2500	1.295	.623	.388	.515
Individual Pupil Engagement	7.9167	1.902	.501	.270	.669
Tools Increased Engagement	7.8333	1.788	.505	.272	.661

## **Appendix 6 Qualitative Coding Plans**

- Due to the large size of the coding spreadsheets coding plan links are given below.

Qualitative Coding Plan Students Phase 1

Qualitative Coding Plan Students Phase 2

Qualitative Coding Plan Teachers Phase 1

Qualitative Coding Plan Teachers Phase 2

## Appendix 7 Qualitative Coding Frequencies

### Appendix 7.1 Year 9 Case Study Code Frequencies Level 1 Phase 1

#### Appendix 7.1.1 Student Qualitative Data

**Table A7. 1**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>				
Frequency	3	1	7	11
Percentage, %	27.3%	9.1%	63.6%	100%
<b>SRP (Student Relationships with Peers)</b>				
Frequency	2	1	5	8
Percentage, %	25.0%	12.5%	62.5%	100%
<b>SRT (Student Relationships with Teacher)</b>				
Frequency	4	6	7	17
Percentage, %	23.5%	35.3%	41.2%	100%
<b>SES (Student Enjoyment of Subject)</b>				
Frequency	1	1	3	5
Percentage, %	20.0%	20.0%	60.0%	100%
<b>SEN (Student Engagement)</b>				
Frequency	1	2	6	9
Percentage, %	11.1%	22.2%	66.7%	100%
<b>SIE (Student Increasing Engagement)</b>				
Frequency	2	0	4	6
Percentage, %	33.3%	0.0%	66.7%	100%
<b>SLB (Student Levels of Behaviour)</b>				
Frequency	4	0	4	8
Percentage, %	50.0%	0.0%	50.0%	100%
<b>STE (Student Teacher Expectations)</b>				
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100%
<b>SSE (Student Self Expectations)</b>				
Frequency	1	1	5	7

Percentage, %	14.3%	14.3%	71.4%	100%
<b>SWE (Student Whole Class Engagement)</b>				
Frequency	4	0	1	5
Percentage, %	80.0%	0.0%	20.0%	100%
<b>SPE (Student Pupil Engagement)</b>				
Frequency	2	1	5	8
Percentage, %	25.0%	12.5%	62.5%	100%
<b>SAE (Student Activities Engaging)</b>				
Frequency	1	3	4	8
Percentage, %	12.5%	37.5%	50.0%	100%
<b>SVO (Student Levels of Voice)</b>				
Frequency	0	3	0	3
Percentage, %	0.0%	100.0%	0.0%	100%
<b>SCO (Student Levels of Collaboration)</b>				
Frequency	2	1	1	4
Percentage, %	50.0%	25.0%	25.0%	100%
<b>STI (Student Teacher Improve Engagement)</b>				
Frequency	4	6	2	12
Percentage, %	33.3%	50.0%	16.7%	100%
<b>SUT (Student Used Tools)</b>				
Frequency	13	7	7	27
Percentage, %	48.1%	25.9%	25.9%	100%
<b>SBT (Student Belief in Tools)</b>				
Frequency	1	17	9	27
Percentage, %	3.7%	63.0%	33.3%	100%

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## Appendix 7.1.2 Teacher Qualitative Data

Table A7. 2

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Teacher Classroom Environment)</b>				
Frequency	1	0	2	3
Percentage, %	33.3%	0.0%	66.7%	100%
<b>TPR (Teacher Student Peer Relationships)</b>				
Frequency	1	0	0	1
Percentage, %	100.0%	0.0%	0.0%	100.0%
<b>TSR (Teacher Student Relationships)</b>				
Frequency	2	0	0	2
Percentage, %	100.0%	0.0%	0.0%	100%
<b>TES (Teacher Enjoyment of Subject)</b>				
Frequency	0	0	3	3
Percentage, %	0.0%	0.0%	100.0%	100%
<b>TSE (Teacher Student Enjoyment of Subject)</b>				
Frequency	2	0	1	3
Percentage, %	66.7%	0.0%	33.3%	100%
<b>TEN (Teacher Student Engagement)</b>				
Frequency	1	1	4	6
Percentage, %	16.7%	16.7%	66.7%	100.1%
<b>TLB (Teacher Levels of Behaviour)</b>				
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100%
<b>TIE (Teacher Increasing Engagement)</b>				
Frequency	0	0	2	4
Percentage, %	0.0%	0.0%	100.0%	100%
<b>TBT (Teacher Belief in Tools)</b>				
Frequency	1	1	4	6
Percentage, %	16.7%	16.7%	66.7%	100.1%

*Appendix 7.2 Year 9 Case Study Code Frequencies Level 1 Phase 2*

**Appendix 7.2.1 Student Qualitative Data**

**Table A7.3**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>				
Frequency	2	1	6	9
Percentage, %	22.2%	11.1%	66.7%	100%
<b>SRP (Student Relationships with Peers)</b>				
Frequency	1	2	3	6
Percentage, %	16.7%	33.3%	50.0%	100%
<b>SRT (Student Relationships with Teacher)</b>				
Frequency	5	4	7	16
Percentage, %	31.3%	25.0%	43.8%	100%
<b>SES (Student Enjoyment of Subject)</b>				
Frequency	0	0	5	5
Percentage, %	0.0%	0.0%	100.0%	100%
<b>SEN (Student Engagement)</b>				
Frequency	0	1	7	8
Percentage, %	0.0%	12.5%	87.5%	100%
<b>SIE (Student Increasing Engagement)</b>				
Frequency	1	3	7	11
Percentage, %	9.1%	27.3%	63.6%	100%
<b>SLB (Student Levels of Behaviour)</b>				
Frequency	1	3	0	4
Percentage, %	25.0%	75.0%	0.0%	100%
<b>TIC (Tools Increase Classroom Culture)</b>				
Frequency	0	2	0	2
Percentage, %	0.0%	100.0%	0.0%	100%
<b>SWE (Student Whole Class Engagement)</b>				
Frequency	2	1	0	3
Percentage, %	66.7%	33.3%	0.0%	100%
<b>STA (Students Tool Use Improve Activities)</b>				

Frequency	4	1	0	6
Percentage, %	80.0%	20.0%	0.0%	100%

**SWT (Student Whole Class Improved  
Engagement with Tools)**

Frequency	4	2	14	20
Percentage, %	20.0%	10.0%	70.0%	100%

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## Appendix 7.2.2 Teacher Qualitative Data

Table A7. 4

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Teacher Classroom Environment)</b>				
Frequency	5	0	0	5
Percentage, %	100.0%	0.0%	0.0%	100%
<b>TPR (Teacher Student Peer Relationships)</b>				
Frequency	2	0	0	2
Percentage, %	100.0%	0.0%	0.0%	100%
<b>TSR (Teacher Student Relationships)</b>				
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>TES (Teacher Enjoyment of Subject)</b>				
Frequency	4	1	2	7
Percentage, %	57.1%	14.3%	28.6%	100%
Percentage, %	57.1%	14.3%	28.6%	100%
<b>TSE (Teacher Student Enjoyment of Subject)</b>				
Frequency	0	1	5	6
Percentage, %	0.0%	16.7%	83.3%	100%
<b>TEN (Teacher Student Engagement)</b>				
Frequency	0	0	9	9
Percentage, %	0.0%	0.0%	100.0%	100%
<b>TLB (Teacher Levels of Behaviour)</b>				
Frequency	3	1	1	5
Percentage, %	60.0%	20.0%	20.0%	100%
<b>TIE (Teacher Increasing Engagement)</b>				
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100%
<b>TBT (Teacher Belief in Tools)</b>				
Frequency	0	5	7	12
Percentage, %	0.0%	41.7%	58.3%	100%

*Appendix 7.3 Year 10 Case Study Code Frequencies Level 1 Phase 1*

**Appendix 7.3.1 Student Qualitative Data**

**Table A7. 5**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>				
Frequency	4	4	3	11
Percentage, %	36.4%	36.4%	27.3%	100.1%
<b>SRP (Student Relationships with Peers)</b>				
Frequency	1	4	10	15
Percentage, %	6.7%	26.7%	66.7%	100.1%
<b>SRT (Student Relationships with Teacher)</b>				
Frequency	1	1	8	10
Percentage, %	10.0%	10.0%	80.0%	100.0%
<b>SES (Student Enjoyment of Subject)</b>				
Frequency	0	1	5	6
Percentage, %	0.0%	16.7%	83.3%	100.0%
<b>SEN (Student Engagement)</b>				
Frequency	3	0	8	11
Percentage, %	27.3%	0.0%	72.7%	100.0%
<b>SIE (Student Increasing Engagement)</b>				
Frequency	4	0	3	7
Percentage, %	57.1%	0.0%	42.9%	100.0%
<b>SLB (Student Levels of Behaviour)</b>				
Frequency	3	0	5	8
Percentage, %	37.5%	0.0%	62.5%	100.0%
<b>STE (Student Teacher Expectations)</b>				
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>SSE (Student Self-Expectations)</b>				
Frequency	0	1	2	2
Percentage, %	0.0%	33.3%	66.7%	100.0%
<b>SWE (Student Whole Class Engagement)</b>				

Frequency	5	2	1	8
Percentage, %	62.5%	25.0%	12.5%	100.0%
<b>SPE (Student Pupil Engagement)</b>				
Frequency	2	2	3	7
Percentage, %	28.6%	28.6%	42.9%	100.1%
<b>SAE (Student Activities Engaging)</b>				
Frequency	4	0	6	10
Percentage, %	40.0%	0.0%	60.0%	100.0%
<b>SVO (Student Levels of Voice)</b>				
Frequency	0	1		2
Percentage, %	0.0%	50.0%	50.0%	100.0%
<b>SCO (Student Levels of Collaboration)</b>				
Frequency	1	0	3	4
Percentage, %	25.0%	0.0%	75.0%	100.0%
<b>STI (Student Teacher Improve Engagement)</b>				
Frequency	1	3	2	6
Percentage, %	16.7%	50.0%	33.3%	100.0%
<b>SUT (Student Used Tools)</b>				
Frequency	9	7	3	19
Percentage, %	47.4%	36.8%	15.8%	100.0%
<b>SBT (Student Belief in Tools)</b>				
Frequency	1	14	4	19
Percentage, %	5.3%	73.7%	21.1%	100.1%

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## Appendix 7.3.2 Teacher Qualitative Data

Table A7. 6

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Teacher Classroom Environment)</b>				
Frequency	1	2	1	4
Percentage, %	25.0%	50.0%	25.0%	100.0%
<b>TPR (Teacher Student Peer Relationships)</b>				
Frequency	1	0	0	0
Percentage, %	100.0%	0.0%	0.0%	100.0%
<b>TSR (Teacher Student Relationships)</b>				
Frequency	3	3	0	6
Percentage, %	50.0%	50.0%	0.0%	100.0%
<b>TES (Teacher Enjoyment of Subject)</b>				
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>TSE (Teacher Student Enjoyment of Subject)</b>				
Frequency	3	1	1	5
Percentage, %	60.0%	20.0%	20.0%	100.0%
<b>TEN (Teacher Student Engagement)</b>				
Frequency	2	4	1	7
Percentage, %	28.6%	57.1%	14.3%	100.0%
<b>TTR (Teacher Levels of Respect)</b>				
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>TLB (Teacher Levels of Behaviour)</b>				
Frequency	2	1	1	4
Percentage, %	50.0%	25.0%	25.0%	100.0%
<b>TIE (Teacher Increasing Engagement)</b>				
Frequency	0	0	2	2
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>TBT (Teacher Belief in Tools)</b>				
Frequency	0	1	2	3

Percentage, %	0.0%	33.3%	66.7%	100.0%
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*Appendix 7.4 Year 10 Case Study Code Frequencies Level 1 Phase 2*

**Appendix 7.4.1 Student Qualitative Data**

**Table A7. 7**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>				
Frequency	2	2	3	7
Percentage, %	28.6%	28.6%	42.9%	100.1%
<b>SRP (Student Relationships with Peers)</b>				
Frequency	0	1	7	8
Percentage, %	0.0%	12.5%	87.5%	100.0%
<b>SRT (Student Relationships with Teacher)</b>				
Frequency	0	2	4	6
Percentage, %	0.0%	33.3%	66.7%	100.0%
<b>SES (Student Enjoyment of Subject)</b>				
Frequency	1	3	3	7
Percentage, %	14.3%	42.9%	42.9%	100.1%
<b>SEN (Student Engagement)</b>				
Frequency	1	0	5	6
Percentage, %	16.7%	0.0%	83.3%	100.0%
<b>SIE (Student Increasing Engagement)</b>				
Frequency	0	4	2	6
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>SLB (Student Levels of Behaviour)</b>				
Frequency	2	0	2	4
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>SWT (Student Whole Class Improved Engagement with Tools)</b>				
Frequency	1	3	5	9
Percentage, %	11.1%	33.3%	55.6%	100.0%

## Appendix 7.4.2 Teacher Qualitative Data

Table A7. 8

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Teacher Classroom Environment)</b>				
Frequency	2	3	0	5
Percentage, %	40.0%	60.0%	0.0%	100.0%
<b>TPR (Teacher Student Peer Relationships)</b>				
Frequency	0	1	1	2
Percentage, %	0.0%	50.0%	50.0%	100.0%
<b>TSR (Teacher Student Relationships)</b>				
Frequency	0	3	2	5
Percentage, %	0.0%	60.0%	40.0%	100.0%
<b>TES (Teacher Enjoyment of Subject)</b>				
Frequency	0	1	2	2
Percentage, %	0.0%	50.0%	50.0%	100.0%
<b>TSE (Teacher Student Enjoyment of Subject)</b>				
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>TEN (Teacher Student Engagement)</b>				
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>TLB (Teacher Levels of Behaviour)</b>				
Frequency	1	1	1	3
Percentage, %	33.3%	33.3%	33.3%	99.9%
<b>TIE (Teacher Increasing Engagement)</b>				
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>TBT (Teacher Belief in Tools)</b>				
Frequency	2	6	1	9
Percentage, %	22.2%	66.7%	11.1%	100.0%

*Appendix 7.5 Year 9 Case Study Code Frequencies Level 2 Phase 1*

**Appendix 7.5.1 Student Qualitative Data**

**Table A7. 9**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>	<b>SCE-2-9</b>	<b>SCE-0-9</b>	<b>SCE-1-9</b>	
Frequency	3	1	7	11
Percentage, %	27.3%	9.1%	63.6%	100.0%
<b>SRP (Student Relationships with Peers)</b>	<b>SRP-2-9</b>	<b>SRP-0-9</b>	<b>SRP-1-9</b>	
Frequency	2	1	5	8
Percentage, %	25.0%	12.5%	62.5%	100.0%
<b>SRT (Student Relationships with Teacher)</b>	<b>SRT-2-9</b>	<b>SRT-0-9</b>	<b>SRT-1-9</b>	
Frequency	4	6	7	17
Percentage, %	23.5%	35.3%	41.2%	100.0%
<b>STE (Student Teacher Expectations)</b>	<b>STE-2-9</b>	<b>STE-0-9</b>	<b>STE-1-9</b>	
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>SSE (Student Self-Expectations)</b>	<b>SSE-2-9</b>	<b>SSE-0-9</b>	<b>SSE-1-9</b>	
Frequency	1	1	5	7
Percentage, %	14.3%	14.3%	71.4%	100.0%
<b>SES (Student Enjoyment of Subject)</b>	<b>SES-2-9</b>	<b>SES-0-9</b>	<b>SES-1-9</b>	
Frequency	1	1	3	5
Percentage, %	20.0%	20.0%	60.0%	100.0%
<b>SEN (Student Engagement)</b>	<b>SEN-2-9</b>	<b>SEN-0-9</b>	<b>SEN-1-9</b>	
Frequency	1	2	6	9
Percentage, %	11.1%	22.2%	66.7%	100.0%
<b>SIE (Student Increasing Engagement)</b>	<b>SIE-2-9</b>	<b>SIE-0-9</b>	<b>SIE-1-9</b>	
Frequency	2	0	4	6
Percentage, %	33.3%	0.0%	66.7%	100.0%
<b>SLB (Student Levels of Behaviour)</b>	<b>SLB-2-9</b>	<b>SLB-0-9</b>	<b>SLB-1-9</b>	
Frequency	4	0	4	8
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>SWE (Student Whole Class Engagement)</b>	<b>SWE-2-9</b>	<b>SWE-0-9</b>	<b>SWE-1-9</b>	

Frequency	4	1	0	5
Percentage, %	80.0%	20.0%	0.0%	100.0%
<b>SPE (Student Pupil Engagement)</b>	<b>SPE-2-9</b>	<b>SPE-0-9</b>	<b>SPE-1-9</b>	
Frequency	2	1	5	8
Percentage, %	25.0%	12.5%	62.5%	100.0%
<b>SAE (Student Activities Engaging)</b>	<b>SAE-2-9</b>	<b>SAE-0-9</b>	<b>SAE-1-9</b>	
Frequency	1	3	4	8
Percentage, %	12.5%	37.5%	50.0%	100.0%
<b>SVO (Student Levels of Voice)</b>	<b>SVO-2-9</b>	<b>SVO-0-9</b>	<b>SVO-1-9</b>	
Frequency	0	0	3	3
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>SCO (Student Levels of Collaboration)</b>	<b>SCO-2-9</b>	<b>SCO-0-9</b>	<b>SCO-1-9</b>	
Frequency	2	1	1	4
Percentage, %	50.0%	25.0%	25.0%	100.0%
<b>STI (Student Teacher Improve Engagement)</b>	<b>STI-2-9</b>	<b>STI-0-9</b>	<b>STI-1-9</b>	
Frequency	4	6	2	12
Percentage, %	16.7%	50.0%	33.3%	100.0%
<b>SUT (Student Used Tools)</b>	<b>SUT-2-9</b>	<b>SUT-0-9</b>	<b>SUT-1-9</b>	
Frequency	13	7	7	27
Percentage, %	48.1%	25.9%	25.9%	100.0%
<b>SBT (Student Belief in Tools)</b>	<b>SBT-2-9</b>	<b>SBT-0-9</b>	<b>SBT-1-9</b>	
Frequency	1	17	9	27
Percentage, %	3.7%	63.0%	33.3%	100.0%

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## Appendix 7.5.2 Teacher Qualitative Data

Table A7. 10

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Student Classroom Environment)</b>	<b>TCE-2-9</b>	<b>TCE-0-9</b>	<b>TCE-1-9</b>	
Frequency	1	0	2	3
Percentage, %	33.3%	0.0%	66.7%	
<b>TSR (Teacher Student Relationships)</b>	<b>TSR-2-9</b>	<b>TSR-0-9</b>	<b>TSR-1-9</b>	
Frequency	0	0	2	2
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>TPR (Teacher Student Peer Relationships)</b>	<b>TPR-2-9</b>	<b>TPR-0-9</b>	<b>TPR-2-9</b>	
Frequency	1	0	0	1
Percentage, %	100.0%	0.0%	0.0%	100/0%
<b>TES (Teacher Enjoyment of Subject)</b>	<b>TES-2-9</b>	<b>TES-0-9</b>	<b>TES-1-9</b>	
Frequency	0	3	0	3
Percentage, %	0.0%	100.0%	0.0%	100.0%
<b>TSE (Teacher Student Enjoyment of Subject)</b>	<b>TSE-2-9</b>	<b>TSE-0-9</b>	<b>TSE-1-9</b>	
Frequency	2	0	1	3
Percentage, %	66.7%	0.0%	33.3%	100.0%
<b>TEN (Teacher Engagement)</b>	<b>TEN-2-9</b>	<b>TEN-0-9</b>	<b>TEN-1-9</b>	
Frequency	1	1	4	6
Percentage, %	16.7%	16.7%	66.7%	100.1%
<b>TLB (Teacher Levels of Behaviour)</b>	<b>TLB-2-9</b>	<b>TLB-0-9</b>	<b>TLB-1-9</b>	
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>TIE (Teacher Improves Engagement)</b>	<b>TIE-2-9</b>	<b>TIE-0-9</b>	<b>TIE-1-9</b>	
Frequency	0	0	2	2
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>TBT (Teacher Belief in Tools)</b>	<b>TBT-2-9</b>	<b>TBT-0-9</b>	<b>TBT-1-9</b>	
Frequency	1	1	4	6
Percentage, %	16.7%	16.7%	66.7%	100.1%

*Appendix 7.6 Year 9 Case Study Code Frequencies Level 2 Phase 2*

**Appendix 7.6.1 Student Qualitative Data**

**Table A7. 11**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>	<b>SCE-2-9</b>	<b>SCE-0-9</b>	<b>SCE-1-9</b>	
Frequency	2	1	6	9
Percentage, %	22.2%	11.1%	66.7%	100.0%
<b>SRP (Student Relationships with Peers)</b>	<b>SRP-2-9</b>	<b>SRP-0-9</b>	<b>SRP-1-9</b>	
Frequency	1	2	3	6
Percentage, %	16.7%	33.3%	50.0%	100.0%
<b>SRT (Student Relationships with Teacher)</b>	<b>SRT-2-9</b>	<b>SRT-0-9</b>	<b>SRT-1-9</b>	
Frequency	5	4	7	16
Percentage, %	31.3%	25.0%	43.8%	100.0%
<b>SES (Student Enjoyment of Subject)</b>	<b>SES-2-9</b>	<b>SES-0-9</b>	<b>SES-1-9</b>	
Frequency	0	0	5	5
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>SEN (Student Engagement)</b>	<b>SEN-2-9</b>	<b>SEN-0-9</b>	<b>SEN-1-9</b>	
Frequency	0	1	7	8
Percentage, %	0.0%	12.5%	87.5%	100.0%
<b>SIE (Student Increasing Engagement)</b>	<b>SIE-2-9</b>	<b>SIE-0-9</b>	<b>SIE-1-9</b>	
Frequency	3	1	7	11
Percentage, %	27.3%	9.1%	63.6%	100.0%
<b>SLB (Student Levels of Behaviour)</b>	<b>SLB-2-9</b>	<b>SLB-0-9</b>	<b>SLB-1-9</b>	
Frequency	3	1	0	4
Percentage, %	75.0%	25.0%	0.0%	100.0%
<b>SAE (Student Activities Engaging)</b>	<b>SAE-2-9</b>	<b>SAE-0-9</b>	<b>SAE-1-9</b>	
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>TIC (Tools Increase Classroom Culture)</b>	<b>TIC-2-9</b>	<b>TIC-0-9</b>	<b>TIC-1-9</b>	
Frequency	0	2	0	2
Percentage, %	0.0%	100.0%	0.0%	100.0%
<b>SWE (Student Whole Class Engagement)</b>	<b>SWE-2-9</b>	<b>SWE-0-9</b>	<b>SWE-1-9</b>	

Frequency	2	1	0	3
Percentage, %	66.7%	33.3%	0.0%	100.0%
<b>SPE (Student Pupil Engagement)</b>	<b>SPE-2-9</b>	<b>SPE-0-9</b>	<b>SPE-1-9</b>	
Frequency	1	0	0	1
Percentage, %	100.0%	0.0%	0.0%	100.0%
<b>SAE (Student Activities Engaging)</b>	<b>SAE-2-9</b>	<b>SAE-0-9</b>	<b>SAE-1-9</b>	
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>SVO (Student Levels of Voice)</b>	<b>SVO-2-9</b>	<b>SVO-0-9</b>	<b>SVO-1-9</b>	
Frequency	0	0	0	0
Percentage, %	0.0%	0.0%	0.0%	0.0%
<b>STA (Student Tools Improve Activities)</b>	<b>STA-2-0</b>	<b>STA-0-9</b>	<b>STA-1-9</b>	
Frequency	1	4	0	5
Percentage, %	20.0%	80.0%	0.0%	100.0%
<b>SIV (Student Tools Improve Voice)</b>	<b>SIV-2-9</b>	<b>SIV-0-9</b>	<b>SIV-1-9</b>	
Frequency	0	1	1	2
Percentage, %	0.0	50.0%	50.0%	100.0%
<b>STC (Student Tools Increased Collaboration)</b>	<b>STC-2-9</b>	<b>STC-0-9</b>	<b>STC-1-9</b>	
Frequency	0	1	0	1
Percentage, %	0.0%	100.0%	0.0%	100.0%
<b>SWT (Class Increased Engagement with Tools)</b>	<b>SWT-2-9</b>	<b>SWT-0-9</b>	<b>SWT-1-9</b>	
Frequency	2	4	14	20
Percentage, %	10.0%	20.0%	70.0%	100.0%

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## Appendix 7.6.2 Teacher Qualitative Data

Table A7. 12

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Student Classroom Environment)</b>	<b>TCE-2-9</b>	<b>TCE-0-9</b>	<b>TCE-1-9</b>	
Frequency	5	0	0	5
Percentage, %	100.0%	0.0%	0.0%	100.0%
<b>TSR (Teacher Student Relationships)</b>	<b>TSR-2-9</b>	<b>TSR-0-9</b>	<b>TSR-1-9</b>	
Frequency	0	1	1	2
Percentage, %	0.0%	50.0%	50.0%	100.0%
<b>TPR (Teacher Student Peer Relationships)</b>	<b>TPR-2-9</b>	<b>TPR-0-9</b>	<b>TPR-2-9</b>	
Frequency	2	0	0	2
Percentage, %	100.0%	0.0%	0.0%	100/0%
<b>TTR (Teacher Teacher Respect)</b>	<b>TTR-2-9</b>	<b>TTR-0-9</b>	<b>TTR-1-9</b>	
Frequency	1	0	0	1
Percentage, %	100.0%	0.0%	0.0%	100.0%
<b>TES (Teacher Enjoyment of Subject)</b>	<b>TES-2-9</b>	<b>TES-0-9</b>	<b>TES-1-9</b>	
Frequency	4	1	2	7
Percentage, %	57.1%	14.3%	28.6%	100.0%
<b>TSE (Teacher Student Enjoyment of Subject)</b>	<b>TSE-2-9</b>	<b>TSE-0-9</b>	<b>TSE-1-9</b>	
Frequency	0	1	5	6
Percentage, %	0.0%	16.7%	83.3%	100.0%
<b>TEN (Teacher Engagement)</b>	<b>TEN-2-9</b>	<b>TEN-0-9</b>	<b>TEN-1-9</b>	
Frequency	0	0	8	8
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>TLB (Teacher Levels of Behaviour)</b>	<b>TLB-2-9</b>	<b>TLB-0-9</b>	<b>TLB-1-9</b>	
Frequency	3	1	1	5
Percentage, %	60.0%	20.0%	20.0%	100.0%
<b>TIE (Teacher Improves Engagement)</b>	<b>TIE-2-9</b>	<b>TIE-0-9</b>	<b>TIE-1-9</b>	
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>TBT (Teacher Belief in Tools)</b>	<b>TBT-2-9</b>	<b>TBT-0-9</b>	<b>TBT-1-9</b>	
Frequency	0	5	7	12

<b>Percentage, %</b>	0.0%	41.7%	58.3%	100.0%
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*Appendix 7.7 Year 10 Case Study Code Frequencies Level 2 Phase 1*  
**Appendix 7.7.1 Student Qualitative Data**

**Table A7. 13**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>	<b>SCE-2-10</b>	<b>SCE-0-10</b>	<b>SCE-1-10</b>	
Frequency	4	4	3	11
Percentage, %	36.4%	36.4%	27.3%	100.1%
<b>SRP (Student Relationships with Peers)</b>	<b>SRP-2-10</b>	<b>SRP-0-10</b>	<b>SRP-1-10</b>	
Frequency	1	4	10	15
Percentage, %	6.7%	26.7%	66.7%	100.1%
<b>SRT (Student Relationships with Teacher)</b>	<b>SRT-2-10</b>	<b>SRT-0-1-</b>	<b>SRT-1-10</b>	
Frequency	1	1	8	10
Percentage, %	10.0%	10.0%	80.0%	100.0%
<b>STE (Student Teacher Expectations)</b>	<b>STE-2-10</b>	<b>STE-0-10</b>	<b>STE-1-10</b>	
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>SSE (Student Self-Expectations)</b>	<b>SSE-2-10</b>	<b>SSE-0-10</b>	<b>SSE-1-10</b>	
Frequency	0	1	2	3
Percentage, %	0.0%	33.3%	66.7%	100.0%
<b>SES (Student Enjoyment of Subject)</b>	<b>SES-2-10</b>	<b>SES-0-10</b>	<b>SES-1-10</b>	
Frequency	0	1	5	6
Percentage, %	0.0%	16.7%	83.3%	100.0%
<b>SEN (Student Engagement)</b>	<b>SEN-2-10</b>	<b>SEN-0-10</b>	<b>SEN-1-10</b>	
Frequency	3	0	8	11
Percentage, %	27.3%	0.0%	72.7%	100.0%
<b>SIE (Student Increasing Engagement)</b>	<b>SIE-2-10</b>	<b>SIE-0-10</b>	<b>SIE-1-10</b>	
Frequency	4	0	3	7
Percentage, %	57.1%	0.0%	42.9%	100.0%
<b>SLB (Student Levels of Behaviour)</b>	<b>SLB-2-10</b>	<b>SLB-0-10</b>	<b>SLB-1-10</b>	
Frequency	3	0	5	8
Percentage, %	37.5%	0.0%	62.5%	100.0%
<b>SWE (Student Whole Class Engagement)</b>	<b>SWE-2-9</b>	<b>SWE-0-9</b>	<b>SWE-1-10</b>	

Frequency	5	2	1	8
Percentage, %	62.5%	25.0%	12.5%	100.0%
<b>SPE (Student Pupil Engagement)</b>	<b>SPE-2-10</b>	<b>SPE-0-10</b>	<b>SPE-1-10</b>	
Frequency	2	2	3	7
Percentage, %	28.6%	28.6%	42.9%	100.0%
<b>SAE (Student Activities Engaging)</b>	<b>SAE-2-10</b>	<b>SAE-0-10</b>	<b>SAE-1-10</b>	
Frequency	4	0	6	10
Percentage, %	40.0%	0.0%	60.0%	100.0%
<b>SVO (Student Levels of Voice)</b>	<b>SVO-2-10</b>	<b>SVO-0-10</b>	<b>SVO-1-10</b>	
Frequency	0	1	1	2
Percentage, %	0.0%	50.0%	50.0%	100.0%
<b>SCO (Student Levels of Collaboration)</b>	<b>SCO-2-10</b>	<b>SCO-0-10</b>	<b>SCO-1-10</b>	
Frequency	1	0	3	4
Percentage, %	25.0%	0.0%	75.0%	100.0%
<b>STI (Student Teacher Improve Engagement)</b>	<b>STI-2-10</b>	<b>STI-0-10</b>	<b>STI-1-10</b>	
Frequency	1	3	2	6
Percentage, %	16.7%	50.0%	33.3%	100.0%
<b>SUT (Student Used Tools)</b>	<b>SUT-2-10</b>	<b>SUT-0-10</b>	<b>SUT-1-10</b>	
Frequency	9	7	3	19
Percentage, %	47.4%	36.8%	15.8%	100.0%
<b>SBT (Student Belief in Tools)</b>	<b>SBT-2-10</b>	<b>SBT-0-10</b>	<b>SBT-1-10</b>	
Frequency	1	14	4	19
Percentage, %	5.3%	73.7%	21.1%	100.0%

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## Appendix 7.7.2 Teacher Qualitative Data

Table A7. 14

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Student Classroom Environment)</b>	<b>TCE-2-10</b>	<b>TCE-0-10</b>	<b>TCE-1-10</b>	
Frequency	1	2	1	4
Percentage, %	25.0%	50.0%	25.0%	
<b>TSR (Teacher Student Relationships)</b>	<b>TSR-2-10</b>	<b>TSR-0-10</b>	<b>TSR-1-10</b>	
Frequency	3	3	0	6
Percentage, %	50.0%	50.0%	0.0%	100.0%
<b>TPR (Teacher Student Peer Relationships)</b>	<b>TPR-2-10</b>	<b>TPR-0-10</b>	<b>TPR-2-10</b>	
Frequency	1	0	0	1
Percentage, %	100.0%	0.0%	0.0%	100/0%
<b>TTR (Teacher Teacher Respect)</b>	<b>TTR-2-10</b>	<b>TTR-0-10</b>	<b>TTR-1-10</b>	
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>TES (Teacher Enjoyment of Subject)</b>	<b>TES-2-10</b>	<b>TES-0-10</b>	<b>TES-1-10</b>	
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>TSE (Teacher Student Enjoyment of Subject)</b>	<b>TSE-2-10</b>	<b>TSE-0-10</b>	<b>TSE-1-10</b>	
Frequency	3	1	1	5
Percentage, %	60.0%	20.0%	20.0%	100.0%
<b>TEN (Teacher Engagement)</b>	<b>TEN-2-10</b>	<b>TEN-0-10</b>	<b>TEN-1-10</b>	
Frequency	3	4	1	8
Percentage, %	37.5%	50.0%	12.5%	100.1%
<b>TLB (Teacher Levels of Behaviour)</b>	<b>TLB-2-10</b>	<b>TLB-0-10</b>	<b>TLB-1-10</b>	
Frequency	2	1	1	4
Percentage, %	50.0%	25.0%	25.0%	100.0%
<b>TIE (Teacher Improves Engagement)</b>	<b>TIE-2-10</b>	<b>TIE-0-10</b>	<b>TIE-1-10</b>	
Frequency	0	0	2	2
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>TBT (Teacher Belief in Tools)</b>	<b>TBT-2-10</b>	<b>TBT-0-10</b>	<b>TBT-1-10</b>	
Frequency	0	1	2	3

<b>Percentage, %</b>	0.0%	33.3%	66.7%	100.1%
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*Appendix 7.8 Year 10 Case Study Code Frequencies Level 2 Phase 2*

**Appendix 7.8.1 Student Qualitative Data**

**Table A7. 15**

*Student Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>SCE (Student Classroom Environment)</b>	<b>SCE-2-10</b>	<b>SCE-0-10</b>	<b>SCE-1-10</b>	
Frequency	2	3	2	7
Percentage, %	28.6%	28.6%	42.9%	100.0%
<b>SRP (Student Relationships with Peers)</b>	<b>SRP-2-10</b>	<b>SRP-0-10</b>	<b>SRP-1-10</b>	
Frequency	0	1	7	8
Percentage, %	0.0%	12.5%	87.5%	100.0%
<b>SRT (Student Relationships with Teacher)</b>	<b>SRT-2-10</b>	<b>SRT-0-10</b>	<b>SRT-1-10</b>	
Frequency	0	2	4	6
Percentage, %	0.0%	33.3%	66.7%	100.0%
<b>SES (Student Enjoyment of Subject)</b>	<b>SES-2-10</b>	<b>SES-0-10</b>	<b>SES-1-10</b>	
Frequency	1	3	3	7
Percentage, %	14.3%	42.9%	42.9%	100.0%
<b>SEN (Student Engagement)</b>	<b>SEN-2-10</b>	<b>SEN-0-10</b>	<b>SEN-1-10</b>	
Frequency	1	0	5	6
Percentage, %	16.7%	0.0%	83.3%	100.0%
<b>SIE (Student Increasing Engagement)</b>	<b>SIE-2-10</b>	<b>SIE-0-10</b>	<b>SIE-1-10</b>	
Frequency	0	4	2	6
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>SLB (Student Levels of Behaviour)</b>	<b>SLB-2-10</b>	<b>SLB-0-10</b>	<b>SLB-1-10</b>	
Frequency	2	0	2	4
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>SAE (Student Activities Engaging)</b>	<b>SAE-2-10</b>	<b>SAE-0-10</b>	<b>SAE-1-10</b>	
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>TIC (Tools Increase Classroom Culture)</b>	<b>TIC-2-10</b>	<b>TIC-0-10</b>	<b>TIC-1-10</b>	
Frequency	0	1	0	1
Percentage, %	0.0%	100.0%	0.0%	100.0%
<b>SWE (Student Whole Class Engagement)</b>	<b>SWE-2-10</b>	<b>SWE-0-10</b>	<b>SWE-1-10</b>	

Frequency	0	0	0	0
Percentage, %	0.0%	0.0%	0.0%	0.0%
<b>SPE (Student Pupil Engagement)</b>	<b>SPE-2-10</b>	<b>SPE-0-10</b>	<b>SPE-1-10</b>	
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>SAE (Student Activities Engaging)</b>	<b>SAE-2-10</b>	<b>SAE-0-10</b>	<b>SAE-1-10</b>	
Frequency	0	0	1	1
Percentage, %	0.0%	0.0%	100.0%	100.0%
<b>SVO (Student Levels of Voice)</b>	<b>SVO-2-10</b>	<b>SVO-0-10</b>	<b>SVO-1-10</b>	
Frequency	0	1	0	0
Percentage, %	0.0%	100.0%	0.0%	0.0%
<b>STA (Student Tools Improve Activities)</b>	<b>STA-2-10</b>	<b>STA-0-10</b>	<b>STA-1-10</b>	
Frequency	0	1	0	1
Percentage, %	0.0%	100.0%	0.0%	100.0%
<b>SIV (Student Tools Improve Voice)</b>	<b>SIV-2-10</b>	<b>SIV-0-10</b>	<b>SIV-1-10</b>	
Frequency	0	1	0	1
Percentage, %	0.0	100.0%	0.0%	100.0%
<b>STC (Student Tools Increased Collaboration)</b>	<b>STC-2-10</b>	<b>STC-0-10</b>	<b>STC-1-10</b>	
Frequency	0	1	0	1
Percentage, %	0.0%	100.0%	0.0%	100.0%
<b>SWT (Class Increased Engagement with Tools)</b>	<b>SWT-2-10</b>	<b>SWT-0-10</b>	<b>SWT-1-10</b>	
Frequency	1	3	5	9
Percentage, %	11.1%	33.3%	55.6%	100.0%

## Appendix 7.8.2 Teacher Qualitative Data

Table A7. 16

*Teacher Coding Frequencies*

<b>Code Descriptor</b>	<b>Negative</b>	<b>Neutral</b>	<b>Positive</b>	<b>Totals</b>
<b>TCE (Student Classroom Environment)</b>	<b>TCE-2-9</b>	<b>TCE-0-9</b>	<b>TCE-1-9</b>	
Frequency	2	3	0	5
Percentage, %	40.0%	60.0%	0.0%	100.0%
<b>TSR (Teacher Student Relationships)</b>	<b>TSR-2-9</b>	<b>TSR-0-9</b>	<b>TSR-1-9</b>	
Frequency	0	3	2	5
Percentage, %	0.0%	60.0%	40.0%	100.0%
<b>TPR (Teacher Student Peer Relationships)</b>	<b>TPR-2-9</b>	<b>TPR-0-9</b>	<b>TPR-2-9</b>	
Frequency	0	1	1	2
Percentage, %	0.0%	50.0%	50.0%	100/0%
<b>TTR (Teacher Teacher Respect)</b>	<b>TTR-2-9</b>	<b>TTR-0-9</b>	<b>TTR-1-9</b>	
Frequency	1	0	0	1
Percentage, %	100.0%	0.0%	0.0%	100.0%
<b>TES (Teacher Enjoyment of Subject)</b>	<b>TES-2-9</b>	<b>TES-0-9</b>	<b>TES-1-9</b>	
Frequency	0	1	1	2
Percentage, %	0.0%	50.0%	50.0%	100.0%
<b>TSE (Teacher Student Enjoyment of Subject)</b>	<b>TSE-2-9</b>	<b>TSE-0-9</b>	<b>TSE-1-9</b>	
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>TEN (Teacher Engagement)</b>	<b>TEN-2-9</b>	<b>TEN-0-9</b>	<b>TEN-1-9</b>	
Frequency	0	2	1	3
Percentage, %	0.0%	66.7%	33.3%	100.0%
<b>TLB (Teacher Levels of Behaviour)</b>	<b>TLB-2-9</b>	<b>TLB-0-9</b>	<b>TLB-1-9</b>	
Frequency	1	1	1	3
Percentage, %	33.3%	33.3%	33.3%	100.0%
<b>TIE (Teacher Improves Engagement)</b>	<b>TIE-2-9</b>	<b>TIE-0-9</b>	<b>TIE-1-9</b>	
Frequency	1	0	1	2
Percentage, %	50.0%	0.0%	50.0%	100.0%
<b>TBT (Teacher Belief in Tools)</b>	<b>TBT-2-9</b>	<b>TBT-0-9</b>	<b>TBT-1-9</b>	
Frequency	2	6	1	9

Percentage, %	22.2%	66.7%	11.1%	100.0%
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Interacts appropriately with peers in a social setting.	1	2	3	4	5	
Very weak	<input type="radio"/>	Very strong				
Interacts appropriately with peers / classmates in an academic setting.	1	2	3	4	5	
Very weak	<input type="radio"/>	Very strong				
Engages with peers / classmates.	1	2	3	4	5	
Very weak	<input type="radio"/>	Very strong				

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**General Behaviour and Conduct**

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General work ethic.	1	2	3	4	5	
Very weak	<input type="radio"/>	Very strong				
General Manners.	1	2	3	4	5	
Very weak	<input type="radio"/>	Very strong				
Positive role modelling.	1	2	3	4	5	
Very weak	<input type="radio"/>	Very strong				
Shows concern for the classroom / school environment.	1	2	3	4	5	
Very weak	<input type="radio"/>	Very strong				

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General Observations / Comments.

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Phase 1 Lesson Observation

Phase 2 Lesson Observation

*Appendix 8.2 Lesson Observation Initial Data Phase 1*

**Table A8. 2**

*SPSS Output Year 9 Students Phase 1*

	Class Attentive to Instruction	Class Following Instructions	Class Constructively Collaborate	Class Organised Work Habits	Class Work Carefully	Class Complete Work
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	2.1667	2.8333	3.0000	2.5000	2.1677	2.3333
Median	2.0000	3.0000	3.0000	2.5000	2.0000	2.5000
Mode	2.00	3.00	3.00	2.00 <sup>a</sup>	2.00	3.00
SD	.40825	.75227	.00000	.54772	.40825	.81650
Range	1.00	2.00	0.00	1.00	1.00	2.00
Minimum	2.00	2.00	3.00	2.00	2.00	1.00
Maximum	3.00	4.00	3.00	3.00	3.00	3.00
	Class Work Willingly	Class Respects Teacher	Class Engages with Teacher	Class Respectful of Peers	Class Interacts with Peers Socially	Class Interacts with Peers Academically
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	3.0000	2.0000	2.5000	2.1667	2.3333	3.0000
Median	3.0000	2.0000	2.5000	2.0000	2.0000	3.0000
Mode	3.00	2.00	2.00 <sup>a</sup>	2.00	2.00	3.00
SD	.63246	.00000	.54772	.40825	.51640	.00000
Range	2.00	0.00	1.00	1.00	1.00	0.00
Minimum	2.00	2.00	2.00	2.00	2.00	3.00
Maximum	4.00	2.00	3.00	3.00	3.00	3.00
	Class Engages with Peers	Class Work Ethic	Class General Manners	Class Positive Role Models	Class Concern for Classroom	
N Valid	6	6	6	6	6	
Missing	0	0	0	0	0	

Mean	2.6667	2.6667	2.5000	3.0000	3.0000
Median	3.0000	2.5000	2.5000	3.0000	3.0000
Mode	3.00	2.00	2.00 <sup>a</sup>	3.00	3.00
SD	.51640	.81650	.54772	.00000	.00000
Range	1.00	2.00	1.00	.00	.00
Minimum	2.00	2.00	2.00	3.00	3.00
Maximum	3.00	4.00	3.00	3.00	3.00

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<sup>a</sup> Multiple modes exist. The smallest value is shown

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**Table A8. 3***SPSS Output Year 10 Students Phase 1*

	Class Attentive to Instruction	Class Following Instructions	Class Constructively Collaborate	Class Organised Work Habits	Class Work Carefully	Class Complete Work
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	2.5000	2.8333	2.8333	2.8333	3.1667	2.8333
Median	2.5000	3.0000	3.0000	3.0000	3.0000	3.0000
Mode	2.00 <sup>a</sup>	3.00	3.00	3.00	3.00	3.00
SD	.54772	.40825	.40825	.40825	.40825	.40825
Range	1.00	1.00	1.00	1.00	1.00	1.00
Minimum	2.00	2.00	2.00	2.00	3.00	2.00
Maximum	3.00	3.00	3.00	3.00	4.00	3.00
	Class Work Willingly	Class Respects Teacher	Class Engages with Teacher	Class Respectful of Peers	Class Interacts with Peers Socially	Class Interacts with Peers Academically
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	2.8333	2.5000	3.1667	2.5000	2.3333	3.0000
Median	3.0000	2.5000	3.0000	2.5000	2.0000	3.0000
Mode	3.00	2.00 <sup>a</sup>	3.00	2.00 <sup>a</sup>	2.00	3.00
SD	.40825	.54772	.40825	.54772	.51460	.00000
Range	1.00	1.00	1.00	1.00	1.00	.00
Minimum	2.00	2.00	3.00	2.00	2.00	3.00
Maximum	3.00	3.00	4.00	3.00	3.00	3.00
	Class Engages with Peers	Class Work Ethic	Class General Manners	Class Positive Role Models	Class Concern for Classroom	
N Valid	6	6	6	6	6	
Missing	0	0	0	0	0	
Mean	3.0000	2.5000	2.0000	2,6667	3.0000	
Median	3.0000	2.5000	2.0000	3.0000	3.0000	

Mode	3.00	2.00 <sup>a</sup>	2.00	3.00	3.00
SD	.00000	.54722	.00000	.51640	.00000
Range	.00	1.00	.00	1.00	.00
Minimum	3.00	2.00	2.00	2.00	3.00
Maximum	3.00	3.00	2.00	3.00	3.00

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<sup>a</sup>Multiple modes exist. The smallest value is shown

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*Appendix 8.3 Lesson Observation Initial Data Phase 2*

**Table A8. 4**

*SPSS Output Year 9 Students Phase 2*

	Class Attentive to Instruction	Class Following Instructions	Class Constructively Collaborate	Class Organised Work Habits	Class Work Carefully	Class Complete Work
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	3.6667	3.1667	3.0000	3.8333	3.6667	3.5000
Median	4.0000	3.0000	3.0000	4.0000	3.5000	3.5000
Mode	4.00	3.00	3.00	4.00	3.00	3.00 <sup>a</sup>
SD	.51640	.40825	.00000	.40825	.81650	.54772
Range	1.00	1.00	.00	1.00	2.00	1.00
Minimum	3.00	3.00	3.00	3.00	3.00	3.00
Maximum	4.00	4.00	3.00	4.00	5.00	4.00
	Class Work Willingly	Class Respects Teacher	Class Engages with Teacher	Class Respectful of Peers	Class Interacts with Peers Socially	Class Interacts with Peers Academically
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	3.6667	3.8333	3.5000	3.8333	3.8333	3.1667
Median	4.0000	4.0000	3.5000	4.0000	4.0000	3.0000
Mode	4.00	4.00	3.00 <sup>a</sup>	4.00	4.00	3.00
SD	.51640	.75277	.54772	.40825	.40825	.40825
Range	1.00	2.00	1.00	1.00	1.00	1.00
Minimum	3.00	3.00	3.00	3.00	3.00	3.00
Maximum	4.00	5.00	4.00	4.00	4.00	4.00
	Class Engages with Peers	Class Work Ethic	Class General Manners	Class Positive Role Models	Class Concern for Classroom	
N Valid	6	6	6	6	6	
Missing	0	0	0	0	0	

Mean	3.3333	3.8333	3.8333	3.5000	3.5000
Median	3.0000	4.0000	4.0000	3.5000	3.5000
Mode	3.00	4.00	4.00	3.00 <sup>a</sup>	3.00 <sup>a</sup>
SD	.51640	.40825	.75277	.54772	.54772
Range	1.00	1.00	2.00	1.00	1.00
Minimum	3.00	3.00	3.00	3.00	3.00
Maximum	4.00	4.00	5.00	4.00	4.00

---

<sup>a</sup> Multiple modes exist. The smallest value is shown

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**Table A8. 5***SPSS Output Year 10 Students Phase 2*

	Class Attentive to Instruction	Class Following Instructions	Class Constructively Collaborate	Class Organised Work Habits	Class Work Carefully	Class Complete Work
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	3.3333	3.1667	3.1667	3.0000	3.6667	2.8333
Median	3.5000	3.0000	3.0000	3.0000	4.0000	3.0000
Mode	4.00	3.00	3.00	3.00	4.00	3.00
SD	.81650	.40825	.40825	.00000	.51640	.40825
Range	2.00	1.00	1.00	.00	1.00	1.00
Minimum	2.00	3.00	3.00	3.00	3.00	2.00
Maximum	4.00	4.00	4.00	3.00	4.00	3.00
	Class Work Willingly	Class Respects Teacher	Class Engages with Teacher	Class Respectful of Peers	Class Interacts with Peers Socially	Class Interacts with Peers Academically
N Valid	6	6	6	6	6	6
Missing	0	0	0	0	0	0
Mean	3.5000	3.6667	3.1667	3.8333	3.8333	3.1667
Median	3.5000	4.0000	3.0000	4.0000	4.0000	3.0000
Mode	3.00 <sup>a</sup>	4.00	3.00	4.00	4.00	3.00
SD	.54772	.51640	.40825	.40825	.40825	.40825
Range	1.00	1.00	1.00	1.00	1.00	1.00
Minimum	3.00	3.00	3.00	3.00	3.00	3.00
Maximum	4.00	5.00	4.00	4.00	4.00	4.00
	Class Engages with Peers	Class Work Ethic	Class General Manners	Class Positive Role Models	Class Concern for Classroom	
N Valid	6	6	6	6	6	
Missing	0	0	0	0	0	
Mean	3.0000	3.3333	3.8333	3.3333	3.3333	
Median	3.0000	3.0000	4.0000	3.0000	3.0000	

Mode	3.00	3.00	4.00	3.00	3.00
SD	.00000	.51640	.40825	.51640	.51640
Range	.00	1.00	1.00	1.00	1.00
Minimum	3.00	3.00	3.00	3.00	3.00
Maximum	3.00	4.00	4.00	4.00	4.00

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<sup>a</sup>Multiple modes exist. The smallest value is shown

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