In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Sarah Hopkinson

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Abstract

Low self-beliefs hinder students' learning (Bong & Skaalvik, 2003) and consequently their life chances (Teach First, 2018). Education is a determining factor of a student's future quality of life, and one of the most important subjects in the national curriculum is mathematics (Department of Education, 2021). This present study focuses on the self-beliefs of self-concept and self-efficacy within the mathematics classroom, as both constructs act either to encourage or limit learning (Bong & Skaalvik, 2003). The study explores the influence of increased verbal praise and feedback (VPF) on students' mathematics self-beliefs and whether this influenced their classroom learning, in particular regarding task participation, response to failure, perseverance, and help-seeking. VPF is praise coupled with feedback implemented in a sincere, concise, and task-centred way to help students understand their successes and how to improve in future. A seven-week intervention took place across two lower attaining Year 10 mathematics classes, where teachers increased their use of VPF, aiming to raise student self-beliefs and classroom learning. Data were obtained though questionnaires from all student participants and interviews with eight student participants. The questionnaire data were numerically analysed through descriptive statistics while interview data were thematically coded. The study found that increased VPF positively influenced students' self-concept and self-efficacy, with self-efficacy displaying the greatest shift and thus indicating greater malleability than self-concept. Mathematics classroom learning was particularly influenced within the themes of response to failure and perseverance, both demonstrating the greatest positive shifts. Thus, increased VPF helped raise students' self-beliefs which positively influenced their mathematics learning. Consequently teachers could consider

implementing VPF within their everyday practice to help support students' self-beliefs and mathematics learning.

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Chapter 1: Introduction

Education can be a key determining element of a student's future quality of life (Teach First, 2018), with mathematics being an important subject in the national curriculum as basic numerical competence can help daily problem solving in everyday life (Department of Education, 2021). Despite this, mathematics is often unpopular as students can find it difficult to understand, leading to a dislike of mathematics (Nardi & Steward, 2003). Many policymakers and researchers in multiple countries are concerned about students' low mathematical performance (OECD, 2016), which it is imperative to remedy by identifying and understanding the barriers.

Several constructs influence a student's success or failure during education, including low competence beliefs (Marsh et al., 2017). Mathematics competence beliefs are how successful a student perceives they will be in a particular mathematics task, and can be evaluated by focusing on self-concept and self-efficacy constructs (Hascoët et al., 2018), referred to in combination in this study as self-beliefs. Self-beliefs are students' subjective perceptions of internal self-assessments which dictate their external behaviour (Bong & Skaalvik, 2003) and are key influences on achievement (Schoor, 2016). Perceptions are

assessments of students' external behaviours from which they draw conclusions to form an understanding regarding their self-beliefs and learning (Bem, 1972). These perceptions are not always entirely precise representations of students' true selves (Cash, 2012) and can have either a positive or negative influence on students; if students perceive themselves as holding lower self-beliefs, it can hinder their learning (Hascoët et al., 2018) and put them at a higher risk of underachievement than those with higher self-beliefs (Devries et al., 2021). This suggests the importance of mathematics self-beliefs in addition to mathematical knowledge and skills.

1.1: Rationale

Low self-beliefs are a particular concern for the Head of Year 10 (HOY 10) and the Senior Leadership Team (SLT) of The Academy, the secondary school setting of this study. In each year group there are two classes composed primarily, if not wholly, of students with extremely low self-beliefs, motivation, and attainment, including Class A and Class B in Year 10 which form the focus for this study. Year 10 is the midpoint of secondary school and the beginning of the mathematics General Certificate of Secondary Education (GCSE) course at The Academy. Low self-beliefs can hinder achievement (Schoor, 2016), and therefore raising these students' self-beliefs is crucial to increasing their engagement and achievement during their education.

The Academy is an inner London secondary school, with students of mixed attainment and gender and a high number of minority ethnic groups (OFSTED, 2011). Many Academy students have inherent disadvantages from their socioeconomic background,

influencing their GCSE and A-Level aspirations and results (Teach First, 2018). Class A and Class B, referred to at The Academy as the 'nurture' classes, are the lowest attaining students in Year 10. While there are other students in Year 10 who also hold low self-beliefs, this is a key issue for Class A and Class B. Further details about the school context are provided in Appendix A.

My own personal perspective as a joint practitioner and researcher is also relevant. During my first year of teaching at The Academy, I became aware that more low attaining students have lower self-beliefs than high attaining students. While teaching Class A and observing Class B, I regularly overheard students claim they could not complete tasks, even before attempting them. Speaking to these students they explained that they chose not to participate as they expected failure. Class A and Class B are prime examples of lower attaining students who hold low self-beliefs which decreases their motivation (OECD, 2016) and raises their vulnerability to self-protection strategies, such as avoidance and/or procrastination to prevent experiencing failure (Gibbons et al., 2002), hindering achievement (Devries et al., 2021). This motivated my interest: I am passionate about all students being willing to participate and feeling able to achieve, and my desire to increase students' mathematics self-beliefs led me to this current study. In collaboration with the mathematics Head of Department (HOD) and HOY 10, the intervention, which formed a core part of this study, was developed to target Class A and Class B's self-beliefs. This intervention took place in a colleague's and my own classroom, enabling the current study to benefit both of our professional development as well as students. The collaborative approach of this present study aimed to ease connection between research into self-beliefs and classroom practice, promoting learning at The Academy.

Self-concept and self-efficacy are widely considered important in a student's educational journey as both constructs can act either to encourage or limit mathematics learning (Bong & Skaalvik, 2003). A significant body of research has examined self-concept and self-efficacy across diverse student groups and educational settings, indicating self-beliefs are suitable for evaluation across The Academy's diverse intake. Academic achievement is the goal of GCSEs, and numerous studies have reported that positive academic self-beliefs facilitate increased student achievement (Susperreguy et al., 2018; Sewasew & Schroeders, 2019), which supports The Academy's aim to achieve the best grades possible for each student (SLT-1). Research indicates that positive self-beliefs can help overcome educational challenges as positive self-beliefs appear to influence task participation, response to failure, perseverance, and help-seeking - all vitally important in The Academy students' education and discussed in section 2.3.

Chapter 2: Literature review

An increase in self-concept and self-efficacy may positively influence The Academy students' achievements as students with higher self-beliefs are less at risk of underachievement (Schoor, 2016; Devries et al., 2021). Consequently, the following questions guided this literature review and are responded to in turn:

- What are self-concept and self-efficacy?
- What factors are thought to influence self-concept and self-efficacy?
- How do self-concept and self-efficacy influence students' learning?
- How could self-concept and self-efficacy be increased?

2.1: What are self-concept and self-efficacy?

Self-concept and self-efficacy are ways of explaining and predicting how people interact with their environment across multiple domains, creating the motivation to engage in or avoid a particular task or behaviour (Bandura, 1993). Students' levels of self-concept and/or self-efficacy can range from high/positive to low/negative (Schöber et al., 2018; Nandika, 2020). Colloquially, self-concept is "a composite view of oneself" (Bong & Skaalvik, 2003:2), and while the precise definition is debated, self-concept is generally understood to be a person's perception of their attainment and personality formed through social comparisons (Arens et al., 2016). Self-efficacy was identified by Bandura (1977)

as a factor regulating time and effort spent on a challenging task. It is now understood to include the cognitive process behind students' actions which determines motivation, aspirations, and achievements (Bandura, 1993). Self-efficacy is formed through comparing a current task to previous similar, successfully completed tasks to calculate the task's probability of success (Schunk & DiBenedetto, 2016).

In education, academic self-concept is the evaluative judgement formed by students through comparing themselves to others they perceive to be of similar attainment level (Peiffer, Ellwart, & Preckel, 2020), while academic self-efficacy is "the belief students hold about their academic capabilities" (Carpenter & Clayton, 2014:110). Both self-beliefs influence students' perceptions of their attainment and consequently their learning behaviours (Leflot, Onghena, & Colpin, 2010). Within mathematics, self-concept describes students' beliefs about their mathematics attainment and mathematics self-efficacy refers to students' beliefs about how successful they could be in solving the mathematics problem (OECD, 2013). These definitions of self-concept and self-efficacy are adopted throughout this present study.

2.1.1: Conceptions of self-concept and self-efficacy

Both constructs are multidimensional, self-concept operating through a hierarchical structure and self-efficacy from different perceptions of varying tasks (Peiffer, Ellwart, & Preckel, 2020), however the structure of each construct differs. In the past, self-concept was viewed as a purely global construct, indicating a person's whole self-concept, but this was criticised for being detached from human behaviour (Bandura, 1981). Human

behaviour differs depending on situational influences which produce vague and ambiguous relationships, particularly between self-concept and achievement (Marsh & O'Mara, 2008). Consequently, a hierarchical model (Figure 1) was conceived with global self-concept at the apex, then differentiated into academic and non-academic domains, and non-academic further divided into emotional, physical, and social domains (Shavelson, Hubner, & Stanton, 1976). The academic domain divides into mathematical and verbal, and then into particular subjects (Marsh, Kong, & Hau, 2001). Self-concept evaluations tend to be considered domain-specific (Arens et al., 2011), suggesting mathematics self-concept is evaluated in the mathematics domain of the hierarchy. While a minority of researchers dispute the hierarchical structure as its statistical nature does not fully align with the possibilities of an individual's psychological structure (Harter, 1998), studies are not conclusive, and the majority of research supports self-concept being a hierarchical structure (Klapp, 2018).

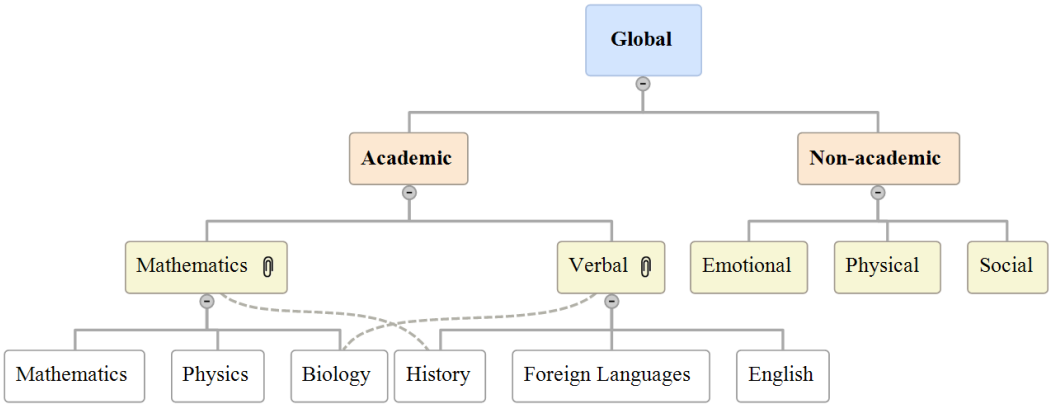

Figure 1: Self-concept's hierarchical structure, based on Shavelson, Hubner, & Stanton, (1976) and Marsh, Kong, & Hau (2001).

Unlike self-concept, self-efficacy's structure is highly debated and there is limited research in an academic setting (Peiffer, Ellwart, & Preckel, 2020). Some scholars view

self-efficacy as a global construct, with global self-efficacy indicating one's whole self-efficacy (Chen, Gully, & Eden, 2001). However, this structure fails to explain why self-efficacy judgements differ across different domains (Bong & Skaalvik, 2003), which could be because global self-efficacy is disconnected from situational influences. Some believe self-efficacy is domain- and content-specific (Bandura, 2006). Amongst others, Bong (1997) discovered empirical evidence for mathematical and verbal self-efficacy as overarching structures under academic self-efficacy, with specific subjects being dependent on one or both (Figure 2). Bong and Skaalvik (2003) suggest this loosely forms a hierarchical structure, however Marsh et al. (2019) uncovered no evidence of this.

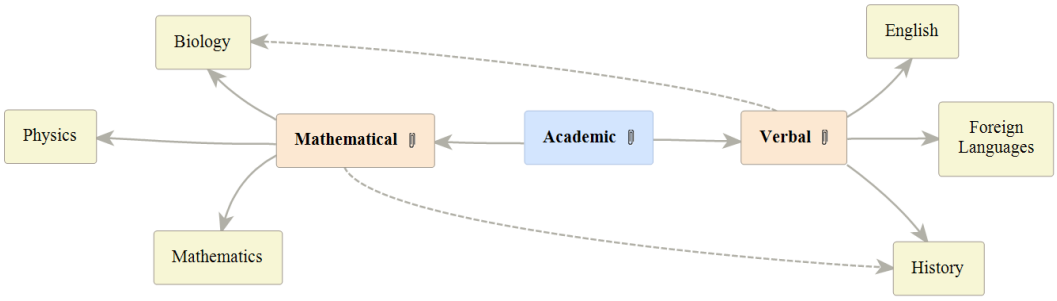

Figure 2: Self-efficacy structure, based on Bong (1997).

2.2: What factors are thought to influence self-concept and self-efficacy?

There are a number of factors common to self-concept and self-efficacy. Consideration of these factors reveals key similarities and differences in the two self-beliefs. For convenience these are presented first in Table 1 and discussed in more detail later.

Table 1: Key comparisons between self-concept and self-efficacy.

Comparison dimension	Self-concept	Self-efficacy
Age	Development stabilises with age	Development debated
Social comparison weighting	Strong weighting	Light weighting
Time orientation	Past orientated	Future orientated
Temporal stability	Stable	Malleable
Achievement	Positively correlated	Positively correlated
Gender	Higher in males	Relationship disputed

2.2.1: Age

Much research indicates that self-concept develops over time, beginning from an early age (Leflot, Onghena, & Colpin, 2010). At this early age self-concept is often overinflated and not in line with true attainment (Brown & Cairney, 2020), possibly due to limited social comparisons, and therefore likely to be unstable. Self-concept then decreases during childhood as the pool of comparisons influencing it grows, gradually becoming more stable and aligned to actual attainment (Arens et al., 2016). During early-adolescence (11- to 14-years-old) students' self-concept level decreases further, maybe affected by the transition from primary to secondary school, where results become more influential, increasing pressure to perform (Teach First, 2018). This is further compounded in mathematics through the move from a primarily arithmetic focus to a much wider curriculum in secondary school (Weidinger, Steinmayr, & Spinath, 2019). In late-

adolescence (18- to 21-years-old) self-concept becomes strongly formed and less malleable (Brown & Cairney, 2020). The shifts in self-concept during adolescence could be attributable to development of cognitive abilities or environmental changes (Harter, 2012), with the exact reasons debated. As Year 10 students are in middle-adolescence (15- to 17-years-old), their self-concept could already be somewhat developed, possibly minimising this study's intervention's influence.

There is little consensus among researchers regarding the development of self-efficacy. Hornstra et al. (2013) observed self-efficacy decreasing then increasing in Dutch students with an average age of 9-years-old. This aligns with Phan, Ngu and Alrashidi's (2018) discovery that 12- to 13-year-old Australian secondary school students' mathematics self-efficacy was constantly shifting over a nine-month period. Conversely, Phan and Ngu (2016) found 11- to 12-year-old Australian secondary school students' mathematics self-efficacy hardly shifted across a one-year period, suggesting mathematics self-efficacy was relatively stable. Alternatively, Schunk, Meece, & Pintrich (2014) observed that during adolescence self-efficacy is more likely to decrease. The above studies all contradict Zimmerman and Martinez-Pons's (1990) and Lau et al.'s (2018) findings that self-efficacy only increased as students progressed through their educational journey. However, all these studies have differing variables: different settings (Netherlands, Australia, and U.S.); varying participant sizes, ranging from 90 students in Zimmerman and Martinez-Pons's (1990) study to 722 students in Hornstra et al.'s (2013) study; and differing ages, from 6-years-old in Lau et al.'s (2018) study to 17-years-old in Zimmerman and Martinez-Pons's (1990) study. Such differences make direct comparison difficult and further hinder confidence in predicting any development and shifts in self-efficacy as students age. With such varying literature, it will be interesting to discover if self-efficacy is stable or

malleable in this current study. Moreover, since the intervention, which formed part of this study, is over a short period it will be difficult to compare its findings to those above, which were the result of studies over a longer period.

2.2.2: Social comparison weighting

All students experience both conscious and subconscious social comparisons, comparing their peers' performance to their own to evaluate the accuracy and appropriateness of their perceptions of their self-beliefs (Dijkstra et al., 2008). Students compare themselves to peers in two ways: through upwards comparison with higher-performing peers or downwards comparison with lower-performing peers (Dijkstra et al., 2008). As students progress through education and experience more feedback and higher academic demands, their social comparison focus can shift from a question of completion to improvement (Bong & Clark, 1999). Social comparison heavily influences self-concept formation, and is thought to have a greater influence than prior achievement (Peiffer, Ellwart, & Preckel, 2020). Upwards comparison can hinder self-concept through creating perceptions of underperformance (Dijkstra et al., 2008) and prompting self-protection strategies to prevent experience of failure (Gibbons et al., 2002). Despite this, students with high self-concept can be more inclined to perform positive upwards comparisons (Huguet et al., 2009), viewing these as sources of information regarding how to improve (Bong & Clark, 1999). Downwards comparisons can maintain or increase self-concept through creating the perception of performing better than peers (Pulford, Woodward, & Taylor, 2018). Nevertheless, Bear and Minke (1996) discovered self-concept was not influenced by social comparisons for 400 U.S. primary school students, but there was no explicit focus

on social comparisons, reducing the reliability of findings regarding social comparisons. Additionally, as self-concept develops through a student's education, Year 10 students' social comparisons may be different from primary school students', rendering it additionally problematic to apply Bear and Minke's (1996) findings directly to this present study.

Social comparisons tend to have less influence on self-efficacy than self-concept, as self-efficacy is primarily influenced by self-comparison against previous task successes (Schunk & DiBenedetto, 2016). Social comparison is thought to influence self-efficacy when success criteria are perceived as unclear (Carmona et al., 2008). In such situations, upwards and downwards social comparisons can affect self-efficacy in a similar way to self-concept as discussed above (Bandura, 1977). As with self-concept, students with stronger self-efficacy can be more inclined to make upwards comparisons as they can be more resilient than students with lower self-efficacy to its negative side effects (Miyake & Matsuda, 2002). Since the weighting given to social comparisons differs between self-beliefs, it will be interesting to see how social comparisons influence this study's low attaining Year 10 students' self-beliefs, and if comparisons begin to shift focus from completion to improvement.

2.2.3: Time orientation and temporal stability

Time orientation differs in both constructs. Self-concept evaluations are past orientated, based on perceptions of historical mathematical social comparisons (Bong & Skaalvik, 2003). In secondary school students, the pool of these past orientated self-concept

evaluations is large and deeply rooted (Wigfield et al., 1997) and students' self-concept tends to be less malleable. Therefore, a shift may require a simultaneous offsetting influx of new experiences at multiple levels of the hierarchical structure to shift the existing self-concept perceptions (Shavelson, Hubner, & Stanton, 1976), suggesting short period interventions may have limited influence on self-concept. However, some researchers contend that the lower hierarchical levels of self-concept are more dependent on situational factors and require fewer factors to change simultaneously, implying mathematics self-concept could be malleable (Zlatković, et al., 2012). Nevertheless, in the literature more research favours the stability of self-concept (Bong & Skaalvik, 2003).

Conversely self-efficacy descriptions are future orientated, focusing on future completion of current tasks by evaluating success in previous similar tasks (Bong & Skaalvik, 2003:24). Future events are uncontrollable and do not always remain stable for long, therefore self-efficacy can be unstable and constantly adjusting (Kaskens et al., 2020), suggesting short period interventions could mould self-efficacy beliefs more than self-concept. Research on the malleability of self-efficacy is minimal but the existing studies tend to agree self-efficacy is malleable (Bong & Skaalvik, 2003). When secondary school students' self-concept and self-efficacy were compared by Pajares and Graham (1999), self-efficacy scores varied but there was no significant change in self-concept scores, implying self-efficacy is more malleable than self-concept. Based on the findings available, it is predicted that The Academy Year 10 students' self-efficacy may be influenced through this study's intervention, but as it is only over a short period, self-concept may remain unchanged.

2.2.4: Achievement

Both self-beliefs hold positively correlating relationships with mathematics achievement (Cvencek et al., 2018; Burns, Crisp, & Burns, 2020), and were observed internationally in the Programme for International Student Assessment (PISA) 2013 study (OECD, 2013) and other database analyses (for example Marsh & Hau, 2004; Lee, 2009). However, it remains debated whether self-concept or self-efficacy holds the strongest relationship with achievement. Richardson, Abraham, and Bond's (2012) meta-analysis suggests self-efficacy, whereas Valentine, DuBois, and Cooper's (2004) meta-analysis discovered neither were dominant. Kaskens et al. (2020) contend that there is a stronger relationship between self-concept than self-efficacy and arithmetic achievement in primary school students, which corresponds with multiple studies involving similarly aged students (for example Viljaranta et al., 2014; Timmerman, Toll, & Luit, 2017). The overall lack of consensus about whether self-concept or self-efficacy holds the stronger relationship with achievement is further complicated for The Academy due to its diverse student intake. The PISA (OECD, 2013) study of 276,165 15-year-old students from 41 countries discovered Western European students displayed a stronger relationship between self-concept and achievement, while for Asian and Eastern European students' self-efficacy was stronger. As The Academy is based in Western Europe yet with a diverse student intake, the multicultural diversity of these students makes it difficult to predict whether students will associate mathematics achievement more strongly with self-concept or self-efficacy.

2.2.5: Gender

A gender gap within mathematics self-beliefs has been documented across multiple countries (OECD, 2012). Gender gaps begin to appear from 7-years-old (Government Equalities Office, 2019), with secondary schools more likely to have males demonstrating higher self-concept beliefs than females (Leibham, Alexander, & Johnson, 2013). This is supported by Fredricks and Eccles's findings in their 2002 longitudinal study beginning in 1987 of 514 U.S. students across their 12-year educational journey. Conversely, the gender differences in self-efficacy are not universally agreed. Conclusions divide between self-efficacy being higher in males (Namaziandost & Çakmak, 2020), higher in females (Reilly, Neumann & Andrews, 2019) and there being no gender gap (Shkullaku, 2013). Reilly, Neumann, and Andrew's (2019) results may reflect the push in recent years for more equal representation of women in the mathematics field (Government Equalities Office, 2019), however Namaziandost & Çakmak's (2020) findings could suggest either this effort has not been impactful on female's self-efficacy or other factors have also caused a corresponding increase in self-efficacy for males.

2.2.6: Type of influence

Both self-beliefs have been considered independently thus far in this literature review. However, some researchers believe self-concept and self-efficacy should be considered in combination. Desideri et al. (2019) discovered self-efficacy predicts self-concept, suggesting self-efficacy may be a central element in producing self-concept. Conversely, researchers such as Tosto et al. (2016) claim self-concept predicts self-efficacy in

mathematics. Other studies indicate that the two constructs cyclically influence each other with equal importance, forming a reciprocal relationship (Ferla, Valcke, & Cai, 2009). For example, if students believe they can complete a task (self-concept), this influences their self-efficacy, producing a mastery orientation which consequently fosters self-concept (Peiffer, Ellwart, & Preckel, 2020). As the research differs, it is difficult to draw definitive conclusions about both constructs' influence on each other.

2.3: How do self-concept and self-efficacy influence students' learning?

Self-concept and self-efficacy influence a student's education in multiple ways. This study focuses on four key themes affected by self-beliefs inside the classroom: task participation, response to failure, perseverance, and help-seeking. These themes are discussed further in turn following the paragraph below.

The extent of influence self-beliefs have on these themes is influenced by students' levels of self-concept and/or self-efficacy, ranging from high/positive to low/negative (Schöber et al., 2018; Nandika, 2020), and what students perceive as successes or failures (Nelson et al., 2019). Regular experiences of mathematics failure can decrease mathematics self-beliefs and increase fear of failure, while regular experiences of mathematics success can raise mathematics self-beliefs (Vancouver, Thompson, & Williams, 2001; Nelson et al., 2019). Regular exposure to failure tends to result in students gradually beginning to expect failure (Walsh, 2011), with their self-beliefs becoming undermined and forming firmly established negative self-beliefs (Nelson et al., 2019), lowering subsequent achievement (Schoor, 2016). Intermittent experiences of success or failure can have a brief influence,

but this is usually overpowered by regular exposure (Schunk & DiBenedetto, 2016). Therefore, if possible, schools should regularly recognise success in class to enable students to believe in their own capabilities to achieve (Fernandez-Rio et al., 2017), aiming to increase students self-beliefs (Oldham, 2018). Lower attaining Academy nurture students' experiences of limited success and repeated failure during Year 7 to Year 9 mathematics learning could have contributed to firmly established low self-beliefs.

2.3.1: Task participation

Task participation varies depending on the task presented to students, which in mathematics can be broadly categorised as routine or non-routine. Routine tasks tend to be more procedural while non-routine tasks involve problem solving and the application of multiple mathematical skills at once (Abdullah et al., 2014). If students are primarily exposed to routine tasks, when presented with non-routine tasks, they can find these more challenging (Weidinger, Steinmayr, & Spinath, 2019). For students who have less experience with challenging tasks, it is often the level of self-beliefs which may help address the challenge (Kaskens et al., 2020): students who hold higher self-beliefs can view this as something which can be overcome, whereas students with low self-beliefs tend to view non-routine tasks as a threat (Bandura, 1994). This suggests that students with higher self-beliefs are better equipped to problem solve and so are more likely to participate in non-routine tasks. For both self-beliefs, multiple studies over time have discovered self-efficacy beliefs to be the greater influence on students' participation in non-routine tasks than self-concept (Pajares & Kranzler, 1995; Usher & Pajares, 2009; Öztürk, Akkan, & Kaplan, 2020), with students with higher self-efficacy persevering for

longer in challenging situations and trying multiple different options or mathematics skills (Salanova, Llorens, & Schaufeli, 2011).

Student participation in routine and non-routine tasks often involves their evaluation of expectations of success and task-value (Eccles et al., 1993). Figure 3 displays this evaluation, combining task participation evaluation questions from Rueda's (2011) study and the relationship between task participation and task-value from Al-Harthy and Aldhafri's (2014) study. Students ask themselves two questions (Rueda, 2011): Question-1 ("Am I able to do this task?") evaluates their expectations of success based on self-beliefs (Eccles et al., 1993), and if answered affirmatively is followed by Question-2 ("Why should I do this task?"), calculating task-value. A negative response to Question-1 indicates low self-beliefs (Schunk & DiBenedetto, 2016) and removes consideration of Question-2 as the task-value becomes irrelevant if the student does not believe they will be successful (Al-Harthy & Aldhafri, 2014). Thus task-value appears reliant on the expectation of success formed through self-beliefs: without sufficient self-beliefs there is no task-value assessment. However, answering 'yes' to Question-1 enables Question-2 task-value assessment, evaluating the cost of effort, interest, importance, and usefulness of the task (Eccles, 1983). High task-value increases task participation, while low task-value decreases task participation (Eccles et al., 1993).

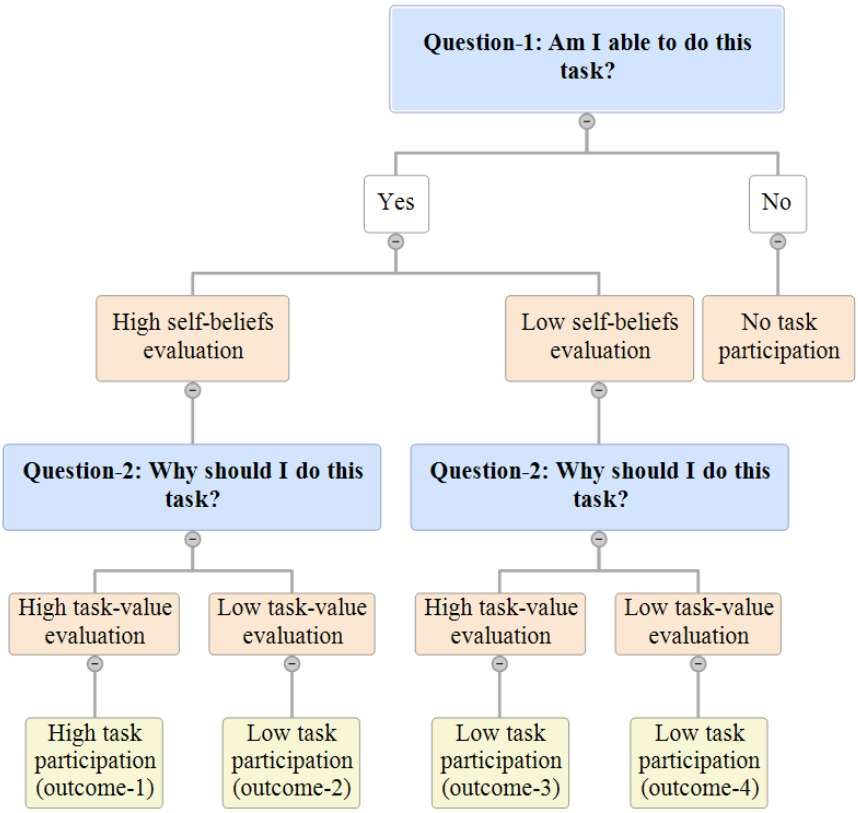

Figure 3: Task participation flow chart, based on Rueda (2011) and Al-Harthy and Aldhafri (2014).

When evaluating task participation, four possible outcomes can be produced (Al-Harthy & Aldhafri, 2014) through answering Question-1 and Question-2 (Figure 3). High self-beliefs and high task-value (outcome-1) increase student task participation: high self-beliefs tend to raise students' expectations of success through their perception of sufficient capability to apply their knowledge, and high task-value indicates any effort employed will be worth the end result. The same high self-beliefs from outcome-1 are also present in outcome-2 but are combined with low task-value, limiting task participation. Conversely, high task-value is made irrelevant by low self-beliefs (outcome-3) which can restrict expectations of success, thus limiting participation. Finally, in outcome-4, low self-beliefs and low task-value can leave minimal incentive to participate. Only outcome-

1 produces high task participation from the multiplicative relationship between self-beliefs and task-value, and therefore is ideally required for positive long-term influences of task participation on achievement (You, 2018). The other outcomes produce limited or negative participation, instead often facilitating self-protection strategies to prevent experiences of failure (Gibbons et al., 2002). From my personal observations prior to this present study, many Academy nurture students who hold low self-beliefs often present with outcome-3, outcome-4, or answer 'no' to Question-1. The intervention, which forms part of this study, focuses on increasing students' self-beliefs, aiming in turn to increase the number of students who believe they can succeed at a given task and will therefore then consider task-value and participation.

2.3.2: Response to failure

Following a student's unsuccessful completion of a task, attribution of the cause of failure could be to one or both elements of task participation (self-beliefs and/or task-value) and is subjective to each student (Weiner, 1980). Weiner (1980) suggests four main attributions are attainment, effort, task difficulty, and luck. If failure is attributed to a factor deemed controllable (effort or development of attainment) students can react positively, understanding how this failure may be avoided in the future (Simpson & Maltese, 2017). However, attributing failure to uncontrollable factors (task difficulty or limited natural ability) develops a pessimistic outlook, subsequently lowering self-beliefs (Simpson & Maltese, 2017) and making students more vulnerable to future failures (Henry et al., 2019). Hence, the attribution of failure to uncontrollable factors can lessen

students' perceived responsibility for each failure, forming a cycle of negatively influencing self-beliefs.

Following repeated failure, students can implement self-protection strategies to help prevent experiencing failure, for example by attributing failures to uncontrollable factors (Simpson & Maltese, 2017). Despite self-protection strategies, constant failures can gradually dissolve students' self-beliefs through their perception that tasks are too challenging to overcome and that their learning is therefore outside their control (Stoet & Geary, 2018). Consequently, students can become afraid of failure (Nelson et al., 2019), producing extended underachievement (Schoor, 2016). This is further compounded by a shift in some students' attribution of failure from lack of effort (low self-efficacy) to lack of attainment (low self-concept) (Yantraprakorn, Darasawang, Wiriyakarun, 2018). Thus, students can adopt a negative self-fulfilling prophecy as previous failures lower self-beliefs, resulting in slower recovery from future failures (Bandura, 1994), possibly reducing future performance (Bong & Skaalvik, 2003). Some Year 10 Academy nurture students may already have begun to adopt this negative self-fulfilling prophecy, attributing their repeated failures to uncontrollable factors, hindering their response to failure and access to success.

Students with high self-beliefs, however, view occasional failures as methods of exposing gaps in knowledge that can be acquired through increased effort (Grassinger & Dresel, 2017), attributing their failure to controllable factors such as insufficient effort, limited knowledge and/or preparation (Simpson & Maltese, 2017). These students tend rarely to avoid tasks and seem less afraid of failure, allowing more opportunities for and recognition of success than those with lower self-beliefs (Grassinger & Dresel, 2017). Thus, students need both high self-beliefs and frequent recognition of success to view

failures as learning opportunities. Self-beliefs should slightly exceed capability to strengthen effort in the face of challenge; however, students who vastly overestimate their self-beliefs are often limited by their skills (Sorrenti et al., 2018) and therefore can experience multiple repeated failures if they try to achieve in line with their self-beliefs. These failures subsequently can decrease self-beliefs.

2.3.3: Perseverance

Perseverance is the amount of time and effort implemented on a task (Wong, 2016). Self-beliefs influence perseverance similarly to response to failure as discussed above. Students with high self-beliefs often view effort as changeable and so tend to persevere for longer on a challenging task to overcome it (Simonsmeier et al., 2020) than students with low self-beliefs for whom success can feel unachievable, leaving little or no incentive to persevere as failure is expected (Walsh, 2011). Thus, high self-beliefs support perseverance in challenging tasks, however overestimation of self-beliefs can increase perseverance but not always achievement (Schunk & Meece, 2006). For some students, the reverse influence also occurs: perseverance helps to overcome a challenge which increases self-beliefs (Usher et al., 2019), suggesting perseverance predicts self-beliefs. In some cases both self-beliefs and perseverance can influence each other in a cyclical relationship: students' high self-beliefs promote perseverance, and once the task is completed, the success from persevering positively influences self-beliefs. While the particular relationship between self-beliefs and perseverance is debated, there is a strong indication of a correlation between high self-beliefs and high perseverance. Many Year 10 Academy nurture students view mathematics as overwhelming and inaccessible, and

have extremely low (if any) perseverance, often self-limiting their achievements through self-protection strategies, possibly as a result of extremely low self-beliefs. Thus, this study's intervention aimed to raise perseverance through increasing self-beliefs.

2.3.4: Help-seeking

Academic help-seeking is a self-regulatory strategy where students identify that help is required, seek advice, and then implement it (Smalley & Hopkins, 2020). Help-seeking is an important method of overcoming mathematics challenges: those more willing to help-seek persevere for longer, increasing their chances of success (Smalley & Hopkins, 2020). Unfortunately, many students avoid help-seeking which risks undermining their learning (Ryan, Pintrich, & Midgley, 2001). The direction of the relationship between self-beliefs and help-seeking is contested. Some researchers believe self-beliefs are antecedent to help-seeking (Girli & Öztürk, 2017), while others believe help-seeking precedes self-beliefs, arguing that help-seeking prevents failure as it enhances the opportunities for success which in turn boosts self-beliefs (Amemiya & Wang, 2017).

Students with high self-beliefs tend to hold more positive views of their capabilities and so are less vulnerable to feeling inadequate when help-seeking, and therefore help-seek more often than students with low self-beliefs (Wolters & Pintrich, 1998). Students with high self-beliefs often employ adaptive help-seeking for hints and explanations to facilitate learning (Ryan, Patrick, & Shim, 2005); however, help-seeking can be limited by high self-beliefs when students want to be successful independently (Butler, 1998). Students with low self-beliefs will generally either avoid help-seeking or use expedient

help-seeking to obtain the answer quickly, rather than applying learning methods (Ryan, Patrick, & Shim, 2005). Expedient help-seeking can be produced when failure is viewed as a sign of weakness or threatens students' self-image through appearing incompetent to peers, thus rendering help-seeking embarrassing (Ryan, Pintrich, & Midgley, 2001). This often damages self-beliefs, hindering future help-seeking and provoking students to question its value to the detriment of learning (Wood & Wood, 1999). Hence, self-beliefs can shape help-seeking tendencies.

Low task-value can also influence help-seeking, indicating minimal effort should be applied, possibly leading to expedient help-seeking; high task-value indicates maximal effort, suggesting adaptive help-seeking (Ryan, Patrick, & Shim, 2005). Students who assign a higher task-value can be more likely to help-seek constructively as they place a higher value on academic success (Du, Xu, & Fan, 2016). Thus, help-seeking can not only be influenced by self-concept and/or self-efficacy but also by task-value.

2.4: How could self-concept and self-efficacy be increased?

Teachers can influence the development of students' self-beliefs through their reactions to students' successes and failures (Bandura, 1994). When supported through failure or praised for success, students' self-beliefs often increase (Szumski & Karwowski, 2019), reducing the negative influence low self-beliefs can have on learning. Teachers can support students through failure or success by using public verbal praise and feedback (VPF). This is oral praise coupled with feedback to help students understand their successes and how to improve in the future (Hattie & Timperley, 2007), prompting

students to believe in their own capabilities to achieve (Fernandez-Rio et al., 2017) and consequently increasing their self-beliefs (Oldham, 2018). VPF communicates the teacher's approval of the student's effort and emphasizes a particular beneficial learning behaviour (Blaze, 2013). Using VPF, teachers can simultaneously influence individual students' self-beliefs through verbal persuasion (Asakereh & Yousofi, 2018) and groups of students' self-beliefs through vicarious experience (Peiffer, Ellwart, & Preckel, 2020). Thus, VPF can be a powerful tool to encourage the development of self-beliefs.

VPF provides verbal persuasion by directing personal comments to a specific student (Asakereh & Yousofi, 2018), praising positive learning behaviours, and giving feedback aimed to persuade the student they have the capability, effort, and perseverance to achieve (Bandura, 1994). Verbal persuasion can boost task participation while possibly simultaneously raising self-beliefs (Question-1) and task-value (Question-2), as the feedback aspect of VPF indicates how effort can help produce success (Oldham, 2018). However, when verbal persuasion precedes failure, any increase in self-beliefs tends to be temporary, causing an unrealistic inflation of self-beliefs which does not match the students' skill level (Sorrenti et al., 2018).

VPF produces vicarious experiences when students overhear VPF directed to others and compare their perception of their own attainment to the receiving student's (Peiffer, Ellwart, & Preckel, 2020). When students perceive their attainment is at least in line with the student receiving the VPF, the task appears achievable, raising self-beliefs (Chen et al., 2013). Students with lower self-beliefs can be more influenced by vicarious experience than those with higher self-beliefs (Zelenak, 2020), possibly as students with lower self-beliefs have limited experience of success. However, as vicarious experience depends on students' perceptions and interpretations of their own and peers' attainment

rather than assessment-based attainment, teachers have less control over vicarious experiences than verbal persuasion (Asakereh & Yousofi, 2019). Consequently, there is increased scope for adverse influences which can hinder formation of positive self-beliefs, especially when proceeded by failure through over-inflated self-beliefs (Simonsmeier et al., 2020). However, teachers can try to mitigate this through providing specific and appropriate VPF, mindful not only of the influences on the intended recipient but also those around them (Peiffer, Ellwart, & Preckel, 2020).

Nevertheless, an increase in self-beliefs stemming from either verbal persuasion or vicarious experience alone is likely to be limited and temporary (Oldham, 2018) as the two elements often influence each other (Miyauchi, 2019), suggesting both are simultaneously required to have a noticeable influence on self-beliefs. Additionally, both verbal persuasion and vicarious experience are social environmental influences (Wong, 2007), and hence are difficult to consider as independent influences on self-concept or self-efficacy formation. Therefore, verbal persuasion and vicarious experience are considered as a single influence within this study.

2.4.1: Reactions to verbal praise and feedback (VPF)

Students can react positively or negatively to VPF. When students feel proud of the social recognition received, the associated positive feelings produce a shift towards a desired behaviour, increasing students' willingness and motivation to repeat the behaviour in the future (Ware, 1978). However, for some students VPF can be uncomfortable and embarrassing if they dislike teacher attention, possibly feeling humiliated or awkward

when the teacher evaluates them in front of their peers, and subsequently perceiving VPF as a punishment (Blaze, 2013). If this embarrassment is observed by others, it can influence others to feel the same and may reduce classmates' wish for VPF and repetition of the desired behaviours (Blaze, 2013), causing a possible decrease in self-beliefs. VPF is thus influenced by the social reaction of peers in addition to the VPF content. Negative reactions of embarrassment to VPF are commonly more prevalent in students with low self-beliefs (Lam, Yim, & Ng, 2008), although students with high self-beliefs are not immune to the detrimental effects of VPF which can increase the pressure continuously to perform to a high standard (Amemiya & Wang, 2018). Given this fine balance between positive or negative classroom reactions to VPF, understanding and implementation of VPF are especially important.

2.4.2: Implementation of verbal praise and feedback (VPF)

A teacher's intention when using VPF is usually to inspire and/or reinforce students' positive learning behaviour (Szumski & Karwowski, 2019). However, VPF's effect on a student's self-beliefs can depend on their susceptibility to VPF. Susceptibility is often heightened when the provider of VPF is a credible source believed to be providing authentic and sincere VPF, such as a teacher (Henderlong & Lepper, 2002). Specificity of VPF can also influence susceptibility; generalised statements which students have heard multiple times have limited influence (Hattie & Timperley, 2007). Therefore, VPF should be purposeful and provide specific praise for success coupled with feedback focused on improvement through a particular effort-based learning behaviour which students can reproduce in the future (Petty, 2004). VPF can positively influence perseverance through

generating incremental increases in self-beliefs (Dickhäuser et al., 2017). VPF "operates inside an existing social network within the classroom" (Blaze, 2013:33), and therefore the classroom environment often also contributes to VPF's effectiveness.

2.5: Summary of research

This literature review was specifically centred around four initial questions regarding self-beliefs in the mathematics classroom. Responses to these questions from the literature are summarised below.

2.5.1: What are self-concept and self-efficacy?

A student's self-concept is their perception of their attainment level (Arens et al., 2016), mainly formed through social comparisons (Peiffer, Ellwart, & Preckel, 2020). Self-concept is usually past orientated (Bong & Skaalvik, 2003) and most research suggests a hierarchical structure (Shavelson, Hubner, & Stanton, 1976; Klapp, 2018), with mathematics self-concept usually operating in the mathematics domain of the hierarchy (Bong and Skaalvik, 2003). A student's level of self-concept shifts throughout their educational journey to become gradually more aligned with their actual attainment (Arens et al., 2016), increasing in stability (Brown & Cairney, 2020).

Self-efficacy is a student's perception of their chance of success (Carpenter & Clayton, 2014), largely formed through self-comparison to previous similar successful tasks

(Schunk & DiBenedetto, 2016). Self-efficacy is future orientated, focusing on completion of current and future tasks (Bong & Skaalvik, 2003). Self-efficacy's structure and how it shifts with age are both highly debated. It is therefore not possible to predict with confidence how self-efficacy is likely to behave at a certain point in a student's educational journey.

2.5.2: What factors are thought to influence self-concept and self-efficacy?

Differences between self-concept and self-efficacy are evident in the definitions given above, for example their time orientation. Social comparison is another characteristic that differs. Self-concept relies heavily on social comparison to others of the same perceived attainment (Peiffer, Ellwart, & Preckel, 2020), whereas self-efficacy is more influenced by self-comparisons with previous successes in similar tasks (Schunk & DiBenedetto, 2016). Social comparison is therefore less relevant, except in certain circumstances, such as when success criteria are perceived as unclear (Carmona et al., 2008). In both constructs social comparison can be upwards or downwards, with both able to influence self-beliefs positively and negatively. Differences are also observed between self-concept and self-efficacy in their gender bias. Self-concept is generally higher in males (Leibham, Alexander, & Johnson, 2013), whereas the relationship between gender and self-efficacy is debated.

As self-efficacy is future orientated and thus based on uncertain future events, it is not stable for a long period (Kaskens et al., 2020), whereas the global hierarchical structure of self-concept indicates self-concept's stability. Moulding self-concept can require

simultaneous shifts in multiple, existing deeply-rooted self-concept beliefs across the hierarchical structure (Wigfield et al., 1997). However, for mathematics self-concept, which exists at a lower level in the hierarchical structure, fewer simultaneous shifts are required, suggesting mathematics self-concept could be malleable (Zlatković et al., 2012), similar to self-efficacy.

Similarities are also observed with achievement. Both self-concept and self-efficacy hold positively correlating relationships with mathematics achievement (Cvencek et al., 2018; Burns, Crisp, & Burns, 2020). Which construct is the driving force behind increased achievement is particularly difficult to distinguish and often debated as the constructs can often be interlinked (Bong & Skaalvik, 2003; Marsh et al., 2019).

2.5.3: How do self-concept and self-efficacy influence students' learning?

Both constructs influence multiple areas of a student's education, with the extent of influence depending on the student's self-concept and/or self-efficacy levels (Schöber et al., 2018; Nandika, 2020). These tend to be primarily influenced by regular exposure to success or failure (Schunk & DiBenedetto, 2016), with regular experiences of failure decreasing self-beliefs (Vancouver, Thompson, & Williams, 2001; Nelson et al., 2019). Consequently, teachers should aim to raise student self-beliefs through increasing recognition of success (Fernandez-Rio et al., 2017).

Self-beliefs can impact task participation, which students evaluate first by considering expectation of success (Question-1, self-beliefs evaluation), and only if affirmed proceeding to Question-2 to assess task-value (Eccles et al., 1993; Rueda, 2011; Al-

Harthy & Aldhafri, 2014). Therefore, task participation often depends on students having the self-beliefs to succeed, as without these there may be no subsequent evaluation of task-value and limited or no task participation (Al-Harthy & Aldhafri, 2014). Hence self-concept and self-efficacy beliefs can be considered key constructs when looking to encourage students to participate in learning. Another important theme is how students respond to failure, as self-beliefs play a critical role. Students with higher self-beliefs generally attribute their failure to controllable factors and therefore view failure as a learning opportunity (Simpson & Maltese, 2017). Students with lower self-beliefs instead often attribute failure to uncontrollable factors, developing pessimistic views and heightening their vulnerability to future failures (Henry et al., 2019). High self-beliefs also usually indicate students are more likely to persevere at a task through implementing higher effort (Wong, 2016), providing more opportunities for recognition of success. Finally, some researchers believe self-beliefs can increase help-seeking (Girli & Öztürk, 2017), allowing students greater opportunity to learn through adaptive help-seeking (Ryan, Patrick, & Shim, 2005). However, Amemiya and Wang (2017) found the relationship is reversed, with help-seeking influencing self-beliefs.

2.5.4: How could self-concept and self-efficacy be increased?

This present study aimed to influence self-beliefs positively through an intervention utilising VPF, discussed in more detail in Chapter 3. VPF can help to increase self-beliefs by highlighting positive success, persuading students they have the competence and attainment to be successful (Chen et al., 2013; Bandura, 1994). VPF can influence both the individual student targeted through verbal persuasion (Asakereh & Yousofi, 2018) and

their peers through vicarious experiences (Peiffer, Ellwart, & Preckel, 2020). Verbal persuasion is more easily controlled by the teacher as it is tailored towards a particular student (Asakereh & Yousofi, 2019), while influences of vicarious experiences can vary depending on a student's perception of their own attainment and their peers' (Peiffer, Ellwart, & Preckel, 2020). Therefore, to provide the best environment to raise self-beliefs, teachers should consider the influence of VPF on individually targeted students as well as on those around them. For VPF to have a noticeable influence, it is suggested both verbal persuasion and vicarious experiences should be implemented simultaneously (Miyauchi, 2019). In addition, VPF should be implemented in a sincere, concise, and task-centred way, with praise focusing on success and any feedback being improvement based (Henderlong & Lepper, 2002; Hattie & Timperley, 2007). This minimises embarrassment and thus helps to raise self-beliefs, as VPF is further influenced by students' reactions: if positive, their self-beliefs are more likely to increase (Ware, 1978); if negative then self-beliefs are more likely to decrease (Lam, Yim, & Ng, 2008).

2.6: Research questions

Self-concept and self-efficacy are both key constructs in education, influencing students' perseverance, task participation, response to failure and help-seeking, all of which affect students' learning. Discovering whether self-beliefs can be positively influenced by VPF is important as it could allow teachers to enhance students' education. Therefore, using the insights from this literature review, this present study investigated whether and to what extent increased VPF influenced self-beliefs and consequently students' mathematics

learning, with a focus on Year 10 an important stage in their educational journey. This study's research questions and hypotheses were:

Research question 1: How has increased verbal praise and feedback (VPF) influenced students' self-concept and/or self-efficacy?

Hypotheses 1: Both self-beliefs will show a positive shift as VPF increases, but there is a higher capacity for increase in self-efficacy than self-concept due to its greater malleability and future orientation, which is better suited to a short period intervention.

Research question 2: In what ways did the effects of increased verbal praise and feedback (VPF) on student self-beliefs influence their task participation, response to failure, perseverance, and help-seeking?

Hypotheses 2: As VPF begins to shift student self-beliefs higher:

- task participation will begin to increase, with more students beginning to answer 'yes' to Question-1, resulting in more students progressing to considering Question-2;
- students' attributions of failures will begin to shift from uncontrollable to controllable factors;

- there will be a common trend in the upwards shift of student self-beliefs and perseverance, although it will be difficult to determine which factor precedes the other;

- students will feel more willing to help-seek.

Chapter 3: Methodology

This present study investigates how increased VPF influences self-concept and self-efficacy, and whether there are any impacts on classroom learning. The research design included both quantitative and qualitative data collection tools, such as questionnaires and interviews, which will be explained in greater detail throughout this chapter. This methodology was designed to:

- identify overarching trends in students' self-beliefs (aim 1);
- provide more detailed understanding behind any trends observed (aim 2).

Chapter 3 first explains the current teaching situation, practitioner research approach, ethical considerations, timeline, intervention design, the collaboration undertaken, and participant information before a discussion of the data collection and analysis.

3.1: Current teaching situation

This study was conceived in September 2021 when in-person teaching had restarted after its suspension due to the COVID-19 pandemic, with the expectation this would continue throughout the academic year. However, as the pandemic worsened, restrictions were reimplemented, limiting the opportunities for in-person learning (Kuhfeld & Tarasawa, 2020). Students and teachers had to re-adapt quickly to online teaching methods, with constant uncertainty and fluctuating methods of working. Across the UK overall mathematics achievement was reduced due to a decrease in student engagement in online

learning (Kuhfeld & Tarasawa, 2020), which was mirrored by the majority of The Academy's students. However, a few Academy students who previously had demonstrated lower engagement showed increased engagement, reasons for which may be a topic for future research.

The return to online learning occurred during the planning of this study's intervention, allowing for adaptations. As The Academy's learning simulated in-person learning, with live interaction, this study's intervention itself did not require adaption. Nevertheless, the beginning of the intervention coincided with a reduction in restrictions which allowed the return to in-person learning. However, due to social distancing restrictions, data collection was online, with the questionnaire being conducted via Microsoft Forms and interviews through Microsoft Teams. The initial questionnaire data collection took place during an online lesson while the post-intervention student questionnaire was completed as optional online homework, and in both instances completion rates were consistent.

3.2: Practitioner research approach

This present study takes a practitioner research approach, conducted from my professional perspective as a practising secondary school mathematics teacher. Rather than the development of theory, this study aims to influence student learning through enhancing teaching practice in an area of difficulty (Dana & Yendol-Hoppey, 2020), by offering professional development to the participating teachers and myself through "improving and gaining understanding on how educational theory and practice can be orchestrated to yield productive and beneficial outcomes" (Gutierez, 2019:2). This study employs a five-

phase professional development process inspired by Desimone's (2009) Path Model and Willegems et al.'s (2017) professional development Framework. The five phases are:

1) learning: developing my own personal theoretical understanding and research skills;

2) training: increasing teachers' knowledge of theory and its practical application;

3) intervention: implementing theory through an intervention;

4) reviewing: evaluating the influence on students' learning;

5) sharing: sharing of results.

The first four phases facilitate the untangling of educational complexities present within teachers' daily practices through an intentional systematic review, intervention, and evaluation of authentic classroom data (Dimmock, 2016). This study's research, data and conclusions are context-specific, and therefore less widely generalisable or transferable than other scientific research (Lytle & Cochran-Smith, 2009). Nonetheless phase five is important for teachers within The Academy due to this study's specificity to The Academy and thus its teachers' professional development.

3.3: Ethical considerations

Teachers' 'normal good practice' is to uphold high moral and legal obligations in supporting and developing students (Department of Education, 2011). As this study falls under this designation, a headteacher *modus operandi* (Appendix B) supported the Central University Research Ethics Committee approval (Appendix C). The British Educational Research Association's 'Ethical Guidelines for Educational Research' (2018) and The Academy's guidance were also followed throughout. While providing VPF is part of 'normal good practice' so consent was not required for this study's intervention, informing participants and parents/guardians about the present study was vitally important. Obtaining voluntary informed consent for interviews comprised four steps: firstly, providing information sheets including the option to opt-out without having to provide reasons (Appendix D); secondly, speaking directly to participants and parents/guardians, ensuring information was understood and questions answered; thirdly, obtaining voluntary written informed consent from parents/guardians on behalf of students who as minors are unable to give full consent, and also from participating teachers' (Appendix E). Finally, student participant interviews began with oral confirmation of their voluntary informed consent (Appendix F).

Within practitioner research the dual role as practitioner and researcher is susceptible to ethical difficulties (Lytle & Cochran-Smith, 2009), particularly power-differentials and personal bias. Power-differentials can influence interview responses' validity, as participants may feel compelled to participate when asked by an authoritative figure, removing their voluntary participation (de Leeuw, 1992). Additionally, participants may worry about being critical or say what they think is expected (Mitchell & Jolley, 2021). Although elimination of the power-differential was unlikely as a second independent

interviewer was not available (Cohen, Manion, & Morrison, 2018), multiple steps were taken to mitigate any influence:

- ensuring participants' best interests were at the heart of this study;
- assuring participants of confidentiality and anonymity, except for safeguarding issues which would be reported in accordance with The Academy's safeguarding procedure;
- allowing participants to choose interview times within a week's parameters, helping put participants at ease (Menter et al., 2016);
- observing non-verbal gestures suggesting participant discomfort or wish to withdraw (Powell et al., 2012).

My bias and knowledge of students' personal contexts and background could possibly influence data analysis, reducing the reliability of findings (Menter et al., 2016). To counter this and promote honest and truthful analysis, I planned two safeguards during analysis: my own honesty and integrity to report truthful findings, and a second independent reviewer. This collaboration was intended to increase the reliability of analysis by limiting my subconscious bias unintentionally ignoring unexpected results which conflicted already held ideas (Robson & McCartan, 2016). However, no independent reviewer was available as all teachers approached were overwhelmed by the constantly changing educational landscape during the Covid-19 pandemic. Therefore, I was heavily reliant on my own honesty and integrity to remain open to all results.

3.4: Timeline

Following ethical approval and consent, a timeline was formed. This is summarised in Figure 4 below and detailed in Appendix G.

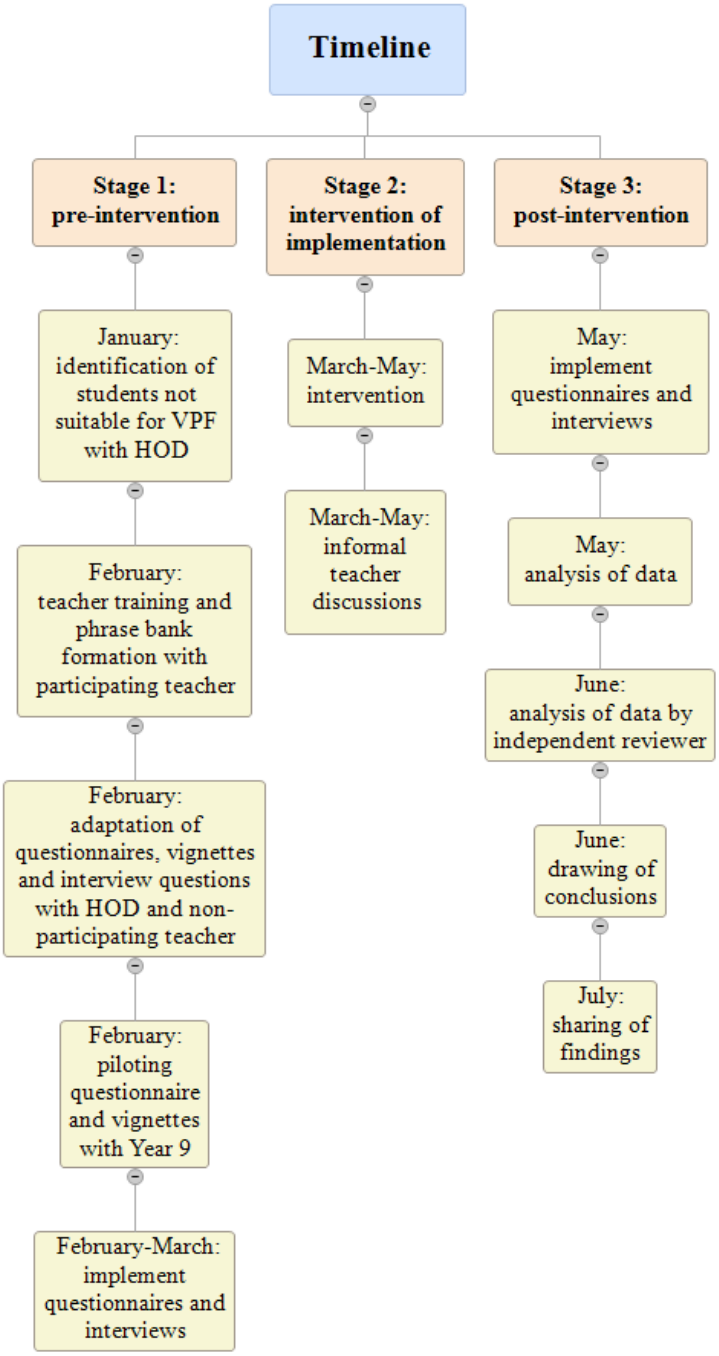

Figure 4: This study's timeline.

3.5: Intervention design

The intervention, which was a core part of this study, was implemented during Stage 2 (Figure 4) when the teachers of two Year 10 classes increased their use of VPF, aiming to raise students' awareness of successes and learning opportunities within lessons. VPF is an ideal strategy for this study as it is low-cost in terms of resources, does not significantly impact teachers' workload and is currently inconsistently and minimally used at The Academy. Observations of Year 10 teachers indicate habitual use of generic praise, such as 'good job' or 'well done'. Therefore prior to the intervention during Stage 1 (Figure 4), training teachers on the role and importance of VPF, its possible influences and its implementation, was vital. Following the training, a phrase bank (Appendix H) of various examples of specific yet concise VPF was collaboratively formed to provide consistency in implementation. During Stage 2, VPF from the phrase bank was given orally, directly commenting on specific positive aspects of students' mathematics workings and/or learning behaviours to ensure students knew what they had done well. This was followed by feedback to identify appropriate next steps and encourage the continuation of these workings/learning behaviours. Throughout Stage 2, informal discussions were held each week with participating teachers to allow insight into teachers' experiences implementing VPF. This enabled support where required and timely discussion of any positives or issues with student reactions to ensure any adaptations could be made as soon as possible. During these informal discussions, I took handwritten notes which were not part of the formal data collection methods but are referred to in the findings where relevant. Both classes were taught the same content throughout this study.

3.6: Collaboration

The practitioner researcher approach facilitated collaboration throughout this study with a variety of partners, outlined in Figure 4 and detailed in Appendix I. Teacher collegial collaboration was possible through our shared vision to provide all students with the best education and our cooperative relationships, facilitating open-ended candid discussions (Kruse, 1999). This study was conceived in collaboration with HOD and HOY 10 and we agreed it would be most beneficial to focus on self-beliefs in two Year 10 nurture classes (Class A and Class B), aligning with my research interests. This collaboration allowed identification of any student unsuitable for participation, ensuring consideration of every student's social and emotional wellbeing.

Collegial collaboration with a variety of teachers was particularly important throughout Stage 1 (Figure 4), enabling fruitful combination of participants' teaching styles to form a VPF phrase bank (Appendix H) for which each participant felt ownership (Bergmark, 2020). This phrase bank clarified the distinction between praise and feedback and was essential to connect research with practice. Additionally, collegial collaboration in Stage 1 during the pilot allowed discussion and adaptation of questionnaire statements, vignettes, and interview questions with HOD and a non-participating teacher. This was integral for testing to uncover any adaptations which could unexpectedly produce inaccurate findings and to increase research quality (Malmqvist et al., 2019) and validity (Cohen, Manion, & Morrison, 2018). No data were collected from the pilot to enable truthful reflection and development of data collection tools (Malmqvist et al., 2019). During Stage 2, collegial collaboration facilitated open and honest informal teacher discussions regarding VPF and phrase implementation, issues, improvements, or support where required. Further details regarding collaboration are discussed in Chapter 5.

3.7: Participant information

The 24 student participants, aged 14- to 15-years-old, were from two lower attaining Year 10 mathematics classes (Class A and Class B). The participants belonged to 12 different minority ethnic groups and 66% were males (Appendix J). All students received this study's intervention and participated in the questionnaires, with eight students being interviewed (62% male).

Participating teachers were the 2020-2021 mathematics teachers of Class A (Teacher-1) and Class B (Teacher-2). Both teachers are female and of White British ethnicity, and I am the teacher of Class A. Both participating class teachers had strong beliefs their students could succeed prior to this study. Ethical considerations were discussed above in section 3.3.

3.8: Data collection procedures

Due to the subjective nature of self-beliefs and the practitioner research approach, this study required a mixed methodology of quantitative and qualitative research methods. Quantitative research methods provide observations of trends through numerical analysis, aligning with aim 1, while qualitative research methods provide a more detailed approach, exploring deeper understanding behind quantitative results (Cohen, Manion, & Morrison, 2018), aligning with aim 2. The mixed methodology approach was particularly important as quantitative research methods can sometimes produce limited data on self-beliefs (Guest, 2018). Mixed methods increase reliability, avoiding exclusive reliance on one

method to mitigate result bias, and boost researchers' confidence by allowing triangulation of data collection (Cohen, Manion, & Morrison, 2018).

3.8.1: Self-reporting procedures

Data were produced through self-reported questionnaire and self-reported verbal interview responses. Self-reporting enables the collection of subjective data (Winne, 2020), especially for variables not always directly observable such as self-beliefs. However, the reliability of self-reporting can be questioned as it depends on participants' situational interpretation which can be misinterpreted and/or modified (Fadnes, Taube, & Tylleskär, 2009), reducing response reliability. To mitigate this, asking the interviewees to focus on this academic year shortened the recall period to increase accuracy (Althubaiti, 2016), and the careful establishing of an open interview environment, discussed in section 3.8.3, enabled free discussion about failures as well as successes (Fadnes, Taube, & Tylleskär, 2009).

3.8.2: Quantitative research method: student questionnaires

Questionnaires were used to evaluate self-beliefs, in line with many of the studies reported in the literature review, and are generally considered more reliable than interviews as their anonymity encourages more honest responses (Cohen, Manion, & Morrison, 2018). The questionnaire implemented was divided into six sections identified from the literature review and mapped to the research questions (Table 2); the first two sections focused on

the constructs of mathematics self-concept and self-efficacy linked to research question 1, while the remaining four sections concentrated on key themes, linked to research question 2, influenced by self-concept and self-efficacy which could influence classroom learning. Several questionnaires were reviewed before selecting the Self-Descriptive Questionnaire-III (SDQ-III), originally devised by Marsh and O'Neill (1984), and Motivated Strategies for Learning Questionnaire (MSLQ), originally devised by Pintrich et al. (1991), as these are considered among the best tools' for evaluating self-concept and self-efficacy respectively. Statements from both questionnaires were combined to form the basis of this study's questionnaire (Appendix K) for five of the six sections (Table 2) as no available questionnaires considered these elements simultaneously. The response to failure theme statements were specifically written for this study as no available questionnaires focus on this in education.

Table 2: Questionnaire themes mapped to research questions and original questionnaires.

<table>
<tr><th>Research question</th><th>Questionnaire constructs/themes</th><th>Original questionnaire</th></tr>
<tr><td rowspan="2">1</td><td>Self-concept</td><td>SDQ-III</td></tr>
<tr><td>Self-efficacy</td><td rowspan="4">MSLQ</td></tr>
<tr><td rowspan="3">2</td><td>Task participation</td></tr>
<tr><td>Perseverance</td></tr>
<tr><td>Help-seeking</td></tr>
<tr><td></td><td>Response to failure</td><td>None available</td></tr>
</table>

The SDQ-III and MSLQ were adapted for several reasons. From my knowledge of students reading ages provided by the HOY 10 (Appendix J) and my personal teacher expertise of working with these students in mathematics classrooms, I was aware that the wording of statements might cause confusion. Statements were therefore adapted to ensure accessibility across all reading ages and to avoid phrasing appearing alien to UK students, limiting misinterpretation (Aubusson, Ewing, & Hoban, 2009). The number of statements were also reduced to prevent answering from becoming onerous and possibly encouraging students to rush the answering process, lowering the accuracy of responses.

The inclusion of negative statements increases the cognitive validity (Cohen, Manion, & Morrison, 2018) but may also cause confusion as they differ from most questions, decreasing the questionnaire's reliability (Józsa et al., 2014). To limit impact on reliability, students were advised about the inclusion of negative statements before beginning and the questionnaire was implemented, allowing students to ask questions to alleviate misunderstanding (Cohen, Manion, & Morrison, 2018). As the questionnaire was tailor-made and therefore less reliable than already tested and reviewed methods (Malmqvist et al., 2019), piloting was required, increasing questionnaire validity. It was piloted in one lower attaining Year 9 class of 12 students, which resulted in refining the wording to limit ambiguity. The questionnaire was formatted for use across various devices to ensure accessibility, and Microsoft Forms randomly ordered the questions, eliminating researcher bias through particular question order (Cohen, Manion, & Morrison, 2018).

3.8.2.1: The Likert scale

Likert scales are generally considered an appropriate instrument for measuring self-beliefs due to their consistency (León-Mantero et al., 2020) and ease of completion (Edwards & Talbot, 2014). As participants usually avoid the two extreme points at either side, possibly masking true responses (Cohen, Manion, & Morrison, 2018), a nine-point Likert scale was chosen, becoming more akin to a seven-point Likert scale. The nine-point scale allowed a more detailed response than five- or three-point Likert scales due to the direct relationship between degrees and response accuracy (Marsden & Wright, 2010), while remaining a sufficiently compact scale for practical use and the identification of overarching trends (aim 1).

The Likert scale enabled transferral from worded to numerical scoring (Table 3) to identify trends (Cohen, Manion, & Morrison 2018), aligning with aim 1. Before analysis, negatively worded statement scores were inverted to allow comparison with positively worded statements (Marsh & O'Neill, 1984); for example, a score of '2' was inverted to '8'. However, the weighting assigned to degrees cannot be assumed to be consistent between students - one student's response of 'agree' does not necessarily align with another student's - decreasing the reliability of results. It was not possible to mitigate this due to the small participant size (Cohen, Manion, & Morrison 2018), so while data generated were consequently relatively crude, they were nonetheless suitable for identifying overarching trends, aligning with aim 1.

Table 3: Numerical scoring of responses to the questionnaire.

Likert scale wording	Very strongly disagree	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree	Very strongly agree
Numerical scoring	1	2	3	4	5	6	7	8	9

Microsoft Forms decreased the data entry time as manual entry was not required. Prior to analysis, an Academy administrator removed identifying personal data from the questionnaire, replacing this with a code to provide anonymity. Anonymisation was completed directly after data collection to allow questionnaire analysis to begin immediately and for interview question adaptation based on questionnaire responses.

3.8.2.2: Implementation sheets

Teachers were provided with a questionnaire implementation pack (Appendix L) including: 'teacher guidance' explaining the implementation, possible questions, and suggested responses; an 'implementation speech' to read to students when introducing the questionnaire and a 'how to answer' presentation. This limited teachers' influence through

signalling ‘correct’ responses (de Leeuw, 1992) and ensured uniformity and consistency across questionnaire implementation. Communication to teachers and students emphasised the anonymity of responses. Another staff member administered the questionnaire to my class, eliminating any bias I may have.

3.8.3: Qualitative research method: student interviews

Student interviews are purposeful conversations to enable deeper understanding into students’ perspectives by adding context to quantitative data in students’ own language (Menter et al., 2016), aligning with aim 2. Although individual interviews can reduce response range, discussions, and topical conflicts, they were nonetheless chosen to facilitate openness about personal and sensitive topics (Kruger et al., 2019). Furthermore, individual interviews can prevent peer influences which may discourage different views and compromise response reliability (Cohen, Manion, & Morrison, 2018). An open environment was further encouraged during online interviews by asking students to choose a private location.

During all interviews it was important I built a rapport with interviewees, by expressing genuine interest in responses through my use of physical body language and gestures, such as maintaining eye contact and smiling (Pitts & Miller-Dau, 2007), possible through Microsoft Teams. I endeavoured to view students’ answers from their perspective and avoided posing leading questions from a position of authority (Cohen, Manion, & Morrison, 2018). This aimed to prevent students feeling they had to justify themselves (Leeson, 2014) or provide responses they may not have otherwise made (Edwards &

Talbot, 2014), skewing the results and reducing response reliability. I tried to enter each interview without preconceived ideas and to ask each question in the same way, mitigating researcher bias. To increase the reliability and validity of results further, I employed silent pauses where appropriate to enable interviewees to express themselves fully without my influencing their perspective (Rezmer et al., 2020). Some interviews contended with internet inconsistencies, occasionally delaying communication speed and interrupting the flow of conversation. Although this was uncontrollable, implementing silent pauses mostly mitigated the impact. Due to student hesitancy regarding video recording, only audio was recorded.

3.8.3.1: Vignettes

The interviews consisted of vignettes followed by open-ended questions. Vignettes were chosen to help students express their self-beliefs as this can be difficult (Stravakou & Lozgka, 2018). The vignettes (Appendix M) drew upon my personal teacher expertise from working with these students in the mathematics classroom and were specifically created to simulate real-life classroom events as a story in accessible language (Skilling & Stylianides, 2020). The interview structure mirrored the questionnaire structure, with one vignette and associated questions created for each theme, directly mapped to the research questions (Table 4), enabling detailed understanding behind any trends observed in quantitative data (aim 2). This structured approach increased reliability through mitigating against accidental omission of topics and irrelevant discussion hindering response comparability (Cohen, Manion, & Morrison, 2018). The vignettes combined with the associated questions elicited deeper responses than questions alone through

provoking open-ended discussion (Skilling & Stylianides, 2020). Interviews began with the reading aloud of vignettes to accommodate for students' higher level of spoken comprehension than reading comprehension, followed by silent thinking time, before posing the associated questions. Discussions of the vignettes with teachers condensed wording and removed ambiguities, raising vignette validity. These changes resulted in successful piloted interviews with four low attaining Year 9 students, who were all able to access and discuss the content and meaning of the vignettes.

Table 4: Vignettes mapped to research questions.

Research question	**Vignette construct/theme**
1	Self-concept
	Self-efficacy
2	Task participation
	Response to failure
	Perseverance
	Help-seeking

3.9: Data analysis

3.9.1: Analysis tools

Excel and Sonocent Audio Notetaker facilitated management of the data. Excel ran descriptive statistic calculations while audio thematic coding was inputted in Sonocent Audio Notetaker. These tools facilitated identification of shifts and trends within the data.

3.9.2: Quantitative data analysis: student questionnaires

Mean, median and standard deviation scores were calculated for each statement and overarching theme (similar to Hammoudi's 2020 study). The median analysis allowed identification of overarching shifts in self-beliefs, with the integer values limiting the visibility of more subtle shifts, which were detected using decimal values within the mean analysis. The latter was important due to the short time period of this study's intervention where shifts may be more subtle. Standard deviation was also calculated to understand shifts in the range of responses pre- and post-intervention.

3.9.3: Qualitative data analysis: interviews with students

Thematic coding was chosen as it provides a detailed systematic method of identifying and analysing themes through connecting data and themes (Saldaña, 2021). All themes

were deductively identified and mapped directly to the specific research questions, constructs, and themes (Appendix N) generated from the literature review, aligning with aim 2. As there were multiple interviews, each over 20 minutes, it was not practical to transcribe the interviews fully nor necessary due to the coding approach. The coding took three steps, becoming progressively more granular (Figure 5). Step 1 divided data into two overarching questionnaire and interview themes: the first being self-concept or self-efficacy and the second either task participation, response to failure, perseverance, or help-seeking. If responses were categorised into self-concept or self-efficacy, Step 2 then identified whether they presented as high/medium/low. Step 2 differentiated other responses for each theme into either self-concept or self-efficacy, and then Step 3 whether the response was high/medium/low. A different colour was assigned to each theme and shaded according to strength of presentation, and key words and phrases were identified. This coding method helped thorough analysis of the data and the drawing of appropriate conclusions.

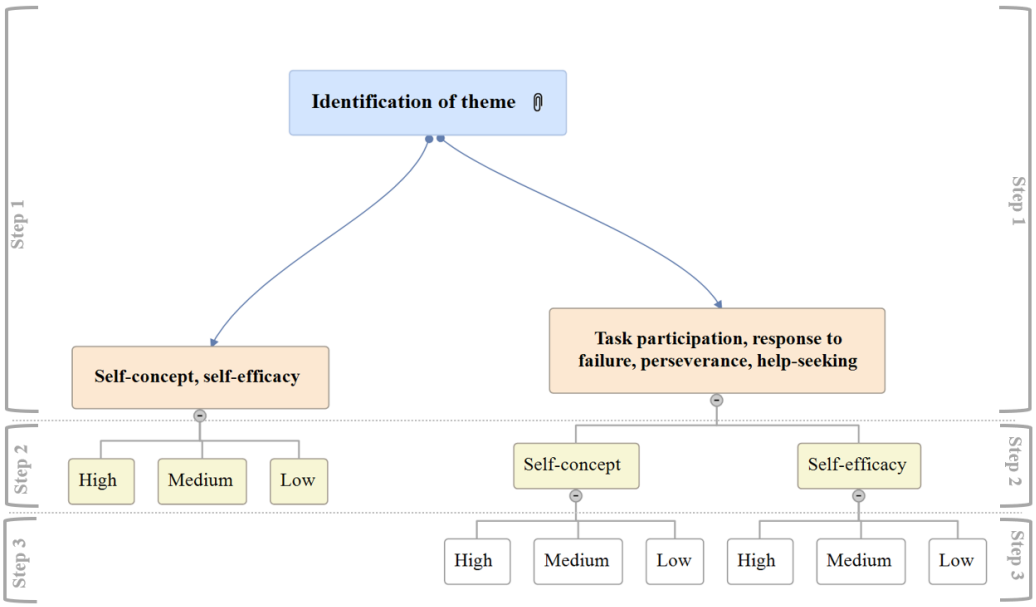

Figure 5: Thematic coding steps.

3.9.4: Non-controllable variables

During analysis it was important to be aware of non-controllable variables which could diminish the results' validity, such as students' previous exposure to praise or missing data. There was no satisfactory way to address missing data without considerable impact on this small-scale study. No students withdrew but some missed the initial data collection lesson due to illness. I therefore expanded the data collection period from one lesson to the whole week, successfully enabling full data capture. Consequently no missing data hindered the results' validity, but it might have decreased due to participants completing questionnaires and interviews at different times (Cohen, Manion, & Morrison, 2018).

3.10: Validity and reliability

While threats to validity and reliability cannot be entirely mitigated, they can be reduced by study design and organisation (Cohen, Manion, & Morrison, 2018). From the literature reviewed, I identified two constructs (self-concept and self-efficacy) and four themes (task participation, response to failure, perseverance, and help-seeking) and made these central to the planning of this study's intervention, data collection and analysis to ensure consistency throughout. Firstly, two research questions were formulated to link with these constructs and themes: research question 1 focuses on self-beliefs while research question 2 on the four themes. Secondly, two established, well-known questionnaires (SDQ-III and MSLQ) were selected and adapted to align with these constructs and themes. The reliability and validity of both questionnaires have been individually tested across multiple studies, such as Hammoudi's (2020) and Ma, Maleki, & Jaberghaderi's (2020), increasing the reliability and validity of this study's questionnaire. Thirdly, vignettes and follow-up questions were purposefully constructed for each construct and theme, raising

the reliability of results, and supporting construct validity. This study's construct validity was further enhanced by utilising the same questionnaire and interview structure during pre- and post-intervention data collection, enabling direct comparison of responses when analysing results (Cohen, Manion, & Morrison, 2018). The use of questionnaires and interviews as data collection procedures were complimentary, as the questionnaire provided observations of trends (aim 1) while the interviews provided deeper understanding behind quantitative results (aim 2) (Cohen, Manion, & Morrison, 2018). Finally, data analysis was also aligned with the construct and themes. Thus, the use of constructs and themes throughout this study increased consistency and reliability.

Chapter 4: Findings and discussion

Findings are presented in relation to the two research questions formed to investigate the ways in which VPF influences students' self-concept and self-efficacy beliefs and their mathematics classroom learning. Research question 1 is differentiated into self-concept and self-efficacy constructs and research question 2 separated into the themes of task participation, response to failure, perseverance, and help-seeking - all themes initially identified from the literature review. The findings combine the most relevant responses from both quantitative questionnaire results and qualitative interview responses, providing rich data for discussion of each research question. To aid ease of comparative viewing, a condensed visual representation of the possible links between research questions, constructs and themes is presented in Appendix N. Throughout this chapter graphs visually represent the questionnaire data, facilitating comparison between pre- and post-intervention median, mean and standard deviation scores, provided numerically in Appendix O. Appendix K lists questionnaire statements.

4.1: Research question 1: How has increased verbal praise and feedback (VPF) influenced students' self-concept and/or self-efficacy?

4.1.1: Self-concept and self-efficacy

Analysis of median scores of self-concept and self-efficacy revealed a constant median score of 4 for self-concept both pre- and post-intervention, and an increase from 4 to 5 for

self-efficacy (Figure 6). Within this median analysis only self-efficacy increased through the implementation of VPF, possibly as self-concept is considered less malleable (Shavelson, Hubner & Stanton, 1976; Klapp, 2018). During both pre- and post-intervention interviews, seven of the eight students interviewed repeatedly referred to historical self-concept beliefs formed throughout their educational journey, despite being asked to focus on this academic year alone, emphasising a strong past orientation of self-concept beliefs (Bong & Skaalvik, 2003). This suggests an ingrained sense of self-concept stemming from several, deeply-rooted instances of educational social comparisons (Wigfield et al., 1997), likely contributing to students' strong and relatively stable self-concept. This was unexpected as it is generally thought that students only fully stabilise their self-concept in late adolescence (Brown & Cairney, 2020), hence some shift in self-concept was hypothesised; however, it appears self-concept was too established to show any material impact on the median score though this study's short period intervention. Thus, VPF may need more time to overcome the deeply rooted social comparisons that influence students' self-concept.

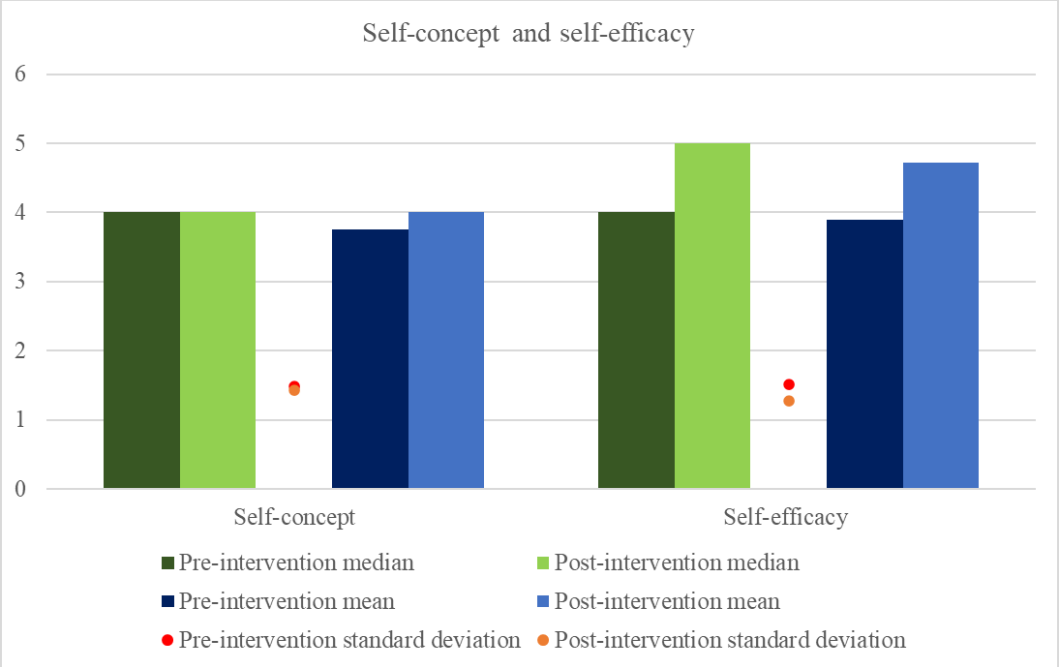

Figure 6: The median, mean and standard deviation scores for self-concept and self-efficacy comparing pre- and post-intervention questionnaire results.

As this study hypothesised, self-efficacy increased post-intervention, in line with findings that self-efficacy can be positively moulded by Zimmerman and Matinez-Pons (1990) and Lau et al. (2018). Self-efficacy's ability to be moulded over this study's short period VPF intervention could be due to its future orientation (Bong & Skaalvik, 2003). This was observed in students' future tense responses: "I know I will be able to answer rounding questions as I got them right last lesson" (Student-4). The past orientation of social comparisons which influence self-concept appear to be more deeply embedded than the future orientation of students' self-comparisons with prior task experience which influence their self-efficacy. While the findings of the aforementioned studies support those of this study, it is not possible to claim direct confirmation because of the differences between variables (age range, participant size etc). Apart from Student-6, all students'

self-efficacy increased, supporting this study's hypothesis that self-efficacy is malleable for Year 10 students and can be positively influenced by classroom VPF.

Due to the Likert integer scale only whole number responses were recorded, limiting the median's ability to display subtle shifts. Therefore, it was important also to consider the mean to identify whether this study's intervention prompted any smaller, more sensitive shifts not initially visible in the median. The small positive shift by 0.2 in the mean self-concept score (Figure 6) could indicate that, while self-concept is more stable than self-efficacy and hence did not increase as substantially, when evaluated in the mathematics classroom domain at the lower-level of the hierarchy structure, self-concept was slightly malleable and possibly becoming susceptible to VPF, similar to Zlatković et al.'s (2012) findings. This supports the claim that self-concept is not fully formed until late-adolescence (Brown & Cairney, 2020), rather than the majority of the research which favours self-concept being formally stable (Shavelson, Hubner & Stanton, 1976; Wigfield et al., 1997; Bong & Skaalvik, 2003). A longer period intervention might discover if Year 10 students can experience more significant self-concept shifts than the minimal shifts observed in this study. Another possibility for further study could be to replicate the same short period intervention with students of lower age groups to ascertain whether a more material increase can be observed for self-concept and/or self-efficacy in younger students.

Analysis of individual statements for self-concept and self-efficacy (Appendix O) highlighted the greatest shifts in statements referring to students' confidence in their capabilities to be successful and to understand mathematics following this study's intervention. In particular, mean scores for responses to SE-statement-1 and SE-statement-5 both increased by 1.2 and 1.5 respectively, both almost three times larger than

the most material mean increase for self-concept statements which was 0.5 (Self-concept (SC) in Figure 7; Self-efficacy (SE) in Figure 8). These results again support the understanding that self-efficacy is constantly adjusting and more malleable than self-concept. This was also observed in the standard deviation for self-concept remaining largely unchanged. The growth in self-efficacy was also reflected in the post-intervention interviews with varying degrees of agreement. Students explained that, while the beginning of lessons remained difficult, they felt more confident that they could understand and complete the topic by the end of the lesson as a result of VPF. Student-3 articulated: the teacher "is saying I have done it right, so I am understanding it easier, so I have to be improving." This suggests VPF helps students notice their success, encouraging them to believe in their own capabilities to be successful (Fernandez-Rio et al., 2017), with a greater positive influence on self-efficacy than self-concept. Thus, this study's findings support its the hypotheses that increased VPF has the potential to raise both self-beliefs and consequently classroom learning. A longer period intervention could explore whether the greater shift in self-efficacy could be mirrored in self-concept. It is possible that, were these shifts to continue over an extended time, mathematics might become less unpopular as students find it easier to understand.

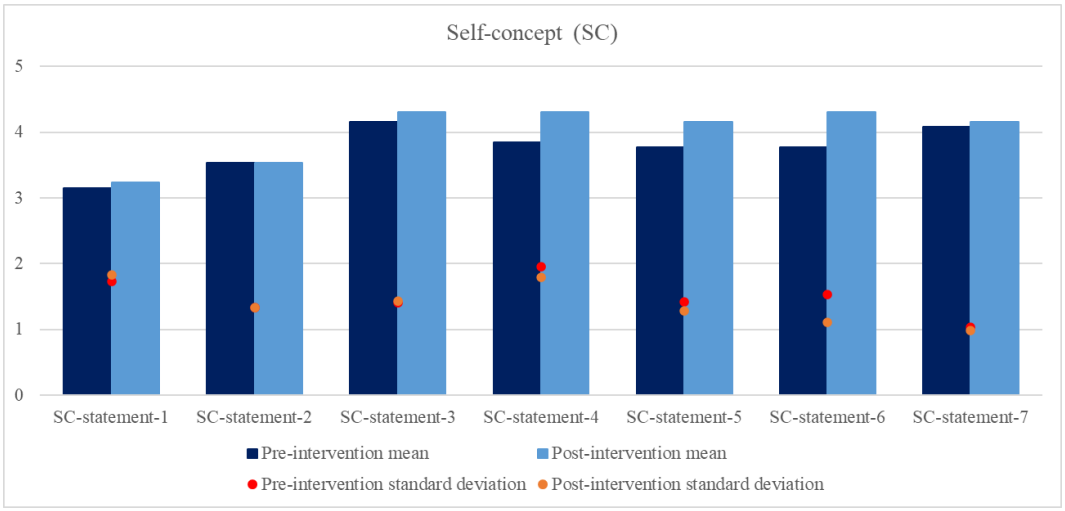

Figure 7: The mean and standard deviation scores for self-concept comparing pre- and post-intervention questionnaire results.

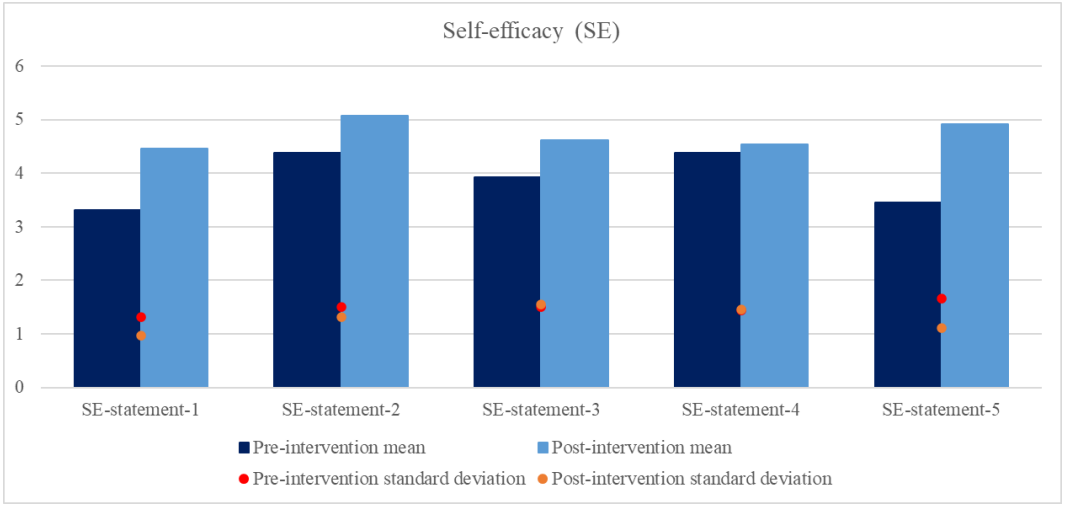

Figure 8: The mean and standard deviation scores for self-efficacy comparing pre- and post-intervention questionnaire results.

4.1.2: Social comparison vs self-comparison

Pre-intervention interviews revealed students were typically performing upwards social comparisons to peers in higher sets. This contributed to student significantly lowered self-concept beliefs as students perceived themselves to be continuously underperforming (Dijkstra et al., 2008). Student-1 stated: "We're the bottom of Year 10! I never get stuff right and those in the top always do," indicating that downwards social comparisons are difficult as students perceive there is no one to compare downwards to (Dijkstra et al., 2008). During the teacher training in Stage 1 (Figure 4) there were frequent discussions about teachers witnessing students make negative upwards comparisons, reducing students' confidence, and hindering their task participation through the use of self-protection strategies predicted by Gibbons et al. (2002). Therefore, pre-intervention neither upwards nor downwards social comparisons were a method for these students to maintain or increase their self-concept (Pulford, Woodward & Taylor, 2018). Interestingly, students' perceptions of their position in the class had begun to shift post-intervention, most evident in Student-1 and Student-2's responses that the VPF received helped them feel better about their mathematics attainment, noticing they were performing better than other students and that they could complete the tasks. This shift from solely negative upwards comparison produced the capacity for beneficial downwards social comparisons which positively influenced students' self-concept, contradicting Bear and Minke's (1996) conclusions. Hence, receiving increased VPF enabled students to focus on their successes, allowing them to view themselves as performing well and shifting their perception of their position in the class, enabling downwards social comparisons to positively influence students' self-concept.

Student-1's shift further developed from a focus on task completion though downwards comparison to also thinking about focusing on improvement as part of upwards comparison, as observed in Bong and Clark's (1999) study. During the post-intervention interview, Student-1 remarked: "I used to work as hard as [student in higher set] and I always failed, but now I know my maths is improving. Maybe I can start trying hard again and get it right." Increased VPF appears to have aided Student-1's shift to viewing upwards social comparisons as a source of improvement, possibly as they displayed one of the greatest increased shifts in self-concept and students with higher self-concept are more likely to perform positive upwards social comparison (Huguet et al., 2009). However, for most students, more time may be required for their completion focus through downwards comparison to heighten their self-concept before they consider upwards comparison as a positive influence, rather than the negative one it has historically been perceived to be.

In contrast, self-efficacy discussions during interviews rarely referenced social comparison, instead focusing on self-comparison. This is possibly due to classroom learning having explicit success criteria, which have been found to provide minimal or limited opportunity for social comparison to influence self-efficacy (Carmona et al., 2008). During pre-intervention interviews, students primarily referred to their perceived task failures. However, post-intervention, students' references shifted to successful tasks completed during this study's intervention, suggesting increased VPF expanded the number of successful tasks students can reference when performing self-comparisons (Schunk & DiBenedetto, 2016) and appears to have positively influenced students' self-efficacy. Thus, the growth in the recognition of success acknowledged through VPF has

positively influenced students' self-efficacy through providing greater references of success to draw on to form belief in their success in current tasks.

4.1.3: Achievement

It was not possible to evaluate the relationship between self-beliefs and formal examination achievement within this present study as students completed their end-of-year examinations following data collection. Additionally, only negligible shifts were observed in questionnaire SC-statement-7 (Figure 7) and SE-statement-4 (Figure 8), addressing any influence self-beliefs had on formal testing. Achievement in this study was therefore evaluated in smaller and less formal scenarios as part of standard Academy classroom learning, such as whiteboard activities, independent tasks, and teacher questioning. Post-intervention interview analysis discovered a consensus among seven out of the eight interviewed students who perceived their achievement as increasing. However, the students differed in their attributions for this shift. Student-2 believed VPF influenced their response to tasks shifting from "Why bother? I always get it wrong!" to "I can do those questions if [student's name] can." This growth in their perception of their attainment through social comparison, and hence their self-concept, corresponds with Kaskens et al.'s (2020) study which found that self-concept had a stronger relationship with achievement than self-efficacy. Contrastingly, Student-4 explained the approval received through VPF on previous tasks helped them to believe they could attempt the current similar task and be successful. This implies that Student-4's self-efficacy has raised their perceived achievement, aligning with Richardson, Abraham, and Bond's (2012) finding that self-efficacy held the dominant influence on achievement over self-

concept. Alternatively, Student-8 said the motivation VPF provided "made me want to start the task and continue trying to get it right," encouraging perseverance to achieve and dissuading from self-protection strategies which were a repeated feature during the pre-intervention interviews. VPF could therefore influence perseverance before self-beliefs, and the subsequent increase in perseverance could influence achievement. This contrasts with the research presented in the literature review and would be an interesting focus for further investigation. Students' different responses to the increased VPF - relating it to their perceived attainment, task success or application of effort – demonstrate that the interpretation of VPF can subsequently influence a student's alliance to self-concept, self-efficacy or perseverance as holding the primary influence on achievement.

4.1.4: Conclusion

Following this study's intervention, students' mathematics self-beliefs positively shifted overall but to varying degrees. Self-concept remained relatively stable; the median score stayed unchanged, and the mean score increased only minimally. This stability seems influenced by students' deeply-rooted social comparisons formed throughout their educational journey, with a simultaneous larger influx of new experiences than provided in this study required for these historical social comparisons to shift further. Nevertheless, the increase in the mean score indicated that, when evaluated in the mathematics domain, self-concept seemed gradually susceptible to VPF. This evidence of malleability contrasts with most research which favours self-concept as stable (Shavelson, Hubner, & Stanton, 1976; Klapp, 2018). Self-efficacy, however, displayed a positive shift in both the median and mean score analysis, possibly as self-efficacy has a future orientation (Bong &

Skaalvik, 2003) and is influenced by uncontrollable future events (Kaskens et al., 2020). Self-efficacy therefore appears more malleable and constantly adjusting in comparison to self-concept, supporting this study's hypothesis. VPF helped students notice their success and enabled them to believe in their own capabilities to be successful (Fernandez-Rio et al., 2017), and the findings support this study's hypothesis that increased VPF has the potential to raise self-beliefs.

Social comparisons shifted from primarily upwards comparisons to include downwards comparisons. VPF helped students notice their successes, shifting their perception of their position in the class, enabling positive downwards social comparisons to influence students' self-concept positively. For Student-1 the shift continued further to include upwards comparisons as a source of improvement. Self-efficacy responses, however, minimally referenced social comparisons, instead focusing on self-comparisons, possibly as classroom learning has explicit success criteria. Students' self-comparison references shifted to successful tasks completed during this study's intervention, instead of previous task failures, indicating that VPF raised students' recognition of their successes. VPF has thus appeared to boost students' references of success to draw on when forming both social and self-comparisons, influencing self-concept and self-efficacy respectively. The relationship between achievement and self-beliefs differed between students, depending on their responses to the increased VPF, relating it to either their attainment (self-concept), task success (self-efficacy), or effort (perseverance). These three relationships demonstrate that students' interpretation of VPF can subsequently affect the primary influence on their achievement.

4.2: Research question 2: In what ways did the effects of increased verbal praise and feedback (VPF) on student self-beliefs influence their task participation, response to failure, perseverance, and help-seeking?

Both self-concept and self-efficacy increased to differing degrees through the implementation of increased VPF and appeared to influence classroom learning positively. It is interesting to note that this study's intervention did not negatively influence any theme overall. There was a positive increase for median and mean scores for perseverance and response to failure themes; help-seeking showed no shift in the median score but a minimal positive shift in the mean score; while task-value remained relatively stable as per the median and mean analysis (Figure 9). The shifts in these themes are discussed in detail below.

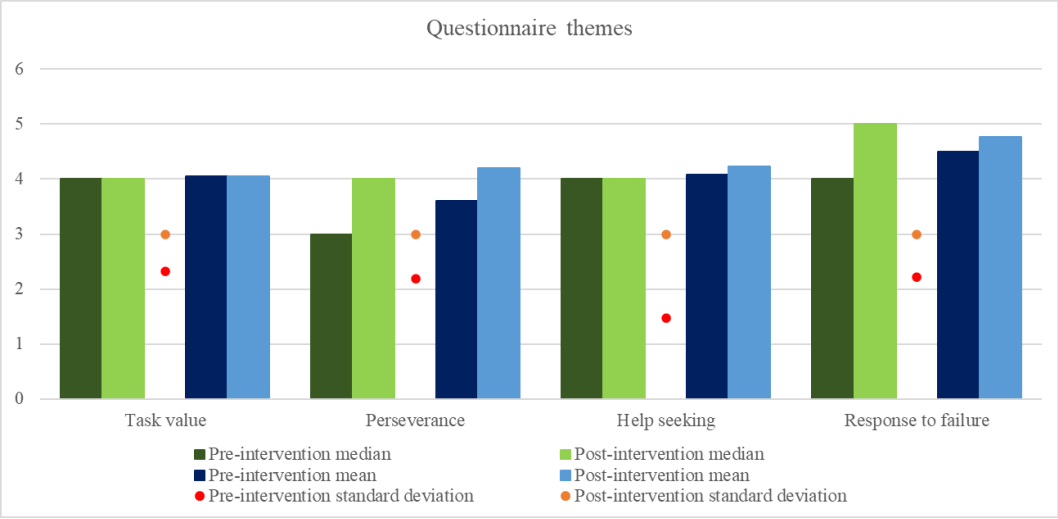

Figure 9: The median, mean and standard deviation scores for questionnaire themes comparing pre- and post-intervention questionnaire results.

4.2.1: Task participation

The literature review noted that task participation is considered dependent on the answers to two questions, Question-1 evaluating self-beliefs and Question-2 assessing task-value (Rueda, 2011). If students answer Question-1 negatively, implying limited self-beliefs, they eliminate consideration of Question-2 (Al-Harthy & Aldhafri, 2014). As this study hypothesised, during pre-intervention interviews all students presented with limited self-beliefs: six students responded negatively to Question-1 and two students answered with outcome-4. In response to Question-1, Student-5 said: "Why should I bother with negative numbers? I've never been able to do them without a calculator and I've been doing them for years. I'm fed up with getting them wrong." Teacher-2 explained her students made the appearance of task participation through self-protection strategies, possibly to self-protect from future failures (Gibbons et al., 2002). Thus, low self-beliefs seemed to hinder students' task participation.

Post-intervention, students' perceptions were beginning to shift, moving beyond Question-1 in more tasks. Of the interviewed students who displayed shifts in self-beliefs, two remained affirmative and five began answering 'yes' to Question-1. Student-5 explained the shift was due to VPF influencing their perception of previous lessons' successes, enabling them to believe it could happen again: "I attempted the bracketed indices task as I thought I may be able to do it, as I got all the multiplying indices right last lesson." Despite students' self-efficacy not being fully formed, their perceptions shifted towards the possibility of being as successful in the current task as they had been in previous similar tasks, enabling progression to task-value assessment. This consequently influenced students' perception of their task participation, with all students except Student-6 perceiving their task participation to have increased minimally and self-

protection strategies decreased. In informal teacher discussions, Teacher-2 agreed, noting she had seen a small positive shift in the amount of work most students were completing. Thus, while task participation remained low, it nevertheless increased, supporting the understanding that task participation requires affirmative self-belief assessment before task-value can be evaluated.

Small positive shifts in self-beliefs are important, as increased task participation provides heightened chances of success and subsequent receipt of VPF, further raising self-beliefs (Vancouver, Thompson, & Williams, 2001; Nelson et al., 2019). This suggests a cyclical relationship, since without task participation it becomes more difficult to increase self-beliefs as there are limited opportunities for success, as observed prior to this study's intervention. Nevertheless, it is important to be aware that mathematics topics taught before pre- and post-intervention interviews were not the same. It is difficult therefore to say if the shift was due to this study's intervention or the students' confidence with the different topics, as post- intervention interviews highlighted students had a particular liking for algebra, valuing its learning more highly than number or geometry topics.

The increase in task participation described above was not present for all interviewed participants. Despite increased VPF, experienced through verbal persuasion and vicarious experiences, Student-6 perceived no self-beliefs shifts, possibly contributing to their unchanged task participation, continuing to answering 'no' to Question-1 and avoiding task-value assessment. I noticed that Student-6 employed self-protection strategies to prevent exposure to future failures (Gibbons et al., 2002), supported by Student-6's post-intervention comment: "I never get stuff right, I'm fed up with it. I don't care. Being in isolation is better, all I do is copying - it's impossible to get wrong." Student-6's strong associations with deeply-rooted negative failure experiences appear to be influencing their

self-concept beliefs (Shavelson, Hubner & Stanton, 1976; Wigfield et al., 1997; Klapp, 2018). These strong self-concept perceptions could have reduced the impact of this study's short period intervention as self-concept is considered more stable than self-efficacy (Shavelson, Hubner, & Stanton, 1976). Consequently, similar students may require a longer period intervention for shifts to occur.

Questionnaire and interview responses related to task-value remained relatively similar (Figure 9), however the weighting given to elements of task-value - usefulness, interest, importance, and effort (Eccles, 1983) - showed shifts. The perceived usefulness of mathematics decreased, whilst importance and interest offset this through an increase, resulting in an overall consistent mean score for task-value (Figure 10). This indicates that increased VPF, and subsequently shifts in self-beliefs, may have influenced students' task-value to become more focused on interest, importance, and effort. Interviews supported this shift, with interest and importance considered equal first, followed by effort. As Student-3 explained: "If I do not enjoy it, I do not want to do it, so I put very little effort in." Student responses suggested the possibility of a more multi-layered process of task evaluation, where Question-2 could be divided into the evaluation of importance and interest and then effort required after assessment of self-beliefs (Question-1), producing varying degrees of task participation dependent on the outcome of each question.

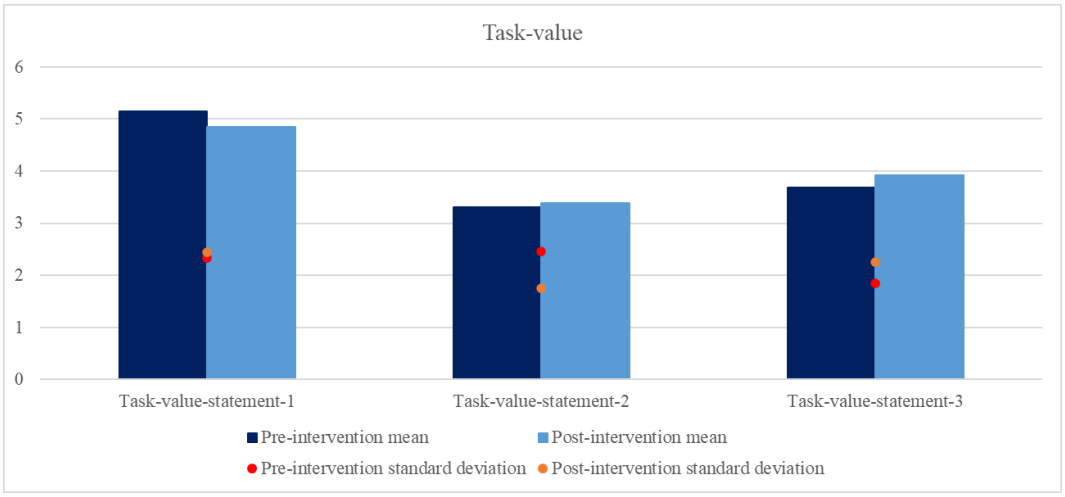

Figure 10: The mean and standard deviation scores for task-value comparing pre- and post-intervention questionnaire results.

4.2.2: Response to failure

As previously discussed, pre-intervention the students implemented self-protection strategies, likely aiming to prevent future failure as they had previously experienced repeatedly failure and now expected it (Nelson et al., 2019). Most students had formed a pessimistic outlook - "getting things wrong makes me look silly" (Student-3) - which subsequently lowered their self-beliefs (Simpson & Maltese, 2017). Interviewed students demonstrated self-protection by attributing failures to uncontrollable factors, such as task difficulty and limited natural ability (Simpson & Maltese, 2017): "if the task is too hard it is not my fault, I can't do it" (Student-8). This attribution places students on a negative downward spiral, where they are more vulnerable to future failures (Henry et al., 2019).

Post-intervention, the attributions of failure by five of the eight students interviewed shifted to being primarily effort-based, a controllable factor which can be influenced by

self-efficacy (Yantraprakorn, Darasawang, Wiriyakarun, 2018), with the mean score increasing by 1.1 in RF-statement-5, the greatest positive shift within this theme (Figure 11). This large positive shift had initially been considered unlikely as pre-intervention these students attributed their failures to lack of attainment (low self-concept) and were therefore expected to be less susceptible to the external influences of VPF (Yantraprakorn, Darasawang, Wiriyakarun, 2018). However, as this study's greatest shift in self-beliefs was in self-efficacy, the shift in attribution of failure to a controllable factor influenced by self-efficacy was not wholly unexpected. Students themselves also noticed that increased effort was beginning to help them succeed: "I tried hard this week and got most of it right" (Student-8). Hence, there seems a link between the shifts in self-beliefs, following increased VPF, and shifts in students' attributions of failures.

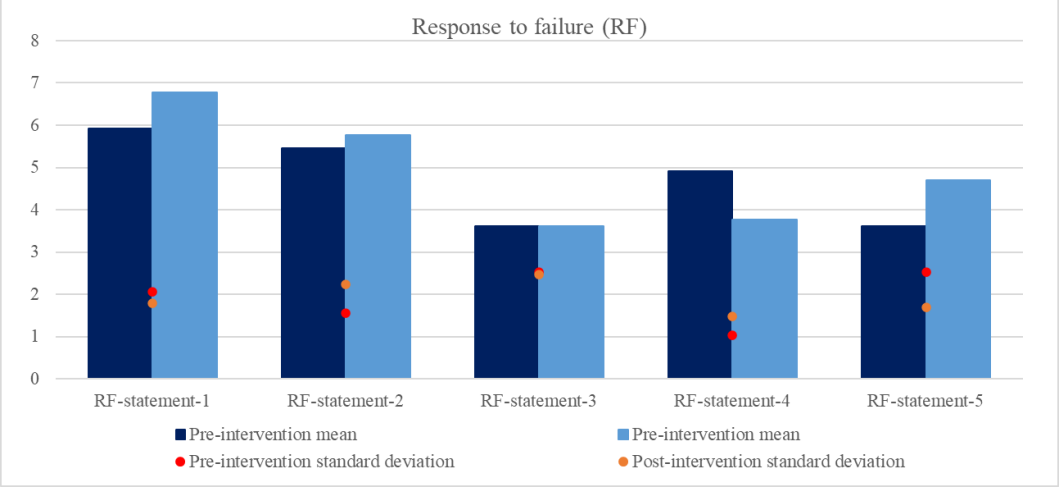

Figure 11: The mean and standard deviation scores for response to failure comparing pre- and post-intervention questionnaire results.

The shift in attribution of failure from uncontrollable to controllable factors developed further in the two students with the highest self-beliefs post-intervention (Student-1 and Student-4). These two students were beginning to interpret their mistakes as learning

opportunities, transferring their attribution of failure to limited knowledge and/or preparation, both controllable factors. Student-4 explained: “When I get it wrong it’s upsetting, but I like finding my mistake as it helps me next time.” While still upset by failure, Student-4 was becoming less afraid of mistakes. This aligns with findings elsewhere that students with higher self-beliefs are more likely to attribute failure to controllable factors as they view failures as learning opportunities (Simpson & Maltese, 2017) and are less afraid of failure (Grassinger & Dresel, 2017).

Despite this move from attributing failure to uncontrollable factors beginning to take place following this study’s intervention, students showed a negative shift in frustration when mistakes were made (RF-statement-4), with a difference of -1.2 between pre- and post-intervention questionnaire mean scores (Figure 11). Student-5 commented: “The more effort I put in, the more I want to get it right, but if I keep getting it wrong, I get upset because I tried really hard.” This was counterproductive as students who associate negative feelings with attributions of failure to controllable factors, may hinder their potential for future growth in self-beliefs. Further repeated failures can cause self-beliefs to decrease (Vancouver, Thompson, & Williams, 2001; Schunk & DiBenedetto, 2016; Nelson et al., 2019) through students expecting failure (Walsh, 2011) as most nurture students did pre-intervention. Teachers can anticipate this tendency and provide support so that feelings of frustration do not hinder students, giving sufficient opportunities to succeed such that failures are not a regular occurrence which overpower positive feelings from students’ success (Schunk & DiBenedetto, 2016). Consequently, while VPF can allow students to attribute their failures to more controllable sources, and thus raise their self-beliefs, this can also lead to increased frustration if VPF is not maintained through recurring successes in class.

4.2.3: Perseverance

Pre-intervention all students held low self-beliefs, possibly aiding in fostering extremely low perseverance. They perceived mathematics as "too difficult" (Student-4) and expected failure, consequently having minimal incentive to persevere, similar to findings by Walsh (2011) and Usher et al. (2019). Students were self-protecting to prevent exposure to failure as discussed above. Post-intervention, perseverance median and mean scores increased by 1 and 0.6 respectively (Figure 9). Apart from Student-6, whose self-beliefs and perseverance remained relatively stable, all students during post-intervention interviews perceived a raise in their perseverance. Informal teacher discussions supported this: I mentioned that Student-3 had started to give up less quickly and was trying to get the question correct. This positive shift in perseverance was particularly noticeable in Student-3's amount of effort implemented (perseverance-statement-1) and time spent on a task (perseverance-statement-3). Both perseverance-statement-1 and perseverance-statement-3's mean scores increased by 1.1, the largest positive shift within this theme (Figure 12). Post-intervention interviews supported this marked shift in perseverance but the influence for the increase was debated. Student-1 and Student-4, who displayed the greatest increase in self-beliefs, explained that their raised self-beliefs helped positively influence their perseverance - "I could do it because I did it last lesson" (Student-4) - and therefore they persevered for longer. This confirms Simonsmeier et al.'s (2020) findings that students with high self-beliefs are more likely to try harder to overcome a challenge through greater perseverance. However, Student-5 and Student-7 perceived that the VPF helped boost their perseverance, as VPF "made me try more and I got more questions correct… it seems less difficult" (Student-5). This shift in their perception of mathematics being too difficult, enabled further opportunities to succeed and thus increase their self-

beliefs (Vancouver, Thompson, & Williams, 2001; Nelson et al., 2019). Contrastingly, Student-3 and Student-2 made repeated references to both perseverance predicting self-beliefs and self-beliefs predicting perseverance, suggesting these are tightly entwined and difficult to differentiate between to determine the influencing element. While this study therefore cannot clarify the direction of the relationship between self-beliefs and perseverance, students' post-intervention responses indicated that increased VPF raised both perseverance and self-beliefs as intended.

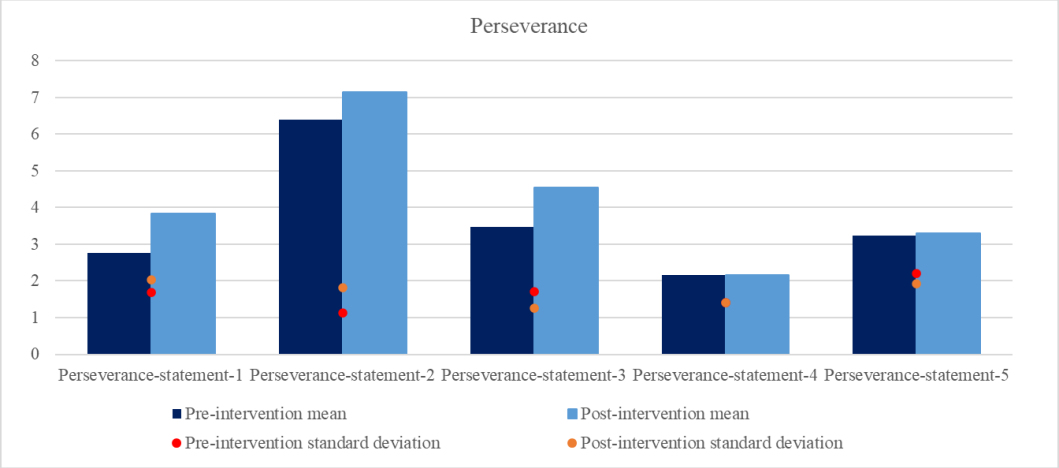

Figure 12: The mean and standard deviation scores for perseverance comparing pre- and post-intervention questionnaire results.

4.2.4: Help-seeking

Students' responses regarding helping-seeking tendencies remained largely consistent, with the median score remaining 4 and the mean score minimally increasing by 0.2 (Figure 9). The Academy students revealed that they perceived help-seeking as embarrassing and hence would rather struggle alone, which is likely to have a detrimental

influence on their self-beliefs and possibly future learning (Wood & Wood, 1999). Nevertheless, post-intervention questionnaire responses to help-seeking-statement-1 had a material increase in the mean score by 1 (Figure 13), indicating students were beginning to associate help-seeking with a positive influence on their learning. Students remarked that help-seeking "helped me to know where to start with the question" (Student-8) and "helped me find my mistakes" (Student-2). Student-2 further commented: "Now I know I'm not bottom in the class anymore I don't mind asking for help," inferring that their raised self-concept from downwards social comparison helped mitigate feelings of embarrassment when help-seeking, similar to findings by Wolters & Pintrich (1998). Informal teacher discussions supported these students' perceptions: both teachers noticed students were asking for help more during this study's intervention than pre-intervention. With regards to this study's initial hypothesis, while there was no shift for the overall theme of help-seeking, but the increased score for help-seeking-statement-1 indicates students had begun to feel more willing to help-seek as they found it less embarrassing, allowing them to experience and notice positives in help-seeking.

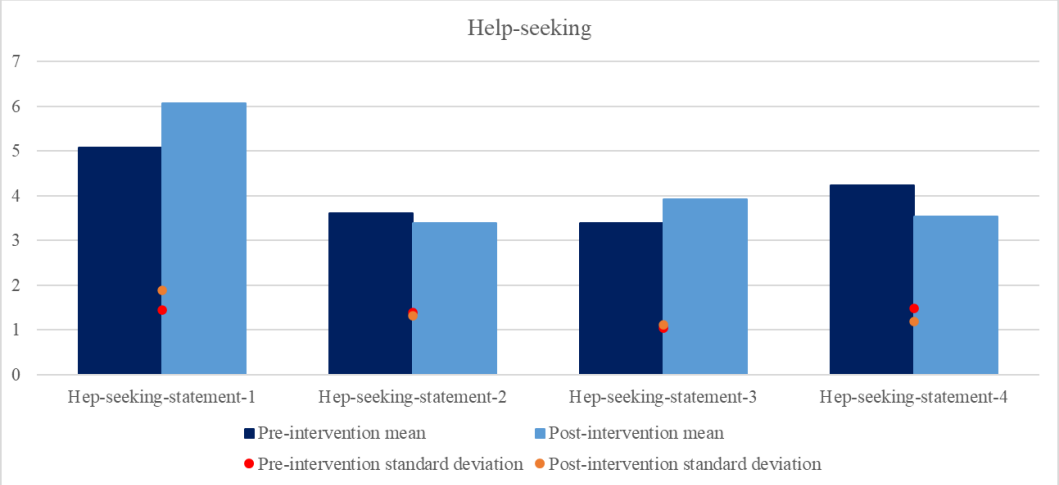

Figure 13: The mean and standard deviation scores for help-seeking comparing pre- and post-intervention questionnaire results.

During this study's intervention I noticed that when students were help-seeking during independent tasks, this continued to be expedient help-seeking rather than adaptive. This is concerning as expedient help-seeking can hinder learning (Ryan, Patrick, & Shim, 2005). To lessen such a risk, VPF could target encouragement of adaptive help-seeking, supported by teacher training. This was beyond the scope of this study but could be a focus of future investigations.

Interestingly, student responses displayed a preference to help-seek from teaching assistants over the teachers, as evidenced by the 0.5 mean score increase for help-seeking-statement-3 (Figure 13). This was also noted in the informal teacher discussions but during interviews students were reluctant to provide clear responses about their preference to turn to teaching assistants. Their reticence could be influenced by my position as a practitioner researcher, with students worried about their answers upsetting me or influencing their future studies (de Leeuw, 1992; Cohen, Manion, & Morrison, 2018), despite my best efforts to try to create an open as possible interview environment through the methods described earlier in section 3.8.3.

4.2.4: Conclusion

Results for research question 2 considered the four themes of task participation, response to failure, perseverance, and help-seeking. Except for Student-6 whose self-beliefs remained relatively constant, all students' self-beliefs displayed a positive shift to differing degrees for each theme. The positive shifts in self-beliefs, possibly due to increased VPF, appear to have had the largest positive shift for response to failure and

perseverance. This conclusion discussed these themes first, followed by task participation and help-seeking.

Regarding response to failure, most students' attributions of failure shifted to consider more controllable factors, primarily the controllable factor of effort which can be influenced by self-efficacy (Yantraprakorn, Darasawang, Wiriyakarun, 2018). This was not wholly unexpected as the greatest shift in self-beliefs was in self-efficacy. This shift continued further for the two students with the highest self-beliefs post-intervention who were displaying signs of interpretating their mistakes as learning opportunities. Regarding the theme of perseverance, except for Student-6, all students perceived an increase in their effort and time spent on a task, but the reasons students gave varied. The two students with the highest self-beliefs post-intervention felt their increased self-beliefs that they could be successful helped encouraged their perseverance. Others thought their perseverance predicted their self-beliefs as VPF encouraged them to persevere, allowing further opportunities to succeed and thus raising their self-beliefs. Another two students referenced both perseverance predicting self-beliefs and self-beliefs predicting perseverance, suggesting self-beliefs and perseverance are tightly entwined. Therefore, it is not possible to suggest whether self-beliefs influence perseverance or vice-versa.

Task participation shifted from very limited/none to low participation. Students' increased self-beliefs allowed them to believe their success could be repeated, enabling the answer of 'yes' to Question-1 (evaluation of self-beliefs) to then permit task-value evaluation (Question-2). This boosted opportunities for success and subsequent receipt of VPF, further raising students' self-beliefs (Vancouver, Thompson, & Williams, 2001; Schunk & DiBenedetto, 2016; Nelson et al., 2019), suggesting a cyclical relationship between VPF, self-beliefs and task participation. Task-value evaluation also shifted, as

considerations of interest and importance were prior to the consideration of effort, suggesting that after self-beliefs' assessment (Question-1), Question-2 could be further divided into an evaluation of importance and interest and then effort. Finally, help-seeking tendencies remained mostly consistent before and during this study's intervention, with expedient help-seeking being the primary method. Despite the consistency in help-seeking as a whole theme, individual theme statement analysis suggested students were beginning to associate help-seeking with a positive influence on their learning. For some students, the increased availability of downwards comparisons helped to mitigate their feeling of embarrassment, allowing them to feel more willing to help-seek.

Chapter 5: Collaboration evaluation and limitations

This chapter reviews and evaluates the collaboration throughout this study, followed by a discussion of the limitations of this study and how these could be mitigated in future investigations.

5.1: Evaluation of collaboration

Collaboration was an important consideration throughout this study, with detailed explanations and evaluations in Appendix I. The informal teacher discussions were an extremely helpful method of identifying issues and their most effective solutions through focused deliberation and debate. During one discussion, Teacher-2 raised that Student-2 repeatedly reacted with reservations to VPF. We questioned whether VPF phrasing and/or rate might be provoking embarrassment or reticence, and how this study's intervention could be adapted to mitigate this. We decided to make VPF for Student-2 more private and concise, specifically targeting verbal persuasion to help limit their embarrassment. These informal teacher discussions additionally provided another level of data to support the findings from quantitative and qualitative research methods with student participants. For example, students' self-belief perceptions, such as the increase in perseverance following VPF, were supported by teachers' perceptions shared during informal teacher discussions. However, teachers were self-reporting and therefore were susceptible to bias and inaccurate recall. To mitigate against this in future, formal lesson observations by another member of staff could be included.

This study encouraged wider benefits to participating teachers by encouraging professional development through training and implementation of the phrase bank. The collaborative creation of the phrase bank enabled the development of phrases all teachers were comfortable with and had ownership over (Bergmark, 2020), so teachers could incorporate these into their practice quickly and naturally. During informal discussions post-intervention, both participating teachers expressed greater confidence in applying VPF following training and the composition of the phrase bank, and the HOD reported that this present study had helped connect research with The Academy's practice in a way which was easy to implement. This feedback heightened my awareness of the importance of collaboration and sharing teaching knowledge to enhance students' learning, as often teachers feel detached from research, making it is difficult to incorporate within their practice.

One of the challenges was the concern that collaboration might lead to a lack of vision and structure, or even a diluted form of VPF due to the need to find phrases that worked across a variety of teaching styles. The latter was mitigated through ensuring there was a large enough bank of phrases to draw from, while the former was helped by weekly informal teacher discussions. This enabled progression towards a common goal, yet still allowed opportunities for teachers to challenge or question any elements.

5.2: Limitations and further investigations

When drawing conclusions, it is important to consider any limitations, particularly which impact findings, and how they could be overcome in future investigations. A detailed explanation can be found in Appendix Q.

The small participation size enabled this study's intervention to focus on classes with heightened low mathematics self-beliefs who would most benefit from increased self-beliefs. However, only 13% of Year 10 students were represented, making it difficult to generalise results across the year group or The Academy, as well to draw conclusions about particular student groupings. For example, while there were minimal differences observed between the male and female students interviewed, females were underrepresented in the interview, making up only 38% of the interviewed participants, preventing discussion about the role of gender and self-beliefs. Repeating this study with a larger population would increase reliability of results and enable results to be generalised and comparisons made regarding criteria such as gender, age, and/or attainment setting. This would facilitate possible identification of the best population to target with VPF and how VPF might be tailored to different groups of students to promote a material long-term impact on self-beliefs. Furthermore, this study's short period intervention of only seven-weeks excluded any investigation into long-lasting shifts. A longer period intervention would allow a review of any long-lasting influences of VPF on self-beliefs and mathematics classroom learning. This could reveal whether Year 10 students continue to experience shifts in their self-beliefs, or whether these begin to plateau or even decrease.

The present study used self-reporting methodologies; hence responses were subjective and dependent on participants' personal interpretations of situations and interview/questionnaire statements (Winne, 2020), impacting their self-beliefs. There were no formal objective observation methods to confirm or challenge whether the self-reported perceptions aligned with students' behaviour during classroom learning. This omission was due to active restrictions on classroom observations due to the COVID-19 pandemic. In subsequent studies, self-reporting data collection methods could be supported by formal observations from teachers independent of the study, increasing collaboration and thus allowing a diverse set of perspectives and opinions to help form and validate any findings.

Chapter 6: Looking forward

This chapter discusses the sharing of this study's findings within The Academy, and the implications for professional and collaborative practice.

6.1: Sharing findings

A key element of practitioner research is the sharing of findings (Gutierez, 2019), phase five of the professional development framework (see section 3.2). Results were initially shared with participating teachers who responded positively and have begun to implement increased VPF within their classes. Presentation of the findings to the HOD and Assistant HOD aimed to disseminate the findings in a positive and inspiring way; these staff expressed interest but were sceptical about VPF's suitability for non-nurture groups. We therefore agreed to pilot the present study across half of Year 10 mathematics classes to investigate whether similar results are observed before implementing VPF across the mathematics department or The Academy. Presentation of this study and training will be provided to the mathematics department during training days (detailed in section 6.2.2).

6.2: Implications for practice

Numerous implications for future practice have arisen. First the implications for my personal professional practice as a teacher through the professional development

framework are discussed, followed by implications for The Academy's collaborative practice.

6.2.1: Implications for personal professional practice

The implications for my personal professional practice include:

- A deeper understanding of self-beliefs, VPF's influence on learning and how VPF can be implemented into my everyday practice. This has embedded VPF in my personal classroom practice, aiming to enhance students' learning by supporting their self-beliefs and assisting my own ongoing professional development.

- Understanding and experience of conducting a research study - identifying barriers, compiling a literature review, and using mixed data collection methods and analysis. This has developed my critical and analytical skills which inform my personal teaching practice.

- Recognising the importance of being a research-informed practitioner to ensure my personal practice takes full advantage of up-to-date teaching and learning strategies.

6.2.2: Implications for The Academy's collaborative practice

Each implication for The Academy's practice is focused on further supporting teachers to enhance student learning, giving every student the opportunity to improve their self-beliefs and overcome their inherent disadvantages. Key implications are provided below.

- The mathematics department professional development training will introduce more staff to current research on self-beliefs and VPF. This aims to increase teachers' knowledge of mathematics self-beliefs, which influence students' learning. Teachers could then add or increase VPF within their professional practice to help boost students' self-beliefs and classroom successes. This training is especially relevant as The Academy is a teacher training school, and therefore it could form an important part of the initial teacher training programme.

- Further collaborative development of the phrase bank with department staff will expand the phrase bank and include phrases all teachers are comfortable to use. This is vital as staff are more likely to implement the phrase bank if they feel they have had an influence and ownership over its creation (Bergmark, 2020). To further encourage an increase in VPF from the current minimal implementation, informal discussion sessions will continue to be available throughout the year.

- The connection between research and practice recognises the importance of sharing research through communicating practical, tested tools that teachers can easily adopt and implement in their daily practice, preventing stagnation of practice and encouraging continuous professional development. Once implemented, the ongoing collaborative development of tools, such as the phrase

bank, could ensure teachers' classroom practice and students' learning are at a high level and informed by current teaching and learning research.

Chapter 7: Conclusions

The present study combined both quantitative and qualitative methodologies to investigate the ways in which VPF influences students' self-concept and self-efficacy beliefs and their mathematics classroom learning for two Year 10 nurture mathematics classes. Two research questions were addressed: research question 1 focused on whether increased VPF influenced students' self-concept and/or self-efficacy, while research question 2 focused on how any shifts in self-beliefs influenced mathematics classroom learning. Summaries of the findings from this study are presented below to answer the two research questions which have guided the present study, followed by an overall study conclusion.

7.1: Conclusion for research question 1: How has increased verbal praise and feedback (VPF) influenced students' self-concept and/or self-efficacy?

Using increased verbal praise and feedback (VPF) was found to raise students' self-concept and self-efficacy, but to different degrees. An increase in mean and median scores for self-efficacy was observed but only a minimal increase in the mean score for self-concept. This indicates that, during this study's short period intervention, self-efficacy was more malleable than the more stable self-concept. Many students held historical, deeply-rooted self-concept beliefs based on negative, upwards social comparisons which may have contributed to the stability of their self-concept. Nevertheless, the minimal mean self-concept score increase suggests self-concept could be positively influenced by VPF

when evaluated within the mathematics domain. This is possibly due to social comparisons beginning to shift from primarily upwards to include downwards comparisons as VPF helped students recognise their successes. Self-efficacy responses shifted from a previous focus on task failures to focus on successful tasks completed during this study's intervention, indicating that VPF raised students' recognition of their successes. VPF enlarged students' pool of successful experiences to reference when forming both social comparisons and self-comparisons, influencing self-concept and self-efficacy respectively, and likely enabling students to believe more in their own capabilities to be successful (Fernandez-Rio et al., 2017).

The relationship between achievement and self-belief varied among the students. There was evidence of a relationship with self-concept through greater use of downwards comparison, a stronger relationship with self-efficacy through previous task VPF affirmation, and a stronger relationship with perseverance stimulated by the encouragement VPF which subsequently raised self-beliefs and achievement. Thus, the interpretation of VPF made by students can subsequently influence their alliance to self-concept, self-efficacy or perseverance as holding the primary influence on achievement.

7.2: Conclusion for research question 2: In what ways did the effects of increased verbal praise and feedback (VPF) on student self-beliefs influence their task participation, response to failure, perseverance, and help-seeking?

Results for this research question related to the four themes of task participation, response to failure, perseverance, and help-seeking. The increased self-beliefs, possibly due to VPF, appear to have had the most effect on response to failure and perseverance. This conclusion discussed these themes first, followed by task participation and help-seeking. Responses to failure shifted positively as students attributed their failures to more controllable factors, such as effort, rather than uncontrollable ones. Additionally, the students with the highest self-beliefs began to interpret their mistakes as learning opportunities. The present study's results associated with perseverance showed all bar one student perceived a growth in their perseverance. However, there were three different relationships between self-beliefs and perseverance, and hence while this study's results show a link between increased VPF, self-beliefs and perseverance, it is not possible to suggest which of these is the driving factor.

Within this study's intervention, task participation displayed positive shifts, but these were smaller than those within the response to failure and perseverance themes. Although task participation remained low, the increase from the initial very limited/no participation appeared to be the result of the cyclical relationship between VPF boosting self-beliefs, allowing the answering of 'yes' to Question-1 (self-beliefs' evaluation), to permit the answering of Question-2 (task-value evaluation), enhancing students' opportunities for success and subsequent receipt of VPF which in turn further raises self-beliefs. When

evaluating task value, this study's results display importance and interest are considered before effort, suggesting Question-2 takes a multi-layered approach. The help-seeking theme remained mostly consistent, with expedient help-seeking being the primary method. Despite the consistency in help-seeking overall, individual help-seeking statements suggested students were beginning to associate help-seeking with a positive influence on their learning. For some students this was possibly due to the greater availability of downwards comparisons, mitigating their feeling of embarrassment and encouraging their willingness to seek help.

7.3: Study conclusion: In what ways does verbal teacher praise and feedback (VPF) influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Overall, this present study discovered that increased VPF positively influenced lower attaining Year 10 mathematics students' self-concept and self-efficacy, with self-efficacy displaying the greatest shift. While self-efficacy was more susceptible to being moulded, both self-beliefs displayed signs of malleability through increased VPF. Mathematics classroom learning was particularly influenced within the theme of response to failure and perseverance, with both themes showing the greatest positive shifts. Thus, increased VPF appeared to boost students' self-beliefs which positively influenced their mathematics learning. Therefore, within their everyday practice teachers could consider implementing increased VPF to help support students' self-beliefs and mathematics learning.

This study's recommended strategy of increased VPF across the mathematics department, and the subsequent expected implications discussed above, could subsequently help to provide a better chance of academic success for a wider number of students. If students hold more positive self-beliefs and thus increase their mathematics classroom learning, possibly instigate a liking of mathematics as it gradually becomes less difficult to understand. This could support everyday problem solving and improve student's life chances.

Reference List

Abdullah, A. H., Ibrahim, N. H., Surif, J., Ali, M., & Hamzah, M. H. (2014). Non-routine mathematical problems among in-service and pre-service mathematics teachers. *IEEE International Conference on Teaching, Assessment and Learning for Engineering: Learning for the Future Now, TALE,* 18–24. https://doi.org/10.1109/TALE.2014.7062620

Al-Harthy, I. S., & Aldhafri, S. S. (2014). The relationship among task-value, self-efficacy, and academic achievement in Omani students at Sultan Qaboos University. *International Review of Social Sciences and Humanities*, *7*(2), 15–22. https://doi:10.5923/j.ijpbs.20190903.03

Althubaiti, A. (2016). Information bias in health research: definition, pitfalls, and adjustment methods. *Journal of Multidisciplinary Healthcare, 9*(1), 211-217. https://doi.org/10.2147/JMDH.S104807

Amemiya, J., & Wang, M. T. (2017). Transactional relations between motivational beliefs and help seeking from teachers and peers across adolescence. *Journal of Youth and Adolescence*, *46*(8), 1743–1757. https://doi.org/10.1007/s10964-016-0623-y

Amemiya, J., & Wang, M. T. (2018). Why effort praise can backfire in adolescence. *Child Development Perspectives*, *12*(3), 199–203. https://doi.org/10.1111/cdep.12284

Arens, A. K., Marsh, H. W., Craven, R. G., Yeung, A. S., Randhawa, E., & Hasselhorn, M. (2016). Math self-concept in preschool children: structure, achievement relations, and generalizability across gender. *Early Childhood Research Quarterly*, *36*(36),

391–403. https://doi.org/10.1016/j.ecresq.2015.12.024

Arens, A. K., Yeung, A. S., Craven, R. G., & Hasselhorn, M. (2011). The twofold multidimensionality of academic self-concept: domain specificity and separation between competence and affect components. *Journal of Educational Psychology*, *103*(4), 970–981. https://doi.org/10.1037/a0025047

Asakereh, A., & Yousofi, N. (2018). Reflective thinking, self-efficacy, self-esteem, and academic achievement of Iranian EFL students. *International Journal of Educational Psychology*, *7*(1), 68–89. https://doi.org/10.17583/ijep.2018.2896

Aubusson, P., Ewing, R., & Hoban, G. (2009). Gathering and learning from evidence. In, P. Aubusson., R. Ewing., & G. Hoban (Eds.) *Action learning in schools: reframing teachers' professional learning and development* (pp. 85–100). London, UK: Routledge.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioural change. *Psychological Review*, *84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1981). Ability self-concept and self-efficacy in higher education: an empirical differentiation based on their factorial structure. In J. H. Flavell & L. D. Ross (Eds.) *Cognitive social development: frontiers and possible futures* (pp. 200–239). Cambridge, UK: Cambridge University Press.

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, *28*(2), 117–148. https://doi.org/10.1207/s15326985ep2802_3

Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.) *Encyclopaedia of human behaviour* (4th ed., pp. 71–81). New York, NY: Academic Press.

Bandura, A. (2006). Guide for constructing self-efficacy scales. In P. Pajares & T. Urdan (Eds.) *Self-efficacy beliefs of adolescents* (5th ed., pp. 307–337). Greenwich, CT: Information Age Publishing.

Bear, G. G., & Minke, K. M. (1996). Positive bias in maintenance of self-worth among children with LD. *Learning Disability Quarterly*, *19*(1), 23–32. https://doi.org/10.2307/1511050

Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in experimental social psychology*, (6th ed., pp. 1-62). New York, NY: Academic.

Bergmark, U. (2020). Teachers' professional learning when building a research-based education: context-specific, collaborative and teacher-driven professional development. *Professional Development in Education*, 1–15. https://doi.org/10.1080/19415257.2020.1827011

Blaze, J. T. (2013). *Public versus private praise: a direct behavioural comparison in secondary classrooms* (Doctoral thesis). The University of Southern Mississippi, Mississippi. Retrieved 15 March 2021 from https://ezproxy-prd.bodleian.ox.ac.uk:2090/dissertations-theses/public-versus-private-praise-direct-behavioral/docview/1112949846/se-2?accountid=13042

Bong, M. (1997). Generality of academic self-efficacy judgments: evidence of hierarchical relations. *Journal of Educational Psychology*, *89*(4), 696–709.

https://doi.org/10.1037/0022-0663.89.4.696

Bong, M., & Clark, R. E. (1999). Comparison between self-concept and self-efficacy in academic motivation research. *Educational Psychologist*, *34*(3), 139–153. https://doi.org/10.1207/s15326985ep3403_1

Bong, M., & Skaalvik, E. M. (2003). Academic self-concept and self-efficacy: how different are they really? *Educational Psychology Review*, *15*(1), 1-40. https://doi.org/10.1023/A:1021302408382

British Educational Research Association. (2018). *Ethical guidelines for educational research*. Retrieved 19 December 2020 from https://www.bera.ac.uk/wp-content/uploads/2018/06/BERA-Ethical-Guidelines-for-Educational-Research_4thEdn_2018.pdf

Brown, D. M., & Cairney, J. (2020). The synergistic effect of poor motor coordination, gender, and age on self-concept in children: a longitudinal analysis. *Research in Developmental Disabilities*, *98,* 1-10. https://doi.org/10.1016/j.ridd.2020.103576

Burns, R. A., Crisp, D. A., & Burns, R. B. (2020). Re-examining the reciprocal effects model of self-concept, self-efficacy, and academic achievement in a comparison of the cross-lagged panel and random-intercept cross-lagged panel frameworks. *British Journal of Educational Psychology*, *90*(1), 77–91. https://doi.org/10.1111/bjep.12265

Butler, R. (1998). Determinants of help seeking: relations between perceived reasons for classroom help-avoidance and help-seeking behaviours in an experimental context.

Journal of Educational Psychology, *90*(4), 630–643. https://doi.org/10.1037/0022-0663.90.4.630

Carmona, C., Buunk, A. P., Dijkstra, A., & Peiro, J. M. (2008). The relationship between goal orientation, social comparison responses, self-efficacy, and performance. *European Psychologist*, *13*(3), 188–196. https://doi.org/10.1027/1016-9040.13.3.188

Carpenter, D. M. II, & Clayton, G. (2014). Measuring the relationship between self-efficacy and math performance among first-generation college-bound middle school students. *Middle Grades Research Journal*, *9*(2), 109–125.

Cash, T. F. (2012). Cognitive-behavioural perspectives on body image. In T. F. Cash (Ed.) *Encyclopaedia of body image and human appearance* (Vol. 1–2, pp. 334–342). Boston, USA: Academic Press. https://doi.org/10.1016/C2010-1-66177-9

Chen, G., Gully, S. M., & Eden, D. (2001). Validation of a new general self-efficacy scale. *Organizational Research Methods*, *4*(1), 62–83. https://doi.org/10.1177/109442810141004

Chen, S. K., Yeh, Y. C., Hwang, F. M., & Lin, S. S. (2013). The relationship between academic self-concept and achievement: a multicohort-multilocation study. *Learning and Individual Differences*, *23*(1), 172–178. https://doi.org/10.1016/j.lindif.2012.07.021

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). London, UK: Routledge.

Cvencek, D., Fryberg, S. A., Covarrubias, R., & Meltzoff, A. N. (2018). Self-concepts, self-esteem, and academic achievement of minority and majority north American elementary school children. *Child Development*, *89*(4), 1099–1109. https://doi.org/10.1111/cdev.12802

Dana, N. F., & Yendol-Hoppey, D. (2020). *The reflective educator's guide to classroom research: learning to teach and teaching to learn through practitioner inquiry*. Thousand Oaks, CA: Corwin.

de Leeuw, E. (1992). Data quality in mail, telephone, and face to face surveys. *BMS, Bulletin de Methodologie Sociologique*, *38*(1), 80–81.

Department of Education. (2011). *Teachers' standards: guidence for school leaders, school staff and governing bodies* (Vol. 2011). Retrieved 12 September 2020 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/665520/Teachers__Standards.pdf%0Ahttps://www.gov.uk/government/collections/teachers-standards

Department of Education. (2021). *National curriculum in England: mathematics programmes of study*. Retrieved 10 September 2020 from https://www.gov.uk/government/publications/national-curriculum-in-england-mathematics-programmes-of-study/national-curriculum-in-england-mathematics-programmes-of-study

Desideri, L., Ottaviani, C., Cecchetto, C., & Bonifacci, P. (2019). Mind wandering, together with test anxiety and self-efficacy, predicts student's academic self-concept but not reading comprehension skills. *British Journal of Educational Psychology*,

89(2), 307–323. https://doi.org/10.1111/bjep.12240

Desimone, M. (2009). Improving impact studies of teachers' professional development: toward better conceptualizations and measures. *Educational Researcher*, *38*(3), 181–199. https://doi.org/10.3102/0013189X08331140

Devries, J. M., Szardenings, C., Doebler, P., & Gebhardt, M. (2021). Subject-specific self-concept and global self-esteem mediate risk factors for lower competency in mathematics and reading. *Social Sciences*, *10*(1), 1–17. https://doi.org/10.3390/socsci10010011

Dickhäuser, O., Janke, S., Praetorius, A. K., & Dresel, M. (2017). The effects of teachers' reference norm orientations on students' implicit theories and academic self-concepts. *Zeitschrift Fur Padagogische Psychologie*, *31*(3–4), 205–219. https://doi.org/10.1024/1010-0652/a000208

Dijkstra, P., Kuyper, H., van Der Werf, G., Buunk, A. P., & van Der Zee, Y. G. (2008). Social comparison in the classroom: a review. *Review of Educational Research, 78*(4), 828-879. https://doi.org/10.3102/0034654308321210

Dimmock, C. (2016). Conceptualising the research–practice–professional development nexus: mobilising schools as 'research-engaged' professional learning communities. *Professional Development in Education*, *42*(1), 36–53. https://doi.org/10.1080/19415257.2014.963884

Du, J., Xu, J., & Fan, X. (2016). Investigating factors that influence students' help seeking in math homework: a multilevel analysis. *Learning and Individual Differences, 48,*

29–35. https://doi.org/10.1016/j.lindif.2016.03.002

Eccles, J. (1983). Expectancies, values, and academic behaviours. In J. T. Spence (Ed.) *Achievement and achievement motives: psychological and sociological approaches* (pp. 75-146). San Francisco, SF: W.H. Freeman.

Eccles, J., Midgley, C., Wigfield, A., Buchanan, C., Reuman, D., Flanagan, C., & Maciver, D. (1993). Development during adolescence - the impact of stage-environment fit on young adolescents' experiences in schools and in families. *American Psychologist*, *48*(2), 90–101. https://doi.org/10.1037/0003-066X.48.2.90.

Edwards, A., & Talbot, R. (2014). *The hard-pressed researcher: a research handbook for the caring professions*. Oxford, UK: Routledge

Fadnes, L. T., Taube, A., & Tylleskär, T. (2009). How to identify information bias due to self-reporting in epidemiological research. *The Internet Journal of Epidemiology, 7*(2), 1-9.

Ferla, J., Valcke, M., & Cai, Y. (2009). Academic self-efficacy and academic self-concept: reconsidering structural relationships. *Learning and Individual Differences*, *19*(4), 499–505. https://doi.org/10.1016/j.lindif.2009.05.004

Fernandez-Rio, J., Cecchini, J. A., Méndez-Gimenez, A., Mendez-Alonso, D., & Prieto, J. A. (2017). Self-regulation, cooperative learning, and academic self-efficacy: Interactions to prevent school failure. *Frontiers in Psychology*, *8*(22), 1-10. https://doi.org/10.3389/fpsyg.2017.00022

Fredricks, J. A., & Eccles, J. S. (2002). Children's competence and value beliefs from

childhood through adolescence: growth trajectories in two male-sex-typed domains. *Developmental Psychology*, *38*(4), 519–533 https://doi.org/10.1037/0012-1649.38.4.519

Gibbons, F. X., Lane, D. J., Gerrard, M., Lautrup, C. L., Pexa, N. A., Reis-Bergan, M., & Blanton, H. (2002). Comparison-level preferences after performance: is downward comparison theory still useful? *Journal of Personality and Social Psychology*, *83*(4), 865–880. https://doi.org/10.1037/0022-3514.83.4.865

Girli, A., & Öztürk, H. (2017). Metacognitive reading strategies in learning disability: relations between usage level, academic self-efficacy, and self-concept. *International Electronic Journal of Elementary Education*, *10*(1), 93–102. https://doi.org/10.26822/iejee.2017131890

GOV.UK. (2019). [redacted]. Retrieved September 17, 2020, from https://www.compare-school-performance.service.gov.uk/school/[redacted] (removed to maintain anonymity).

Government Equalities Office. (2019). *Gender equality at every stage: a roadmap for change*. Retried 23 March 2021 from https://ezproxy-prd.bodleian.ox.ac.uk:9923/download/204296

Grassinger, R., & Dresel, M. (2017). Who learns from errors on a class test? Antecedents and profiles of adaptive reactions to errors in a failure situation. *Learning and Individual Differences*, *53*, 61–68. https://doi.org/10.1016/j.lindif.2016.11.009

Guest, A. M. (2018). The social organization of extracurricular activities: interpreting developmental meanings in contrasting high schools. *Qualitative Psychology*, *5*(1), 41–58. https://doi.org/10.1037/qup0000069

Gutierez, S. B. (2019). Teacher-practitioner research inquiry and sense making of their reflections on scaffolded collaborative lesson planning experience. *Asia-Pacific Science Education*, *5*(1), 1-15. https://doi.org/10.1186/s41029-019-0043-x

Hammoudi, M. M. (2020). Measurement of students' mathematics motivation and self-concept at institutions of higher education: evidence of reliability and validity. *International Journal of Mathematical Education in Science and Technology*, *51*(1), 63–86. https://doi.org/10.1080/0020739X.2019.1670369

Harter, S. (1998). The development of self-representations. In W. Damon & N. Eisenberg (Eds.) *Handbook of child psychology* (p. 553-617). New York, NY: Wiley.

Harter, S. (2012). New directions in self-development: resurrecting the I-self. In D. M. McInerney (Ed.) *Theory driving research: new wave perspectives on self-processes and human development* (pp. 1–20). Charlotte, NC: Information Age Publishing, Inc.

Hascoët, M., Pansu, P., Bouffard, T., & Leroy, N. (2018). The harmful aspect of teacher conditional support on students' self-perception of school competence. *European Journal of Psychology of Education*, *33*(4), 615–628. https://doi.org/10.1007/s10212-017-0350-0

Hattie, J, & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81-112. https://doi.org/10.3102/003465430298487

Henderlong, J., & Lepper, M. R. (2002). The effects of praise on children's intrinsic motivation: a review and synthesis. *Psychological Bulletin, 128*(5), 774-795 https://doi.org/10.1037/0033-2909.128.5.774

Henry, M. A., Shorter, S., Charkoudian, L., Heemstra, J. M., & Corwin, L. A. (2019). Fail is not a four-letter word: a theoretical framework for exploring undergraduate students' approaches to academic challenge and responses to failure in STEM learning environments. *CBE Life Sciences Education, 18*(1), 1-17. https://doi.org/10.1187/cbe.18-06-0108

Hornstra, L., van Der Veen, I., Peetsma, T., & Volman, M. (2013). Developments in motivation and achievement during primary school: a longitudinal study on group-specific differences. *Learning and Individual Differences, 23*(1), 195–204. https://doi.org/10.1016/j.lindif.2012.09.004

Huguet, P., Dumas, F., Marsh, H., Régner, I., Wheeler, L., Suls, J., … Nezlek, J. (2009). Clarifying the role of social comparison in the big-fish-little-pond effect (BFLPE): an integrative study. *Journal of Personality and Social Psychology*, *97*(1), 156–170. https://doi.org/10.1037/a0015558

Józsa, K., & Morgan, G. A. (2017). Reversed items in Likert scales: filtering out invalid responders. *Journal of Psychological and Educational Research, 25*(1), 7–25.

Kaskens, J., Segers, E., Goei, S. L., van Luit, J. E., & Verhoeven, L. (2020). Impact of children's math self-concept, math self-efficacy, math anxiety, and teacher competencies on math development. *Teaching and Teacher Education, 94,* 1-14. https://doi.org/10.1016/j.tate.2020.103096

Klapp, A. (2018). Does academic and social self-concept and motivation explain the effect of grading on students' achievement? *European Journal of Psychology of Education*, *33*(2), 355-376. https://doi.org/10.1007/s10212-017-0331-3

Kruger, L. J., Rodgers, R. F., Long, S. J., & Lowy, A. S. (2019). Individual interviews or focus groups? Interview format and women's self-disclosure. *International Journal of Social Research Methodology*, *22*(3), 245–255. https://doi.org/10.1080/13645579.2018.1518857

Kruse, S. (1999). Collaborate. *Journal of Staff Development*, *20*(3), 14–16.

Kuhfeld, M., & Tarasawa, B. (2020). *The COVID-19 slide: what summer learning loss can tell us about the potential impact of school closures on student academic achievement*. Retrieved 25 April 2021 from https://files.eric.ed.gov/fulltext/ED609141.pdf

Lam, S., Yim, P., & Ng, Y. (2008). Is effort praise motivational? The role of beliefs in the effort-ability relationship. *Contemporary Educational Psychology*, *33*(4), 694–710 https://doi.org/10.1016/j.cedpsych.2008.01.005

Lau, C., Kitsantas, A., Miller, A. D., & Drogin Rodgers, E. B. (2018). Perceived responsibility for learning, self-efficacy, and sources of self-efficacy in mathematics: a study of international baccalaureate primary years programme students. *Social Psychology of Education*, *21*(3), 603–620. https://doi.org/10.1007/s11218-018-9431-4

Lee, J. (2009). Universals and specifics of math self-concept, math self-efficacy, and math

anxiety across 41 PISA 2003 participating countries. *Learning and Individual Differences, 19*(3), 355–365. https://doi.org/10.1016/j.lindif.2008.10.009

Leeson, C. (2014). Asking difficult questions: exploring research methods with children on painful issues. *International Journal of Research and Method in Education, 37*(2), 206–222. https://doi.org/10.1080/1743727X.2013.820643

Leflot, G., Onghena, P., & Colpin, H. (2010). Teacher-child interactions: relations with children's self-concept in second grade. *Infant and Child Development, 19*(4), 385–405. https://doi.org/10.1002/icd.672

Leibham, M. B., Alexander, J. M., & Johnson, K. E. (2013). Science interests in preschool boys and girls: relations to later self-concept and science achievement. *Science Education, 97*(4), 574–593. https://doi.org/10.1002/sce.21066

León-Mantero, C., Casas-Rosal, J. C., Pedrosa-Jesús, C., & Maz-Machado, A. (2020). Measuring attitude towards mathematics using Likert scale surveys: the weighted average. *PLoS ONE, 15*(10), 1-15. https://doi.org/10.1371/journal.pone.0239626

Lytle, S. L., & Cochran-Smith, M. (2009). *Inquiry as stance practitioner research for the next generation*. New York, NY: Teachers College Press.

Ma, Z. M., Maleki, M., & Jaberghaderi, N. (2020). The relationship between information literacy and motivated strategies for learning with self-directed learning readiness. *International Journal of Behavioural Science, 14*(3), 1–6. https://doi.org/10.30491/ijbs.2020.209970.1170

Malmqvist, J., Hellberg, K., Möllås, G., Rose, R., & Shevlin, M. (2019). Conducting the

pilot study: a neglected part of the research process? Methodological findings supporting the importance of piloting in qualitative research studies. *International Journal of Qualitative Methods*, *18*(1), 1-11. https://doi.org/10.1177/1609406919878341

Marsden, P., & Wright, J. (2010). Question and questionnaire design. In P. Marsden & J. Wright (Eds.), *Handbook of survey research* (pp. 263–314). Bingley, UK: Emerald Group Publishing.

Marsh, H W., & Hau, K. T. (2004). Explaining paradoxical relations between academic self-concepts and achievements: cross-cultural generalizability of the internal/external frame of reference predictions across 26 countries. *Journal of Educational Psychology*, *96*(1), 56–67. https://doi.org/10.1037/0022-0663.96.1.56

Marsh, H. W., Kong, C. K., & Hau, K. T. (2001). Extension of the internal/external frame of reference model of self-concept formation: importance of native and non-native languages for Chinese students. *Journal of Educational Psychology*, *93*(3), 543–553. https://doi.org/10.1037/0022-0663.93.3.543

Marsh, H. W., Martin, A., Yeung, A., & Craven, R. (2017). Competence self-perceptions. In A. Elliot, C. Dweck, & D. Yeager (Eds.) *Handbook of competence and motivation. Theory and application* (pp. 85–115). London, UK: The Guilford Press.

Marsh, H. W., & O'Mara, A. (2008). Reciprocal effects between academic self-concept, self-esteem, achievement, and attainment over seven adolescent years: unidimensional and multidimensional perspectives of self-concept. *Personality and Social Psychology Bulletin*, *34*(4), 542–552.

https://doi.org/10.1177/0146167207312313

Marsh, H. W., & O'Neill, R. (1984). Self-description questionnaire III: the construct validity of multidimensional self-concept ratings by late adolescents. *Journal of Educational Measurement*, *21*(2), 153–174. https://doi.org/10.1111/j.1745-3984.1984.tb00227.x

Marsh, H. W., Pekrun, R., Parker, P. D., Murayama, K., Guo, J., Dicke, T., & Arens, A. K. (2019). The murky distinction between self-concept and self-efficacy: beware of lurking jingle-jangle fallacies. *Journal of Educational Psychology*, *111*(2), 331–353. https://doi.org/10.1037/edu0000281

Menter, I., Elliot, D., Hulme, M., Lewin, J., & Lowden, K. (2016). *A guide to practitioner research in education*. Thousand Oaks, CA: SAGE Publications.

Mitchell, M. L., & Jolley, J. M. (2021). *Research design explained*. London, UK: Wadsworth/Thomson Learning.

Miyake, M., & Matsuda, F. (2002). Effects of generalized self-efficacy and negative social comparison feedback on specific self-efficacy and performance. *Psychological Reports*, *90*(1), 301–308. https://doi.org/10.2466/pr0.2002.90.1.301

Miyauchi, N. (2019). Examining two sources of self-efficacy information derived from learners' authentic experiences. *LET Kyushu-Okinawa BULLETIN*, *19*, 37–52. https://doi.org/10.24716/letko.19.0_37

Namaziandost, E., & Çakmak, F. (2020). An account of EFL learners' self-efficacy and gender in the flipped classroom model. *Education and Information Technologies*,

25(5), 4041–4055. https://doi.org/10.1007/s10639-020-10167-7

Nandika, K. (2020). Self-directed learning model to develop academic self-concepts of class xi students in 2019/2020 academic year. *EDUCARE: International Journal for Educational Studies, 13*(1), 61–80.

Nardi, E., & Steward, S. (2003). *Is mathematics T.I.R.E.D? A profile of quiet disaffection in the secondary mathematics classroom*. Oxford, UK: Blackwell Publishing Ltd. https://doi.org/10.1080/01411920301852

Nelson, K. L., Nelson, K. K., McDaniel, J. R., & Tackett, S. (2019). Majoring in STEM: how the factors of fear of failure, impostor phenomenon, and self-efficacy impact decision-making. *National Social Science Journal*, *52*(1), 76–87.

OECD. (2012). *Closing the gender gap: act now*. Paris, France: OECD Publishing. http://dx.doi.org/10.1787/9789264179370-en

OECD. (2013). *PISA 2012 Results: ready to learn (Volume III)*. Paris, France: OECD Publishing. Retrieved 18 March 2021 from http://www.oecd-ilibrary.org/%5Cnjsessionid=17l2ta26dj337.x-oecd-live-02content/book/9789264201170-en

OECD. (2016). *Low-performing students: why they fall behind and how to help them succeed*. Retrieved 10 January 2021 from https://www.oecd-ilibrary.org/sites/9789264250246-en/index.html?itemId=/content/publication/9789264250246-en

OFSTED. (2011). [redacted] inspection report.

https://files.ofsted.gov.uk/[redacted] (removed to maintain anonymity).

Oldham, H. H. (2018). *Mathematics self-efficacy in high school students and the effects of interim goal setting: how goals and efficacy are linked in the self-efficacy goal spectrum* (Doctoral thesis). Georgia State University; Georgia. Retrieved 21 March 2021 from https://scholarworks.gsu.edu/mse_diss

Öztürk, M., Akkan, Y., & Kaplan, A. (2020). Reading comprehension, mathematics self-efficacy perception, and mathematics attitude as correlates of students' non-routine mathematics problem solving skills in Turkey. *International Journal of Mathematical Education in Science and Technology*, *51*(7), 1042–1058. https://doi.org/10.1080/0020739X.2019.1648893

Pajares, F., & Graham, L. (1999). Self-efficacy, motivation constructs, and mathematics performance of entering middle school students. *Contemporary Educational Psychology, 24*(2), 124–139. https://doi.org/10.1006/ceps.1998.0991

Pajares, F., & Kranzler, J. (1995). Self-efficacy beliefs and general mental ability in mathematical problem solving. *Contemporary Educational Psychology, 20*(4), 426–443. https://doi.org/10.1006/ceps.1995.1029

Peiffer, H., Ellwart, T., & Preckel, F. (2020). Ability self-concept and self-efficacy in higher education: an empirical differentiation based on their factorial structure. *PLoS ONE, 15*(7), 1-24. https://doi.org/10.1371/journal.pone.0234604

Petty, G. (2004). *Teaching today: a practical guide*. Oxford, UK: Oxford University Press.

Phan, H. P., & Ngu, B. H. (2016). Sources of self-efficacy in academic contexts: a longitudinal perspective. *School Psychology Quarterly*, *31*(4), 548–564. https://doi.org/10.1037/spq0000151

Phan, H. P., Ngu, B. H., & Alrashidi, O. (2018). Contextualised self-beliefs in totality: an integrated framework from a longitudinal perspective. *Educational Psychology*, *38*(4), 411–434. https://doi.org/10.1080/01443410.2017.1356446

Pintrich, P., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). *A manual for the use of the motivated strategies for learning questionnaire (MSLQ)*. Retrieved 20 October 2020 from https://files.eric.ed.gov/fulltext/ED338122.pdf

Pitts, J. M., & Miller-Dau, E. M. (2007). Upward turning points and positive rapport-development across time in researcher - participant relationships. *Qualitative Research*, *7*(2), 177–201. https://doi.org/10.1177/1468794107071409

Powell, M. A., Fitzgerald, R., Taylor, N., & Graham, A. (2012). *Building capacity for ethical research with children and young people: an international research project to examine the ethical issues and challenges in undertaking research with and for children in different majority and minority world contexts*. Retrieved 13 January 2021 from http://epubs.scu.edu.au/ccyp_pubs/32

Pulford, B. D., Woodward, B., & Taylor, E. (2018). Do social comparisons in academic settings relate to gender and academic self-confidence? *Social Psychology of Education*, *21*(3), 677–690. https://doi.org/10.1007/s11218-018-9434-1

Reilly, D., Neumann, D. L., & Andrews, G. (2019). Investigating gender differences in

mathematics and science: results from the 2011 trends in mathematics and science survey. *Research in Science Education, 49*(1), 25–50. https://doi.org/10.1007/s11165-017-9630-6

Rezmer, B. E., Trager, L. A., Catlin, M., & Poole, D. A. (2020). Pause for effect: a 10-s interviewer wait time gives children time to respond to open-ended prompts. *Journal of Experimental Child Psychology*, *194*, 1-9. https://doi.org/10.1016/j.jecp.2020.104824

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: a systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 353–387. https://doi.org/10.1037/a0026838

Robson, C., & McCartan, K. (2016). The analysis and interpretation of qualitative data. In C. Robson & K. McCartan (Eds.) *Real world research: a resource for users of social research methods in applied settings* (4th ed., pp. 459–486). Chichester, UK: John Wiley & Sons.

Rueda, R. (2011). Cultural perspectives in reading. In M. L. Kamil, P. D. Pearson, E. B. Moje & P. P. Afflerbach (Eds.), *Handbook of reading research (Vol. 4)*. New York, NY: Routledge.

Ryan, A. M., Patrick, H., & Shim, S. O. (2005). Differential profiles of students identified by their teacher as having avoidant, appropriate, or dependent help-seeking tendencies in the classroom. *Journal of Educational Psychology, 97*(2), 275–285. https://doi.org/10.1037/0022-0663.97.2.275

Ryan, A. M., Pintrich, P. R., & Midgley, C. (2001). Avoiding seeking help in the classroom: who and why? *Educational Psychology Review*, *13*(2), 93–114. https://doi.org/10.1023/A:1009013420053

Salanova, M., Llorens, S., & Schaufeli, W. B. (2011). 'Yes, I can, I feel good, and I just do it!' On gain cycles and spirals of efficacy beliefs, affect, and engagement. *Applied Psychology*, *60*(2), 255–285. https://doi.org/10.1111/j.1464-0597.2010.00435.x

Saldaña, J. (2021). *The coding manual for qualitative researchers* (4th ed.). Los Angeles, LA: SAGE Publications.

Schöber, C., Schütte, K., Köller, O., McElvany, N., & Gebauer, M. M. (2018). Reciprocal effects between self-efficacy and achievement in mathematics and reading. *Learning and Individual Differences*, *63*, 1–11. https://doi.org/10.1016/j.lindif.2018.01.008

Schoor, C. (2016). Utility of reading - predictor of reading achievement? *Learning and Individual Differences*, *45*, 151–158. https://doi.org/10.1016/j.lindif.2015.11.024

Schunk, D. H., & DiBenedetto, M. K. (2016). Self-efficacy theory in education. In K. R. Wentzel & D. B. Miele (Eds.) *Handbook of motivation at school*, (2nd ed., pp. 1–532). New York, NY: Routledge.

Schunk, D. H., & Meece, J. L. (2006). Self-efficacy development in adolescence. In F. Pajares & T. Urdan (Eds.) *Self-efficacy beliefs of adolescents* (pp. 71–96). Greenwich, US: Information Age.

Schunk, D. H., Meece, J. L., & Pintrich, P. R. (2014). Social cognitive theory. In D. H. Schunk, J. L. Meece & P. R. Pintrich (Eds.) *Motivation in education: theory,*

research, and applications (pp. 139–194). Essex, UK: Pearson.

Sewasew, D., & Schroeders, U. (2019). The developmental interplay of academic self-concept and achievement within and across domains among primary school students. *Contemporary Educational Psychology, 58,* 204–212. https://doi.org/10.1016/j.cedpsych.2019.03.009

Shavelson, R. J., Hubner, J. J., & Stanton, G. C. (1976). Self-concept: validation of construct interpretations. *Review of Educational Research, 46*(3), 407–441. https://doi.org/10.3102/00346543046003407

Shkullaku, R. (2013). The relationship between self-efficacy and academic performance in the context of gender among Albanian students. *European Academic Research, 1*(4), 467–478.

Simonsmeier, B. A., Peiffer, H., Flaig, M., & Schneider, M. (2020). Peer feedback improves students' academic self-concept in higher education. *Research in Higher Education, 61*(6), 706–724. https://doi.org/10.1007/s11162-020-09591-y

Simpson, A., & Maltese, A. (2017). "Failure is a major component of learning anything": the role of failure in the development of STEM professionals. *Journal of Science Education and Technology, 26*(2), 223–237. https://doi.org/10.1007/s10956-016-9674-9

Skilling, K., & Stylianides, G. J. (2020). Using vignettes in educational research: a framework for vignette construction. *International Journal of Research and Method in Education, 43*(5), 541–556. https://doi.org/10.1080/1743727X.2019.1704243

Smalley, R. T., & Hopkins, S. (2020). Social climate and help-seeking avoidance in secondary mathematics classes. *Australian Educational Researcher*, *47*(3), 445–476. https://doi.org/10.1007/s13384-020-00383-y

Sorrenti, L., Filippello, P., Buzzai, C., Buttò, C., & Costa, S. (2018). Learned helplessness and mastery orientation: the contribution of personality traits and academic beliefs. *Nordic Psychology*, *70*(1), 71–84. https://doi.org/10.1080/19012276.2017.1339625

Stoet, G., & Geary, D. C. (2018). The gender-equality paradox in science, technology, engineering, and mathematics education. *Psychological Science*, *29*(4), 581–593. https://doi.org/10.1177/0956797617741719

Stone, J., & Hirsch, D. (2019). [redacted] *indicators of child poverty, 2017/18.* http://www.endchildpoverty.org.uk/wp-content/uploads/[redacted] (removed to maintain anonymity).

Stravakou, P. A., & Lozgka, E. C. (2018). Vignettes in qualitative educational research: investigating Greek school principals' values. *Qualitative Report*, *23*(5), 1188–1207.

Susperreguy, M. I., Davis-Kean, P. E., Duckworth, K., & Chen, M. (2018). Self-concept predicts academic achievement across levels of the achievement distribution: domain specificity for math and reading. *Child Development, 89*(6), 2196–2214. https://doi.org/10.1111/cdev.12924

Szumski, G., & Karwowski, M. (2019). Exploring the Pygmalion effect: the role of teacher expectations, academic self-concept, and class context in students' math achievement. *Contemporary Educational Psychology*, *59*, 1-10.

https://doi.org/10.1016/j.cedpsych.2019.101787

Teach First. (2018). *Our work and its impact*. Retrieved 15 January 2021 from https://www.teachfirst.org.uk/sites/default/files/2017-09/teach_first_impact_report.pdf

Timmerman, H. L., Toll, S. W. M., & van Luit, J. E. H. (2017). The relation between math self-concept, test and math anxiety, achievement motivation and math achievement in 12 to 14-year-old typically developing adolescents. *Psychology, Society and Education*, *9*(1), 89–103. https://doi.org/10.25115/psye.v9i1.465

Tosto, M. G., Asbury, K., Mazzocco, M. M., Petrill, S. A., & Kovas, Y. (2016). From classroom environment to mathematics achievement: the mediating role of self-perceived ability and subject interest. *Learning and Individual Differences*, *50*, 260–269. https://doi.org/10.1016/j.lindif.2016.07.009

Usher, E. L., Li, C. R., Butz, A. R., & Rojas, J. P. (2019). Perseverant grit and self-efficacy: are both essential for children's academic success? *Journal of Educational Psychology*, *111*(5), 877–902. https://doi.org/10.1037/edu0000324

Usher, E. L., & Pajares, F. (2009). Sources of self-efficacy in mathematics: a validation study. *Contemporary Educational Psychology*, *34*(1), 89–101. https://doi.org/10.1016/j.cedpsych.2008.09.002

Valentine, J. C., DuBois, D. L., & Cooper, H. (2004). The relation between self-beliefs and academic achievement: a meta-analytic review. *Educational Psychologist*, *39*(2), 111-133. https://doi.org/10.1207/s15326985ep3902_3

Vancouver, J. B., Thompson, C. M., & Williams, A. A. (2001). The changing signs in the relationships among self-efficacy, personal goals, and performance. *Journal of Applied Psychology*, *86*(4), 605–620. https://doi.org/10.1037/0021-9010.86.4.605

Viljaranta, J., Tolvanen, A., Aunola, K., & Nurmi, J. E. (2014). The developmental dynamics between interest, self-concept of ability, and academic performance. *Scandinavian Journal of Educational Research*, *58*(6), 734–756. https://doi.org/10.1080/00313831.2014.904419

Walsh, J. (2011). Objectives of instruction. In *Information literacy instruction: selecting an effective model*. Oxford, UK: Chandos Publishing.

Ware, B. A. (1978). What rewards do students want? *Phi Delta Kappan*, *59*(5), 355–356.

Weidinger, A. F., Steinmayr, R., & Spinath, B. (2019). Ability self-concept formation in elementary school: no dimensional comparison effects across time. *Developmental Psychology*, *55*(5), 1005–1018. https://doi.org/10.1037/dev0000695

Weiner, B. (1980). *Human motivation*. New York, NY: Holt, Rinehart & Winston

Wigfield, A., Harold, R. D., Freedman-Doan, C., Eccles, J. S., Yoon, K. S., Arbreton, A. J. A., & Blumenfeld, P. C. (1997). Change in children's competence beliefs and subjective task values across the elementary school years: a 3-year study. *Journal of Educational Psychology*, *89*(3), 451–469. https://doi.org/10.1037/0022-0663.89.3.451

Willegems, V., Consuegra, E., Struyven, K., & Engels, N. (2017). Teachers and pre-service teachers as partners in collaborative teacher research: a systematic literature

review. *Teaching and Teacher Education, 64,* 230-245. https://doi.org/10.1016/j.tate.2017.02.014

Winne, P. H. (2020). Commentary: a proposed remedy for grievances about self-report methodologies. *Frontline Learning Research, 8*(3), 164-173. https://doi.org/10.14786/flr.v8i3.625

Wolters, C. A., & Pintrich, P. R. (1998). Contextual differences in student motivation and self-regulated learning in Mathematics, English, and Social Studies classrooms. *Instructional Science*, *26*(1–2), 27–47. https://doi.org/10.1023/a:1003035929216

Wong, A. E. (2016). *Daily feedback of self-concept clarity and grit*. (Doctoral thesis). Florida Atlantic University, Florida. Retrieved 12 February 2021 from https://fau.digital.flvc.org/islandora/object/fau%3A33725/datastream/OBJ/view/Daily_Feedback_of_Self-Concept_Clarity_and_Grit.pdf

Wong, K. W. (2007). Sources of influence on teacher self-efficacy among preservice teachers. *Seminar Penyelidikan Pendidikan Institut Perguruan Batu Lintang*, 1–17.

Wood, H., & Wood, D. (1999). Help seeking, learning and contingent tutoring. *Computers and Education*, *33*(2-3), 153–169. https://doi.org/10.1016/S0360-1315(99)00030-5

Yantraprakorn, P., Darasawang, P., & Wiriyakarun, P. (2018). Self-efficacy and online language learning: causes of failure. *Journal of Language Teaching and Research, 9*(6), 1319-1329. https://doi.org/10.17507/jltr.0906.22

You, J. W. (2018). Testing the three-way interaction effect of academic stress, academic self-efficacy, and task value on persistence in learning among Korean college

students. *Higher Education*, *76*(5), 921–935. https://doi.org/10.1007/s10734-018-0255-0

Zelenak, M. S. (2020). Developing self-efficacy to improve music achievement. *Music Educators Journal*, *107*(2), 42–50. https://doi.org/10.1177/0027432120950812

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: relating grade, sex, and giftedness to self-efficacy and strategy use. *Journal of Educational Psychology*, *82*(1), 51–59. https://doi.org/10.1037/0022-0663.82.1.51

Zlatković, B., Stojiljković, S., Djigić, G., & Todorović, J. (2012). Self-concept and teachers' professional roles. *Procedia - Social and Behavioural Sciences*, *69*, 377–384. https://doi.org/10.1016/j.sbspro.2012.11.423

Appendices

Appendix A: The Academy context

The Academy is a non-selective secondary school, with approximately 1200 students in Year 7 to Year 13 (11-years-old to 18-years-old). The Academy is located in an inner London borough where 42.6% of the children live in poverty (Stone & Hirsch, 2019). This is reflected in a higher than national average number of students being eligible for and receiving free school meals (OFSTED, 2011).

The Academy's students "come from a wide range of socio-economic, ethnic, religious and cultural backgrounds. Most are from minority ethnic groups, the largest being of Black African and Bangladeshi heritages" (OFSTED, 2011:3), with over 50 languages are spoken (OFSTED, 2011). Additionally, there is a very high proportion of students (90%) who speak English as an additional language (GOV.UK, 2019). Many students join The Academy part way through their education (OFSTED, 2011). Therefore, in general, The Academy students have many disadvantages to overcome throughout their educational journey.

Appendix B: Headteacher *modus operandi*

Note: parts have been removed to maintain anonymity.

UNIVERSITY OF OXFORD
DEPARTMENT OF EDUCATION

15 Norham Gardens, Oxford OX2 6PY
Tel: +44(0)1865 274024 Fax: +44(0)1865 274027
general.enquiries@education.ox.ac.uk www.education.ox.ac.uk

Director Professor Jo-Anne Baird

[redacted]

[redacted]

Dear [redacted] and [redacted],

I am writing to enquire about conducting a research study in school this academic year, 2020-2021. As you know, I am studying for the Master's in Learning and Teaching at Oxford University, supervised by [redacted] ([redacted]@education.ox.ac.uk). This year the final focus is on practitioner action research and my study asks, "In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?"

This study aims to discover if the use of praise followed by feedback is an effective teaching strategy for Year 10 Nurture students, the two lowest attaining classes studying foundation Mathematics GCSE, who hold low self-beliefs. Praise will be given orally and will directly comment on specific positive aspects of students' mathematics working out and learning behaviours to ensure students know exactly what they have done well. This will be followed by feedback to identify appropriate next steps and encourage the

continuation of students' positive approaches and learning behaviours in mathematics. This study will explore the students' perceptions of students' mathematics self-efficacy, self-concept, and classroom learning.

I would like to focus on Year 10 students in mathematic classes [redacted]. Each class teacher will provide praise and feedback to their class. The praise will be focused on a specific element of a task a student has done well, and will be followed by feedback to identify appropriate next steps and encourage the continuation of these mathematics working out and learning behaviours. The study will be separated into four parts: Part 1 is the collection of data prior to the beginning of the intervention; Part 2 is the intervention where participating teachers will implement praise and feedback comments to their classes; Part 3 is the collection of data following the intervention; Part 4 is the analysis of data. The following data will be collected and analysed to discover the impact of the intervention: questionnaires, interviews and informal discussions with staff and students.

[redacted] and other members of the Mathematics Department are interested in this study and its potential impact, so have volunteered to collaborate with me. If the results produce an increase in any positive outcomes, the Department is keen to explore implementing this approach across the whole Department. I will also be very happy to share my findings more widely within The Academy if you think this will be beneficial.

Oxford University has strict ethical procedures on conducting research, consistent with current British Educational Research Association guidelines. The University also recognises, however, that my study is a piece of practitioner research, and that The Academy already operate with the highest ethical standards. Therefore, only your formal

consent as the headteachers is necessary, and not that of individual parents or staff. During the study, staff and students will be asked to participate in interviews. All participants and students' parents/guardians will be informed about the study and given the option to participate. Each staff member and the student's parent/guardian will be asked to give informed written consent, via Microsoft Forms, for the recording of interviews. Throughout the study, students and teachers will be able to withdraw from participating in the study prior to June 2021.

All participants, including students, teachers, and The Academy, would be made anonymous in all research reports. The data collected would be kept strictly confidential, available only to my supervisor, [redacted] ([redacted]@education.ox.ac.uk) and me ([redacted]@education.ox.ac.uk), and only used for academic purposes. The data will be kept for as long as they have academic value.

If you are happy for me to proceed with this study, please provide confirmation using the attached reply form. If you have any concerns or need more information about what is involved, please contact me or my supervisor. Should you have any questions about this ethics process at any time, please contact the Chair of the Department's Research Ethics Committee at: research.office@education.ox.ac.uk

I look forward to hearing from you.

Yours sincerely,

[redacted]

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

[redacted]

University of Oxford, Department of Education

[redacted]

[redacted]

[redacted] and [redacted]:

- ☐ We do not wish to participate in this study.
- ☐ We would like to find out more about this study.
- ☑ We would like to take part in this study.

[redacted]

Headteacher's signature

[redacted]

Headteacher's signature

Appendix C: Central University Research Ethics Committee (CUREC) approval

Note: parts have been removed to maintain anonymity.

CUREC application to review [redacted]

[redacted] <[redacted]education.ox.ac.uk>
Thu 17/12/2020 15:10
To: [redacted]
Cc: Student CUREC <student.curec@education.ox.ac.uk>; [redacted] <[redacted]@education.ox.ac.uk>

Dear [redacted],

Apologies for any delay here, do feel to follow-up. I am presuming no data has been collected (the start date on the form is 1 November 2020, though think this application was submitted after that date)

In what ways does teacher praise and descriptive feedback influence student beliefs about themselves, their ability and engagement in Mathematics?

The above application has been considered on behalf of the Departmental Research Ethics Committee (DREC) in accordance with the procedures laid down by the University for ethical approval of all research involving human participants.

I am pleased to inform you that, on the basis of the information provided to DREC, the proposed research has been judged as meeting appropriate ethical standards, and accordingly, approval has been granted.

Please continue to follow all current guidance issued by CUREC during the pandemic, notably COVID-19: CUREC guidance on research involving human participants, https://researchsupport.admin.ox.ac.uk/governance/ethics/coronavirus

If relevant please also check the CUREC website for their best practice research guides, https://researchsupport.admin.ox.ac.uk/governance/ethics/resources/bpg

Good luck with your research study,

Keep well and safe,

Yours sincerely,

All good wishes,

[redacted]

Chair, DREC

[redacted], PhD, FHEA, FRSA, Docent

Appendix D: Information sheets and opt-out forms

Note: parts have been removed to maintain anonymity.

Student information sheet

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT INFORMATION SHEET - STUDENT

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Central University Research Ethics Committee (CUREC) Approval Reference: **[**[redacted]**]**

My name is [redacted] and I am an MSc student at the University of Oxford, under the supervision of [redacted] As part of my studies, I am conducting a study examining the use/effectiveness of public praise and feedback and how maths teachers can use this to improve students learning.

The aim of this research

I am interested in discovering if praise followed by feedback could be an effective method for your teachers to use to help your maths learning. I would like to find out the impact this has on your belief about your maths learning.

Praise will be given orally and will directly comment on specific positive aspects of your maths working out and learning behaviours to ensure you know exactly what you have done well. This will be followed by feedback to identify appropriate next steps and encourage you to keep going with this.

Why have I been invited to take part?

You have been invited to take part because you are a Year 10 student studying for the Foundation Mathematics GCSE this academic year (2020-2021).

Do I have to take part?

No. Before committing to the study you can ask questions about this study. If you and your parents/guardians agree, you can take part and then change your mind, and you can withdraw from the study without giving a reason or explanation. The deadline by which you can withdraw any information you have contributed to the research is June 2021. All physical data collected for this study will be transferred and saved on OneDrive for Business which The Academy has provided, and the physical copies will then be destroyed. All personal data for participants will be processed in accordance with the provisions of the Data Protection Act 2018.

You and your parents/guardians have been given this information sheet so you and they know what to expect and can make an informed decision about whether you would like to participate. Your parents/guardians will be asked to give consent in writing via Microsoft Forms, if not possible on Microsoft Forms a paper version will be provided.

What will happen to I take part in the research?

You will be invited to:

(a) Take part in interviews,

(b) Complete a questionnaire at two points throughout the year,

(c) Be observed in your normal maths lessons.

You could be asked to participate in all or some of the activities above. When you take part in the interviews, I will talk through the procedures and give you the chance to ask any questions. If you are still happy to take part, I will ask you to give oral consent or sign a consent form where applicable.

If invited to take part in the interviews, these will be at a time convenient to you and your parents/guardians. Interviews will take place individually. The interviews will explore your thoughts and feelings about maths and your maths learning journey at The Academy.

I would like to audio record interviews because this allows me to transcribe the dialogue, and have an accurate record of our conversations. Your parents/guardians will have the option to choose whether to give consent for your interviews to be recorded.

I will continue to be available for any future questions.

Are there any potential risks in taking part?

I do not anticipate any risks to yourself from taking part in this study.

Parents/Guardians have been provided this information sheet, so they know what to expect and can make an informed decision about whether to participate.

What happens to the data provided?

All data will be kept completely confidential. It will not be possible to identify The Academy, individual teachers, or students.

Once the study is complete, and the findings have been written and published, the data will be made openly available on the Oxford University archives online. The study forms part of my MSc Learning and Teaching at Oxford University and may later be published for academic purposes. All data included will be completely anonymous, with no identifying information.

Data will be stored securely electronically on The Academy OneDrive for Business system. This is protected by a password and The Academy security system. As participants' answers will remain private and be held anonymously, it will not be possible to identify individual questionnaires once the study has ended. This means that participants can withdraw their data at any point during the study, up until the study is complete (June 2021). All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 2018.

Will the research be published?

The research may be published in the Oxford University online archive.

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

The research will be written up as a student's thesis. On successful submission of the thesis, it may be deposited both in print and online in the University archives to facilitate its use in future research. If so, the thesis will be openly accessible.

Who has reviewed this study?

This study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee (Reference number: [redacted]).

Who do I contact if I have a concern about the study or I wish to complain?

For studies reviewed by a university research ethics committee only:

If you have a concern about any aspect of this study, please contact [redacted] via email [redacted] or [redacted] via email [redacted], and we will do our best to answer your query. I/we

will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible:

> Chair, **Medical Sciences Inter-Divisional Research Ethics Committee**; Email: ethics@medsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

Data Protection

The University of Oxford is the data controller with respect to your personal data, and as such will determine how your personal data is used in the study.

The University will process your personal data for the purpose of the research outlined above. Research is a task that is performed in the public interest.

Further information about your rights with respect to your personal data is available from http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/.

Further Information and Contact Details

If you would like to discuss the research with someone or have any questions beforehand, during or afterwards, please contact:

> [redacted]
>
> MSc Learning and Teaching student

Department of Education

University of Oxford

15 Norham Gardens,

Oxford

OX2 6PY

[redacted]

Oxford University telephone number: 01865 274024

Student opt-out sheet

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT OPT-OUT FORM – STUDENT

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

OPT-OUT FORM

Central University Research Ethics Committee (CUREC) Approval Reference: **[**[redacted]**]**

I confirm that I have chosen **NOT** to take part in the study named above.

Please fill out the form below and return it to The Academy by [01/06/2021] to update your preference to opt-out of the study named above.

As you have previously provided consent, unless an opt-out form is received by this date, you may be included in this study as described in the accompanying information sheet.

I, the undersigned, hereby <u>DO NOT</u> give permission to be included in the study titled [In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?].

	dd / mm / yyyy	
Name of Participant (Student)	Date	Signature

	dd / mm / yyyy	
Name of person taking consent	Date	Signature

Teacher information sheet

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT INFORMATION SHEET - TEACHER

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Central University Research Ethics Committee (CUREC) Approval Reference: [redacted]

My name is [redacted] and I am an MSc student at the University of Oxford, under the supervision of [redacted] ([redacted]). As part of my studies, I am conducting a study examining how mathematics teacher can use public praise and feedback within lower attaining mathematic classrooms and how this might affect student's learning.

The aim of this research

This study's aim is to discover if the use of praise followed by feedback is an effective teaching strategy to shift students' beliefs about their mathematics self-efficacy, self-concept, and their perceived value of mathematical tasks. The study focuses on Year 10

nurture students, the two lowest attaining classes studying foundation Mathematics GCSE.

Praise will be given orally and will directly comment on specific positive aspects of students' mathematics working out and learning behaviours to ensure students know exactly what they have done well. This will be followed by feedback to identify appropriate next steps and encourage the continuation of these mathematics working out and learning behaviours.

Why have I been invited to take part?

You have been invited because you are a teacher of [redacted] in Year 10 this academic year (2020-2021).

Do I have to take part?

No. Before committing to the study you can ask questions about this study. If you agree to take part and then change your mind, you can withdraw from the study without giving a reason or explanation. The deadline by which you can withdraw any information you have contributed to the research is June 2021. All physical data collected for this study will be transferred and saved on OneDrive for Business which The Academy has provided, and the physical copies will then be destroyed. All personal data for participants will be processed in accordance with the provisions of the Data Protection Act 2018.

All participating teachers have been given this information sheet so you know what to expect and can make an informed decision about whether you would like to give consent to participate. Your written consent will be sought before the start of data collection. You

will be asked to give consent in writing via Microsoft Forms, if not possible on Microsoft Forms a paper version will be provided. A participant information sheet will also be distributed to students and parents/guardians outlining what the study involves.

What will happen to me if I take part in the research?

You will be invited to

(a) Attend training on how to give praise and feedback,

(b) Implement praise and feedback within your Year 10 classroom,

(c) Attend informal discussions every week during the intervention.

If you agree to take part, you will be asked to implement the use of praise and direct feedback within your Year 10 classroom. You will be given training on this prior to implementation. Training will commence within the curriculum master class time. You will also be asked to take part in informal discussions every week to provide insight into your experiences implementing your praise, enable timely discussion of any positives or issues with student reactions and/or for me to provide support to yourself if needed.

At each stage I will explain the process and give you the chance to ask any questions. I will remain available for questions if you have any at a future date.

Are there any potential risks in taking part?

I do not anticipate any risks to yourself or your students from taking part in this study.

Teachers, parents/guardians, and students will be provided with a detailed participant information sheet, so they know what to expect and can make an informed decision about whether to participate.

What happens to the data provided?

All data will be kept completely confidential. At the beginning of the questionnaire participants will be asked to provide their names to allow their data to be tracked during the study. Once all the data have been collected, the identify of participants' answers and interview responses will be made anonymous. Following the completion of the study in June 2021 all data will be deleted from the electronic data set and removed from the paper copies and destroyed.

Once the study is complete, and the findings have been written and published, the data will be made openly available on the Oxford University archives online. The study forms part of my MSc Learning and Teaching at Oxford University and may later be published for academic purposes. All data included will be completely anonymous, with no identifying information. It will not be possible to identify The Academy, individual teachers, or students.

Data will be stored securely electronically on The Academy OneDrive for Business system. This is protected by a password and The Academy security system. As participants' answers will remain private and be held anonymously, it will not be possible to identify individual questionnaires once the study has ended. This means that participants can withdraw their data at any point during the study, up until the study is complete (June 2021). All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 2018.

Will the research be published?

The research may be published in the Oxford University online archive.

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

The research will be written up as a student's thesis. On successful submission of the thesis, it may be deposited both in print and online in the University archives to facilitate its use in future research. If so, the thesis will be openly accessible.

Who has reviewed this study?

This study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee (Reference number: [redacted]).

Who do I contact if I have a concern about the study or I wish to complain?

For studies reviewed by a university research ethics committee only:

If you have a concern about any aspect of this study, please contact [redacted] via email [redacted] or [redacted] via email [redacted], and we will do our best to answer your query. I/we

will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible:

> Chair, **Medical Sciences Inter-Divisional Research Ethics Committee**; Email: ethics@medsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

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The University will process your personal data for the purpose of the research outlined above. Research is a task that is performed in the public interest.

Further information about your rights with respect to your personal data is available from http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/.

Further Information and Contact Details

If you would like to discuss the research with someone or have any questions beforehand, during or afterwards, please contact:

> [redacted]
>
> MSc Learning and Teaching student

Department of Education

University of Oxford

15 Norham Gardens,

Oxford

OX2 6PY

[redacted]

Oxford University telephone number: 01865 274024

Teacher opt-out sheet

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT OPT-OUT FORM – TEACHER

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

OPT-OUT FORM

Central University Research Ethics Committee (CUREC) Approval Reference: **[**[redacted]**]**

I confirm that I have chosen **NOT** to take part in the study named above.

Please fill out the form below and return it to The Academy by [01/06/2021] to update your preference to opt-out of the study named above.

As you have previously provided consent, unless an opt-out form is received by this date, you may be included in this study as described in the accompanying information sheet.

I, the undersigned, hereby <u>DO NOT</u> give permission to be included in the study titled [In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?].

	dd / mm / yyyy	
Name of Participant (Teacher)	Date	Signature

Parent/guardian information sheet

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT INFORMATION SHEET – PARENT/GUARDIAN

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Central University Research Ethics Committee (CUREC) Approval Reference: [redacted]

My name is [redacted] and I am an MSc student at the University of Oxford, under the supervision of Karen [redacted] ([redacted]). As part of my studies, I am conducting a study examining the use/effectiveness of public praise and feedback and how mathematic teachers can use this to improve learning of students within Foundation GCSE mathematic classes.

The aim of this research

I am interested in discovering if praise followed by feedback could be an effective method for your child's teachers to use to help your child's mathematics learning. I would like to

find out the impact this has on their belief that they know what working out to do to achieve a mathematics task, and on their perceptions about mathematics learning.

Praise will be given orally and will directly comment on specific positive aspects of your child's mathematics working out and learning behaviours to ensure they know exactly what they have done well. This will be followed by feedback to identify appropriate next steps and encourage them to keep going with this.

Why has my child been invited to take part?

Your child has been invited to take part because they are a Year 10 student studying for the foundation Mathematics GCSE this academic year (2020-2021).

Does my child have to take part?

No. Before committing to the study you can ask questions about this study. If you agree that your child can take part and then change your mind, you can withdraw your child from the study without giving a reason or explanation. The deadline by which you can withdraw any information your child has contributed to the research is June 2021. All physical data collected for this study will be transferred and saved on OneDrive for Business which The Academy has provided, and the physical copies will then be destroyed. All personal data for participants will be processed in accordance with the provisions of the Data Protection Act 2018.

All parents/guardians of participating Year 10 foundation Mathematics GCSE classes have been given this information sheet so you know what to expect and can make an informed decision about whether you would like to give consent for your child to

participate. You will be provided with consent letters before the start of data collection, and your consent sought for your child to participate in the study. You will be asked to give consent in writing via Microsoft Forms, if not possible on Microsoft Forms a paper version will be provided. A participant information sheet will also be distributed to students outlining what the study involves.

What will happen to my child if they take part in the research?

They will be invited to

(a) Take part in interviews,

(b) Complete a questionnaire at two points throughout the year,

(c) Be observed in their normal mathematics lessons.

You child could be asked to participate in all or some of the activities above. When your child begins the interviews, I will talk them through the study procedures and give them the chance to ask any questions. If your child is still happy to take part, I will ask your child to give oral consent or sign a consent form where applicable.

If invited to take part in the interviews, these will be at a time convenient to yourself and your child. Interviews will take place individually. The interviews will explore your child's thoughts and feelings about mathematics and their mathematics learning journey at The Academy.

I would like to audio record interviews because this allows me to transcribe the dialogue, and have an accurate record of our conversations. You will have the option to choose

whether you give consent for your child's interviews to be recorded. I will provide you with the option to sign a consent form via Microsoft Forms before beginning interviews.

I will continue to be available for any future questions.

Are there any potential risks in taking part?

I do not anticipate any risks to your child from taking part in this study.

Parents/guardians and student have been provided with information sheets, so yourself and your child know what to expect and can make an informed decision about whether to participate.

What happens to the data provided?

All data will be kept completely confidential. At the beginning of the questionnaire participants will be asked to provide their names to allow their data to be tracked during the study. Once all the data have been collected, the identify of participants' answers and interview responses will be made anonymous. Following the completion of the study in June 2021 all data will be deleted from the electronic data set and removed from the paper copies and destroyed.

Once the study is complete, and the findings have been written and published, the data will be made openly available on the Oxford University archives online. The study forms part of my MSc Learning and Teaching at Oxford University and may later be published for academic purposes. All data included will be completely anonymous, with no identifying information. It will not be possible to identify The Academy, individual teachers, or students.

Data will be stored securely electronically on The Academy OneDrive for Business system. This is protected by a password and The Academy security system. As participants' answers will remain private and be held anonymously, it will not be possible to identify individual questionnaires once the study has ended. This means that participants can withdraw their data at any point during the study, up until the study is complete (June 2021). All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 2018.

Will the research be published?

The research may be published in the Oxford University online archive.

The University of Oxford is committed to the dissemination of its research for the benefit of society and the economy and, in support of this commitment, has established an online archive of research materials. This archive includes digital copies of student theses successfully submitted as part of a University of Oxford postgraduate degree programme. Holding the archive online gives easy access for researchers to the full text of freely available theses, thereby increasing the likely impact and use of that research.

The research will be written up as a student's thesis. On successful submission of the thesis, it may be deposited both in print and online in the University archives to facilitate its use in future research. If so, the thesis will be openly accessible.

Who has reviewed this study?

This study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee (Reference number: [redacted]).

Who do I contact if I have a concern about the study or I wish to complain?

For studies reviewed by a university research ethics committee only:

If you have a concern about any aspect of this study, please contact [redacted] via email [redacted] or [redacted] via email [redacted], and we will do our best to answer your query. I/we will acknowledge your concern within 10 working days and give you an indication of how it will be dealt with. If you remain unhappy or wish to make a formal complaint, please contact the Chair of the Research Ethics Committee at the University of Oxford who will seek to resolve the matter as soon as possible:

> Chair, **Medical Sciences Inter-Divisional Research Ethics Committee**; Email: ethics@medsci.ox.ac.uk; Address: Research Services, University of Oxford, Wellington Square, Oxford OX1 2JD

Data Protection

The University of Oxford is the data controller with respect to your personal data, and as such will determine how your personal data is used in the study.

The University will process your personal data for the purpose of the research outlined above. Research is a task that is performed in the public interest.

Further information about your rights with respect to your personal data is available from http://www.admin.ox.ac.uk/councilsec/compliance/gdpr/individualrights/.

Further Information and Contact Details

If you would like to discuss the research with someone or have any questions beforehand, during or afterwards, please contact:

[redacted]

MSc Learning and Teaching student

Department of Education

University of Oxford

15 Norham Gardens,

Oxford

OX2 6PY

[redacted]

Oxford University telephone number: 01865 274024

Parent/guardian opt-out sheet

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT OPT-OUT FORM – PARENT/GUARDIAN

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

OPT-OUT FORM

Central University Research Ethics Committee (CUREC) Approval Reference: **[**[redacted]**]**

I confirm that I have chosen for my child to **NOT** take part in the study named above.

Please fill out the form below and return it to The Academy by [01/06/2021] to update your preference to opt-out of the study named above.

As you have previously provided consent, unless an opt-out form is received by this date, your child may be included in this study as described in the accompanying information sheet.

I, the undersigned, hereby <u>DO NOT</u> give permission for my child to be included in the study titled [In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?].

_____

Name of Participant (Student)

_____ dd / mm / yyyy _____

Name of Parent/Guardian Date Signature

Appendix E: Voluntary written consent form

Note: parts have been removed to maintain anonymity. The consent forms were completed via Microsoft Forms.

Teacher written consent

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT CONSENT FORM – TEACHER

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Central University Research Ethics Committee (CUREC) Approval Reference: **[**[redacted]**]**

Purpose of Study:

This study's aim is to discover if the use of praise followed by feedback as an effective teaching strategy to positively shift students' beliefs about their mathematics self-efficacy and self-concept, and their mathematical classroom learning.

Please initial each box

1 I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2 I understand that my participation is voluntary and that I am free to withdraw, without giving any reason, and without any adverse consequences or penalty. ☐

3 I understand that research data collected during the study may be looked at by authorised people outside the research team. I give permission for these individuals to access my data. ☐

4 I understand that this study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee. ☐

5 I understand who will have access to personal data provided, how the data will be stored and what will happen to the data at the end of the study. ☐

6	I understand how this research will be written up and published.	☐
7	I understand how to raise a concern or make a complaint.	☐
8	I consent to being audio recorded.	☐
10	I understand how audio recordings will be used in the study.	☐
11	I agree to the use of pseudonymised quotations in the study.	☐
12	I agree to take part in the study.	☐

_____	dd / mm / yyyy	_____
Name of Participant	Date	Signature
_____	dd / mm / yyyy	_____
Name of person taking consent	Date	Signature

Parent/guardian written consent

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

PARTICIPANT CONSENT FORM – PARENT/GUARDIAN

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Central University Research Ethics Committee (CUREC) Approval Reference: [redacted]

Purpose of Study:

This study's aim is to discover if the use of praise followed by feedback as an effective teaching strategy to positively shift students' beliefs about their mathematics self-efficacy and self-concept, and their mathematical classroom learning.

Please initial each box

1	I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.	☐
2	I understand that my child's participation is voluntary and that I am free to withdraw, without giving any reason, and without any adverse consequences or penalty.	☐
3	I understand that research data collected during the study may be looked at by authorised people outside the research team. I give permission for these individuals to access mine and my child's data.	☐
4	I understand that this study has been reviewed by, and received ethics clearance through, the University of Oxford Central University Research Ethics Committee.	☐
5	I understand who will have access to personal data provided, how the data will be stored and what will happen to the data at the end of the study.	☐

6	I understand how this research will be written up and published.	☐
7	I understand how to raise a concern or make a complaint.	☐
8	I consent to my child's interview being audio recorded.	☐
10	I understand how audio recordings will be used in the study.	☐
11	I agree to the use of pseudonymised quotes in the study.	☐
12	I agree to my child taking part in the study.	☐

_____

Name of Participant (Student)

_____ dd / mm / yyyy _____

Name of Parent/Guardian Date Signature

Appendix F: Voluntary student oral content script

Note: parts have been removed to maintain anonymity.

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

ORAL CONSENT SCRIPT - STUDENT

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Central University Research Ethics Committee (CUREC) Approval Reference:

[redacted]

1. This script will be read to students before participating in an interview.
2. Oral consent will be recorded using a Record of Consent Form.

1. Oral consent

I'm doing a study with the University of Oxford, and I would like to invite you to take part in it.

I am interested in discovering if praise followed by feedback could be an effective method for your teachers to use to help your maths learning. I would like to find out the impact this has on your maths self-beliefs and classroom learning.

The answers you give will be completely confidential. Other teachers in The Academy will not know what responses you have given. Whether you decide to take part or not will have no effect on your class work, maths work or day-to-day life within The Academy.

With your permission, I would like to audio record our conversations to make sure I have an accurate record of our conversation, but all your responses will be anonymised with your name replaced with a code. Your responses will remain confidential. The recordings and transcripts will be kept securely and not kept any longer than necessary.

You do not have to take part in this conversation: it is completely up to you. If you take part and then want to stop at any point that is perfectly fine. If you stop and would like your responses to be removed, this is possible at any point up to June 2021.

This research study has been reviewed and approved by an Oxford University Ethics Committee.

You can ask me any questions you want about the study before, during and after our conversations.

Do you have any questions for now?

2. Oral consent seeking stage, after participant has had sufficient time to think about whether s/he wants to take part.

I am going to ask you a few questions, to which I would like you to answer, 'yes' or 'no'. If <u>any</u> answers are 'no' or you don't want to take part, that's OK! No one will be cross with you, and it will have no effect on your Academy life.

1. Has this study been explained to you?

2. Do you understand what this study is about?

3. Have you asked all the questions you want at this stage?

4. Have you had your questions answered in a way you understand?

5. Do you understand it's OK to stop taking part?

6. Are you happy for your voice to be recorded?

7. Are you happy for me to quote some of your responses, ensuring you remain anonymous?

8. Are you happy to take part?

Ok, thank you, let's start.

Appendix G: Detailed timeline

A brief outline of the timeline can also be found in Figure 4 in section 3.4.

Action	Details	Deadline
Stage 1: Pre-intervention		
Identification of students who are not suitable for VPF	Head of Year 10 (HOY 10) was contacted to identify students for whom VPF should be avoided if possible. These students can be praised privately, ensuring all students' social and emotional well-being is maintained.	January 2021
Teacher training and collaborative formation of phrase bank	Teacher training on the importance and effects of VPF, and how to implement; teacher collaboration on the development and wording of praise and feedback phrases to form the phrase bank. The teachers who took part in the training were: participating teachers, trainee mathematics teachers and newly qualified mathematics teachers.	February 2021 (Three sessions completed before half term from 13 February - 21 February 2021)
Piloting questionnaire and vignettes	Piloting of the questionnaire and vignettes with Head of Department (HOD), non-participating teachers and lower attaining Year 9 students (non-participating students).	Week beginning 8 February 2021

Student questionnaires	Conducting student questionnaires.	One lesson within week beginning 22 February 2021
Analysis of questionnaire data	Analysing the questionnaires responses and using this to inform interviews.	Straight after questionnaire completion
Student interviews	Conducting student interviews.	Week beginning 1 March 2021
Stage 2: Implementation of the intervention		
Intervention	Teachers provide VPF for students. The VPF focuses on an element which students have done well and is followed by feedback, e.g. 'Have another look at your working out – have you missed any steps? /Why have you missed this line of working out?' (asking students to work out for themselves that they have missed out) or 'Good, now you have completed these 3 questions correctly, can you see what is similar about/what you can do similarly with the next 3?' (focusing on what is similar in terms of answering the question rather than a correct answer being the point of similarity).	8 March 2021 to 3 May 2021 (7 weeks, excluding The Academy holidays on 1 April 2021 to 16 April 2021)

Informal teacher discussions	Informal teacher discussions were held every week to provide insight into teachers' experiences implementing VPF, enabling timely discussion of any positives or issues with student reactions and support of teachers with their VPF implementation. All teachers involved participated in the informal teacher discussions.	Every week during the intervention
Stage 3: Post-intervention		
Student questionnaires	Conducting student questionnaires.	Last lesson of week beginning 3 May 2021 (week 7/ final week of the intervention)
Analysis of questionnaire data	Analysing the questionnaires responses and using this to inform interviews.	Completion within the week beginning 3 May 2021 (week 7)
Student interviews	Conducting student interviews.	10 May 2021 – 14 May 2021
Analysis of data	Analysis of whole study's data	15 – 31 May 2021

Analysis of data by independent reviewer	Analysis of whole study's data by an independent reviewer. The reviewer' analysis would be compared to mine to limit my subconscious bias unintentionally ignoring unexpected results which conflicted with already held ideas (Robson & McCartan, 2016). However, this was not possible as no independent reviewer was available, as all teachers approached were overwhelmed by the constantly changing educational landscape during the Covid-19 pandemic.	June 2021
Drawing of conclusions	Review data analysis and draw conclusions.	June 2021
Sharing of findings	Share this study's findings with: • Participating teachers, • The Academy's HOD and Assistant HOD, • Students during MSc Learning and Teaching seminar at University of Oxford.	July 2021

Sharing of findings	Share this study's findings with: • The Academy's mathematics department, • The Academy headteachers.	Academic Year 2021-2022

Appendix H: Phrase bank

This is a list of the phrases collaboratively created with participating teachers, trainee mathematics teachers and newly qualified mathematics teachers following the teacher training.

This phrase bank can be used in two ways.

1. The top few phrases are divided into two categories: praise and feedback. Teachers select a praise statement and couple it with a feedback statement during their teaching.

2. The lower few phrases are joint praise and feedback which need to be used in combination. Teachers found it very difficult to separate these phrases when creating the phrase bank, so it was decided collaboratively to keep them as one VPF phrase.

Praise	**Feedback**
Well done for keeping trying with those later questions as they have become harder.	Can you spot the line of working out you have missed?
Fantastic checking of your work to spot that mistake.	Can you spot where you have made a mistake in this question? (Point to the question).

I am very impressed with how hard you have worked to complete this set of questions (without any help).	Can you apply the same method to the next question?
It is great to see you working so hard on that question – it's a tough one.	Why have you chosen to use this method?
You came up with an excellent answer for those questions.	Have another look at your working out – have you missed any steps?
You have put a lot of effort into that/those question(s), I can see.	Why have you missed this line of working out?
Good, now you have completed these 3 questions correctly, can you see what is similar about/what you can do similarly with the next 3?	
You're making good progress! Keep using that working out!	
You are doing great on these questions and making good progress. Keep using that working out!	
I can see you are working hard today by .... (describe the work).	
I can see how much effort you have put into your questions compared to yesterday.	
I am so proud of the effort you have put into these questions, and you should be too.	
I've been watching you try and complete that question. Well done for keeping going. I'm so proud that you kept trying and didn't give up. Would you like some help?	

Appendix I: This study's collaboration

Collaboration was throughout this study. The stages are briefly explained in Figure 4 (see section 3.4.).

Study Stage	**Who was collaborated with**	**Collaboration description and aim**	**Evaluation**
Pre-study	HOD, HOY 10	**Study conception** Aim: to identify the research focus most beneficial to the two Year 10 nurture classes (Class A and Class B) which also aligned with my research interests.	Collegial collaboration successfully enabled this study to be focused on an area of real benefit to two Year 10 nurture classes, while also aligning with my research interests and providing professional development for the participating teachers.
1	HOY 10	**Identification of students not suitable for VPF** Aim: to identify students not suitable for VPF to ensure all students' social and emotional wellbeing	Collegial collaboration identified there was no student within both classes not suitable for VPF, however it did identify other students within the year group unsuitable for VPF.

		was maintained throughout this study.	
1	Participating teachers, trainee mathematics teachers and newly qualified mathematics teachers	**Teacher training and formation of phrase bank** Aim: to provide training for teachers on the potential impacts of VPF, types of phrases and how to implement VPF; to create the phrase bank.	The training helped teachers to differentiate between praise and feedback, to understand the best methods of implementation and why to provide VPF. The collaboratively formed phrase bank enabled the development of phrases everyone was comfortable with, meaning teachers could incorporate these into their teaching quickly and naturally. Although their previous application of VPF was generic and repetitive, Teacher-2 expressed greater confidence in applying VPF to their practice more widely following the composition of the phrase bank.
1	HOD and a non-	**Piloting of questionnaire and vignettes (teachers)**	Piloting enabled the modification of questionnaires and vignettes based on feedback

	participating teacher	Aim: to enable the testing of questionnaire and vignettes prior to implementation to ensure accessibility and fitness for purpose.	from teachers prior to implementation with students. These modifications helped to ensure the data collection methods were suitable for the participant and to uncover any unexpected issues which were resolved prior to the data collection. Piloting the vignettes with teachers removed superfluous words and ambiguities.
1	Year 9 students	**Piloting of questionnaire and vignettes (students)** Aim: to enable the testing of questionnaire and vignettes prior to implementation to ensure accessibility and fitness for purpose.	Piloting enabled the modification questionnaires and vignettes based on feedback from students. These modifications helped to ensure the data collection methods were suitable to the participant and helped uncover unexpected issues which were resolved prior to the data collection. The questionnaire was piloted in one lower attaining Year 9 class

			of 12 students, which resulted in refining the wording to limit ambiguity, especially important for an online questionnaire. The modifications suggested by the collaboration on the vignettes with teachers resulted in successful piloted interviews with four lower attaining Year 9 students, who were all able to access and discuss the content and meaning of the vignettes.
2	Participating teachers	**Weekly informal teacher discussions** Aim: to discuss phrase implementation, issues, improvements, or support (where required) openly and honestly, enabling speedy resolution of any problems.	The participating teachers were very open to the informal discussions and found them a safe and useful space to discuss any positives or issues with implementation. The teachers found the informal discussions an extremely helpful method of identifying issues and their most effective solutions through focused discussion and debate. For example, we

			questioned whether VPF phrasing and/or rate were provoking embarrassment or reticence, and if so, how this study's intervention could be adapted to mitigate this. Following discussion of how Student-2 repeatedly reacted with reservations to the VPF, we reviewed the training materials again and decided to make any feedback for this student more concise and more focused on verbal persuasion to limit their embarrassment.
3	Independent non-participating teacher	**Data analysis by an independent reviewer** Aim: to analyse the questionnaire and interview data from an independent perspective.	Unfortunately, this collaboration was prevented by the COVID-19 pandemic as multiple teachers declined as they felt overwhelmed with the constantly changing educational landscape. Therefore, I was heavily reliant on my own honesty and integrity to remain

			open to all results. If this collaboration had been possible, it would have limited my subconscious bias unintentionally ignoring unexpected results which conflicted already held ideas (Robson & McCartan, 2016), consequently increasing the reliability of analysis.
3	MSc Learning and Teaching mathematics students	**Sharing of results with students at MSc Learning and Teaching seminar at Oxford University** Aim: to share the findings of this study.	Following the presentation, other students reported it made them question how they are currently using VPF, and if they could adapt their current practice to enhance their students' self-beliefs and mathematics learning.
3	HOD and Assistant HOD	**Sharing of results with HOD and Assistant HOD** Aim: to share the findings of this study.	Presentation of the findings to the HOD and Assistant HOD aimed to disseminate the findings in a positive and inspiring way. These two members of staff expressed interest but were sceptical about VPF's suitability for non-nurture

			groups. Therefore, we agreed to pilot the present study across half of the Year 10 classes to investigate whether similar results are observed before implementing
3	Mathematics department	**Sharing of results with mathematics department** Aim: to share the findings of this study.	The results will be shared with The Academy mathematics department during the academic year 2021-2022 during the training days. More detail can be found in section 6.2.2.
3	The Academy headteachers	**Sharing of results The Academy headteachers** Aim: to share this study and any possible positive impacts VPF could have on students' self-beliefs if teachers were to implement VPF beyond these two classes.	The results will be shared with The Academy headteachers during the academic year 2021-2022.

Appendix J: Class A and Class B students' contextual data

Class	Male (M) or Female (F)	Ethnicity	SEN Status (see key after table)	EAL Stage (see key after table)	Reading Age
Class A	F	Moroccan	N	N	7
	F	Black - Sudanese	N	N	8
	M	Moroccan	E	E	8
	M	Bangladeshi	E	N	8
	F	Moroccan	K	C	8
	M	Iraqi	K	C	7
	F	Iraqi	N	N	8
	M	White - English	K	O	8
	F	Italian	K	C	9
	F	Moroccan	K	E	8
	M	Other ethnic group	K	O	10
	M	Moroccan	N	C	10
	M	Kurdish	N	C	8

Class	Male (M) or Female (F)	Ethnicity	SEN Status (see key after table)	EAL Stage (see key after table)	Reading Age
Class B	F	Black - Somali	N	C	8
	M	Other Black African	N	E	10
	M	Arab	N	N	8
	M	Kurdish	N	C	11
	M	Kurdish	N	E	9
	M	Bangladeshi	K	E	8
	M	Kurdish	N	C	10
	M	Black - Somali	K	N	8
	M	Black - Somali	N	N	9
	F	Black Caribbean	N	O	7
	M	Arab	N	N	7

SEN Status Key (HOY 10):

N = No SEN needs.

K = SEN Support. The student is supported by the Special Educational Needs (SEN) Department.

E = Education, Health and Care plan. The student is supported by the Special Educational Needs (SEN) Department and also required additional support to meet the students education, health and social care needs.

EAL Key (HOY 10):

N = Competent. The student is as fluent in English (reading, writing, and speaking) as they are in their first language.

C = Developing competence. The student has very well-developed English in oral communication but needs support to develop the use of abstract vocabulary and lengthy written phrases. The students need minimal EAL support.

E = Early acquisition. The student can follow everyday social oral communications. The student has minimal skills in reading and writing but is familiar with everyday vocabulary. The students need substantial EAL support.

O = New to English. The student is new to reading, writing, and speaking English. The students need significant EAL support.

Appendix K: Student questionnaire

Statement identification	**Statements**
Self-concept (SC) (Marsh & O'Neill, 1984)	
SC-statement-1	I find maths interesting.
SC-statement-2	I find maths challenging.
SC-statement-3	I generally do better in maths than in other subjects.
SC-statement-4	Maths makes me feel not good about myself.
SC-statement-5	I have trouble understanding maths.
SC-statement-6	I always do well in maths.
SC-statement-7	I never do well in maths tests.
Self-efficacy (SE) (Pintrich et al., 1991)	
SE-statement-1	I am confident I will understand the basic topics in maths.
SE-statement-2	I am confident I will understand the challenge question(s).
SE-statement-3	I am confident I will do very well in maths homework.
SE-statement-4	I am confident I will do very well in maths exams.
SE-statement-5	I am confident I will do very well in tasks we do in maths class.

Task-value (Pintrich et al., 1991)	
Task-value-statement-1	I think I can use what I have learnt in maths in other subjects.
Task-value-statement-2	I believe learning maths is important.
Task-value-statement-3	I find maths interesting.
Response to failure (RF)	
RF-statement-1	When I get a question wrong it is because the task is too difficult.
RF-statement-2	I try to understand mistakes when I get something wrong.
RF-statement-3	I try to avoid making mistakes, even if this means I do not answer as many questions or attempt the more challenging questions.
RF-statement-4	When I keep making mistakes, I become frustrated.
RF-statement-5	When I get a question wrong it is because I did not try hard enough.
Perseverance (Pintrich et al., 1991)	
Perseverance-statement-1	I work hard in maths (even if I don't like the topic).
Perseverance-statement-2	When there is a difficult question, I often complete the easy questions.
Perseverance-statement-3	If I don't understand or a question is hard, I give up right away.

Perseverance-statement-4	Even when maths is easy, I still complete the work.
Perseverance-statement-5	Even when maths is boring, I still complete the work.
Help-seeking (Pintrich et al., 1991)	
Help-seeking-statement-1	When I'm struggling with a question, I try to do the work on my own without asking for help from anyone.
Help-seeking-statement-2	I ask the teacher for help when I don't understand.
Help-seeking-statement-3	I ask the teaching assistant for help when I don't understand.
Help-seeking-statement-4	I ask other students for help when I don't understand.

Appendix L: Questionnaire implementation

Note: parts have been removed to maintain anonymity.

Department of Education

[redacted]

MSc Learning and Teaching student

[redacted]

Oxford University telephone number: 01865 274024

TEACHER QUESTIONAIRE GUIDANCE

Study: In what ways does verbal teacher praise and feedback influence students' self-concept and self-efficacy beliefs and their mathematics classroom learning?

Teacher guidance

Please read before administering the questionnaire

Thank you for asking your class to complete this questionnaire. The students within your class will complete the questionnaire through Microsoft Forms to investigate how our students' self-beliefs are influencing their mathematics learning.

In this pack you will find:

- a script to read aloud to your students to explain how the questionnaire needs to be completed;

- an ActiveInspire presentation - please show this to students. It will detail how to answer the questions;

- possible questions students may have and answers to be provided.

When explaining the questionnaire, you may be asked some questions. A few possible questions and answers to be given are below:

Question	Suggested responses
Who will be assessing the questionnaire?	Another maths teacher will be reviewing the questionnaire. I will not be able to see your answers. Your answers will not influence your maths lessons or interactions with any teachers. Please try to be as honest as possible.
Why do we have to complete the questionnaire?	The results are for us as a maths department to review and see if we can help improve your maths teaching and learning.
Will any changes be made as a result of our	At the moment we are not sure, but before any changes are made these will be discussed with the Junior Leadership Team.

questionnaire answers?	
What if I don't know the answer?	There are no right or wrong answers. Choose the answer which feels most like you.

If you have any further questions about the questionnaire, please do not hesitate to speak to me.

Thank you again.

Implementation speech (pre-intervention)

Teacher: read the text below aloud.

We would like you to complete a questionnaire to help the maths department understand your self-beliefs about maths. The questionnaire will be answered through Microsoft Forms. When answering these questions please try to answer as honestly as possible and do not worry about giving a right answer; there are no right or wrong answers. I will not be able to see the answers that you give; all your answers will be anonymous. When completing the questionnaire, make sure you read each statement carefully as some include negative statements so may need to be answered differently from the others.

The questionnaire should take you around 10 minutes.

Teacher: show the ActiveInspire presentation. Read the text on each slide aloud.

Does anybody have any questions?

Teacher: pause and take any questions.

You will complete the questionnaire through Microsoft Forms. Please click on the link through Microsoft Teams to complete the questionnaire.

Teacher: pause to allow students to complete this.

Do you have any questions?

Teacher: pause and take any questions.

Implementation speech (post-intervention)

Teacher: read the text below aloud.

In addition to your homework, there is an optional questionnaire, very similar to the one we did during online learning 7 weeks ago. The questionnaire will be answered through Microsoft Forms and will help to help the mathematics department understand your self-beliefs about maths. When answering these questions please try to answer as honestly as possible and do not worry about giving a right answer; there are no right or wrong answers. I will not be able to see the answers that you give; all your answers will be anonymous. When completing the questionnaire, make sure you read each statement carefully as some include negative statements so may need to be answered differently from the others.

The questionnaire should take you around 10 minutes.

Teacher: show the ActiveInspire presentation. Read the text on each slide aloud.

Does anybody have any questions?

Teacher: pause and take any questions.

You will complete the questionnaire through Microsoft Forms. Please click on the link through Microsoft Teams to complete the questionnaire.

Teacher: pause to allow students to complete this.

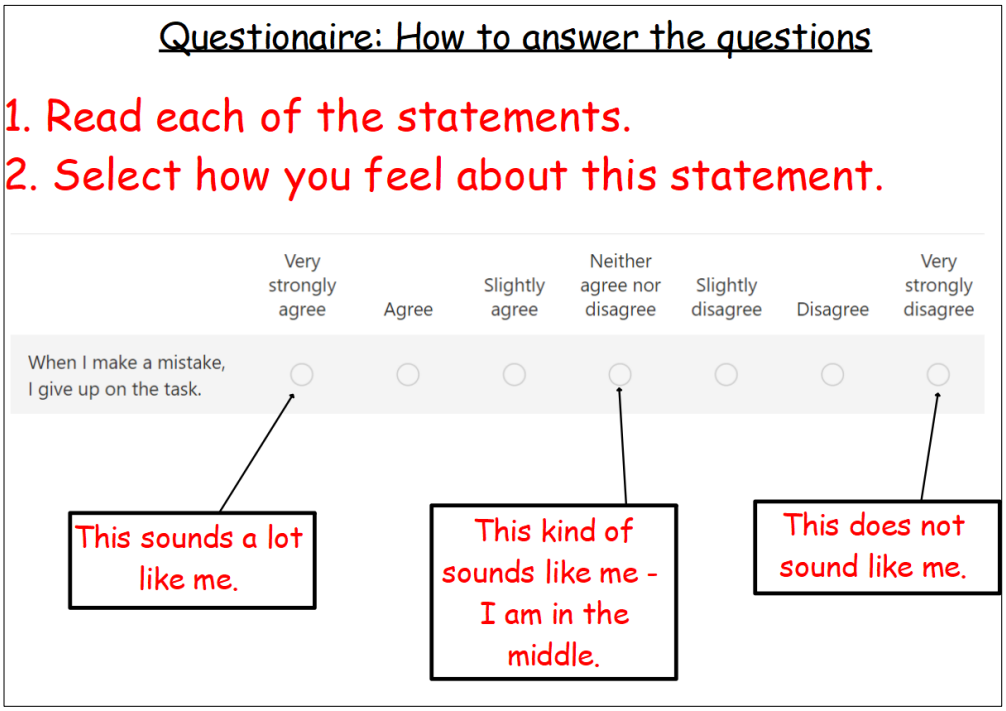
Do you have any questions?

Teacher: pause and take any questions.

Please write this optional homework in your planner.

Teachers: pause to allow students to complete this.

How to answer presentation



Appendix M: Vignettes and follow up questions

Research question 1: How has increased verbal praise and feedback (VPF) influenced students' self-concept and/or self-efficacy?

You will hear me describe a few situations within a maths classroom. Once you have heard each one, have a think about it, and then I will ask you a few questions.

Self-concept and Self-Efficacy

Vignette:

Noor and Yahya are in the same maths class. Noor is thinking about her maths lessons. Noor wants to do well in maths but believes it is pointless as she is always getting questions wrong. Yahya is also thinking about his maths lessons. Yahya wants to do well in maths and believes he can do well as he has been getting questions right in the last few lessons.

Possible follow up questions:

Perceptions about Noor's and Yahya's situation

- Why might Noor feel this way?

- Why might Yahya feel this way?

- What might have influenced Noor to feel this way?

- What might have influenced Yahya to feel this way?

- If you think Noor or Yahya's thinking could be changed, can you explain how?

- How might other students, the teacher and the teaching assistant in Noor and Yahya's class influence how Noor and Yahya feel?

- How do people in Noor and Yahya's year group influence their feelings?

Students' perception of how they relate to Noor's or Yahya's situation

- Who are you most like and why?

- If you have ever felt the same way as Noor in any of these scenarios, what did you do?

- If you have ever felt the same way as Yahya in any of these scenarios, what did you do?

- How would you feel in this scenario?

Research question 2: In what ways did the effects of increased verbal praise and feedback (VPF) on student self-beliefs influence their task participation, response to failure, perseverance, and help-seeking?

Next, you will hear me describe a few situations. Once you have heard all of them, have a think about them, and then I will ask you a few questions.

Task participation

Vignette:

Mohammed has been given a task to complete by his maths teacher. There are four options of what Mohammed could do:

1. Mohammed begins by drawing his margins, tidies his desk, and sticks in the sheet before beginning the work. This takes him at least 5 minutes.

2. Mohammed's first thoughts are 'Is this task worth doing?' and 'How much effort will this task take?'.

3. Mohammed's first thought is 'Can I do this task?'

4. Mohammed starts the questions straight away and tried his hardest to work throughout the whole lesson.

Possible follow up questions:

Perceptions about Mohammed's situation

- What differences do you notice between the scenarios?
- Which do you think is best for Mohammed to do and why?
- Which do you think is worst for Mohammed to do and why?

Students' perceptions of how they relate to Mohammed's situation

- Can you explain which scenario is most like you?
- What have you done/would you do if you ever felt the same way as Mohammed in any of these scenarios?
- How would you feel in each scenario?
- If you have ever been in any of these scenarios can you explain how you felt?
- Would you have had a different response to the options read to you?

Response to failure

Vignette:

Abeer is in a maths lesson. Abeer has just asked the teacher to check her questions. The teacher tells Abeer she has got some of the questions wrong. The teacher asks Abeer to have another go at these questions. What might Abeer think about her mistakes/incorrect answers? You may choose more than one option.

1. Abeer thinks the questions were too difficult.

2. Abeer thinks she doesn't have the ability to complete the questions.

3. Abeer thinks she did not put enough effort into the questions when she attempted them the first time.

4. Abeer thinks it does not matter that she got those questions wrong because she can learn from the mistakes.

5. Abeer thinks something else; if so, please say what she might be thinking.

Possible follow-up questions:

Perceptions about Abeer's scenario

- Why did you choose that option?
- How do you think Abeer would feel about getting these questions wrong?
- Do you think Abeer feels like she is in control of her own learning and why?
- What might have influenced Abeer to feel this way?
- What do you think could help Abeer to see her mistakes as something to learn from?
- How do you think Abeer would feel if she has another go and gets it wrong?
- How do you think Abeer would feel if she has another go and gets it right?

Students' perceptions of how they relate to Abeer's situation

- Can you explain which scenario is most like you?
- If you were to be in Abeer's scenario, what would you do and why?
- If you got questions wrong like Abeer, what do you think would be the reasons for this?

- Do you think your previous maths lessons could help you in this scenario and how?

Perseverance

Vignette:

Heyfa is in a maths lesson. The teacher has explained how to complete the questions and Heyfa has written the examples into her book. Heyfa has been asked to complete some questions by her teacher. Heyfa does not believe she can do these questions and is finding them difficult. What should she do?

1. Give up.
2. Keep trying.
3. Keep trying and look back at the examples to help her.
4. Ask for help.
5. Something else; if so, please give more details.

Possible follow-up questions:

Perceptions about Heyfa's scenario

- Why did you choose that option?
- How do you think Heyfa feels when she finds the questions difficult?
- Why do you think Heyfa might give up? How does this make Heyfa feel?
- Why do you think Heyfa might not give up? How does this make Heyfa feel?
- What could Heyfa do to complete the question?
- If Heyfa keeps trying to answer the question, how do you think she will feel if she gets it wrong again?
- If Heyfa keeps trying the question, how do you think she will feel if she gets it correct?
- What do you think could happen if Heyfa gives up?
- What do you think could happen if Heyfa keeps trying?
- What might have influenced Heyfa to feel this way?
- Might something or someone have influenced Heyfa to feel this way?

Student's perception of how they relate to Heyfa's situation

- If you have ever felt the same way as Heyfa, what did you do?
- If you were in Heyfa's scenario, what would you do? Can you explain why you chose that option?
- What are the reasons you would keep trying at the question?
- What are the reasons you would give up on the question?
- Do you think your previous maths lessons could help you in this scenario and how?

Help-seeking

Vignette:

Adnan is in a maths lesson. Adnan is completing the questions but is struggling with one question and does not know how to complete it. What would you think Adnan should do?

1. Ask the teacher for help.
2. Ask the teaching assistant for help.
3. Ask another student for help.

4. Keep trying the question and hope he gets it right in the end.

5. Keep trying and look back at the examples to help him.

6. Something else; if so, please give more details.

Possible follow up questions:

Perceptions about Adnan's scenario

- Why did you choose that option?
- How do you think Adnan feels when he is struggling?
- How do you think Adnan feels when he asks for help?
- Why do you think Adnan might not want to ask for help?
- What could happen if Adnan did not ask for help?
- What might have influenced Adnan to feel this way?
- Might something have influenced Adnan to feel this way?

Students' perceptions of how they relate to Adnan's situation

- If you have ever felt the same way as Adnan, what did you do?

- If you were in Adnan's scenario, what would you do and why?

- How would you feel asking for help?

- How would you feel asking the teacher/teaching assistant/student for help? (Interviewer choose the correct person)

- Why did you choose teacher/teaching assistant/student instead of the teacher/teaching assistant/student? (Interviewer choose the correct person)

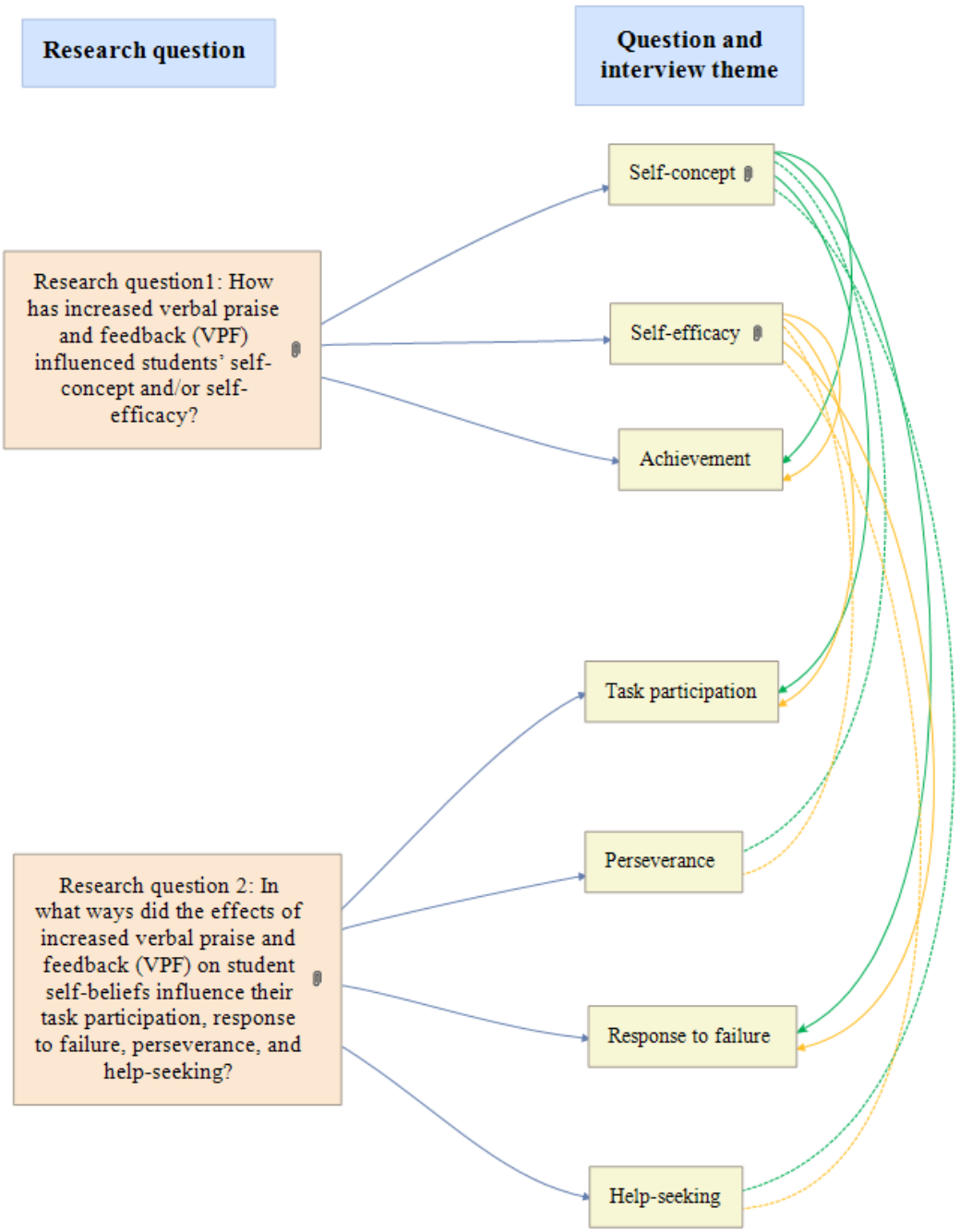
- Who do you think is the best person to ask for help from: teacher, teaching assistant, or student? Can you explain why you think this?

Appendix N: The mapping of questionnaire and interview themes to the research questions, constructs, and themes

Key

 (Straight line connector with an arrow) = This study has discovered a possible link between the shift in either self-concept or self-efficacy influencing the theme from research question 2 (task participation, response to failure, perseverance, and help-seeking).

 (Dotted line connector) = This study has discovered a possible link between the shift in either self-concept or self-efficacy and the theme from research question 2 (task participation, response to failure, perseverance, and help-seeking) but the direction of influence is not clear.


Research question
Question and interview theme
Research question1: How has increased verbal praise and feedback (VPF) influenced students' self-concept and/or self-efficacy?
Research question 2: In what ways did the effects of increased verbal praise and feedback (VPF) on student self-beliefs influence their task participation, response to failure, perseverance, and help-seeking?
Self-concept
Self-efficacy
Achievement
Task participation
Perseverance
Response to failure
Help-seeking

Appendix O: Questionnaire numerical results

		Pre-intervention			Post-intervention		
		Median	Mean	SD	Median	Mean	SD
Self-concept		**4**	**3.76**	**1.49**	**4**	**4.00**	**1.44**
SC-statement-1	I find maths interesting.	3	3.15	1.72	3	3.23	1.83
SC-statement-2	I find maths challenging.	4	3.54	1.33	4	3.54	1.33
SC-statement-3	I generally do better in maths than in other subjects.	4	4.15	1.41	4	4.31	1.44
SC-statement-4	Maths makes me feel not good about myself.	4	3.85	1.95	5	4.31	1.80
SC-statement-5	I have trouble understanding maths.	3	3.77	1.42	4	4.15	1.28
SC-statement-6	I always do well in maths.	4	3.77	1.54	5	4.31	1.11

SC-statement-7	I never do well in maths tests.	4	4.08	1.04	4	4.15	0.99
Self-efficacy		**4**	**3.89**	**1.51**	**5**	**4.72**	**1.28**
SE-statement-1	I am confident I will understand the basic topics in maths.	3	3.31	1.32	4	4.46	0.97
SE-statement-2	I am confident I will understand the challenge question(s).	5	4.38	1.50	5	5.08	1.32
SE-statement-3	I am confident I will do very well in maths homework.	4	3.92	1.50	4	4.62	1.56
SE-statement-4	I am confident I will do very well in maths exams.	4	4.38	1.45	5	4.54	1.45
SE-statement-5	I am confident I will do very well in tasks we do in maths class.	4	3.46	1.66	5	4.92	1.12

Task-value		**4**	**4.05**	**2.32**	**4**	**4.05**	**2.20**
Task-value-statement-1	I think I can use what I have learnt in maths in other subjects.	5	5.15	2.34	5	4.85	2.44
Task-value-statement-2	I believe learning maths is important.	3	3.31	2.46	3	3.38	1.76
Task-value-statement-3	I find maths interesting.	4	3.69	1.84	3	3.92	2.25
Task-value		**4**	**4.05**	**2.32**	**4**	**4.05**	**2.20**
RF-statement-1	When I get a question wrong it is because the task is too difficult.	6	5.92	2.06	7	6.77	1.79
RF-statement-2	I try to understand mistakes when I get something wrong.	5	5.46	1.56	6	5.77	2.24
RF-statement-3	I try to avoid making mistakes, even if this means I do not answer as many questions or attempt the more	3	3.62	2.53	4	3.62	2.47

	challenging questions.						
RF-statement-4	When I keep making mistakes, I become frustrated.	5	4.92	1.04	4	3.77	1.48
RF-statement-5	When I get a question wrong it is because I did not try hard enough.	3	3.62	2.53	5	4.69	1.70
Perseverance		**3**	**3.60**	**2.19**	**4**	**4.20**	**2.37**
Perseverance-statement-1	I work hard in maths (even if I don't like the topic).	3	2.77	1.69	4	3.85	2.03
Perseverance-statement-2	When there is a difficult question, I often complete the easy questions.	6	6.38	1.12	7	7.15	1.82
Perseverance-statement-3	If I don't understand or a question is hard, I give up right away.	4	3.46	1.71	5	4.54	1.27
Perseverance-statement-4	Even when maths is easy, I still complete the work.	1	2.15	1.41	1	2.15	1.41

Perseverance-statement-5	Even when maths is boring, I still complete the work.	3	3.23	2.20	3	3.31	1.93
Help Seeking		**4**	**4.08**	**1.47**	**4**	**4.23**	**1.76**
Help-seeking-statement-1	When I'm struggling with a question, I try to do the work on my own without asking for help from anyone.	5	5.08	1.44	6	6.08	1.89
Help-seeking-statement-2	I ask the teacher for help when I don't understand.	3	3.62	1.39	4	3.38	1.33
Help-seeking-statement-3	I ask the teaching assistant for help when I don't understand.	3	3.38	1.04	4	3.92	1.12
Help-seeking-statement-4	I ask other students for help when I don't understand.	4	4.23	1.48	3	3.54	1.20

Appendix Q: Limitations and further investigations

Limitation	Further investigation
This study was a small-scale study with a participant size of only 13% of Year 10 at The Academy. Therefore, it is difficult to generalise the results across the year group or Academy since they are specific to the context of the students and teachers of Class A and Class B.	Given the positive shifts found with this small participant's self-beliefs, it could be beneficial to repeat this study across a wider scale more representative of The Academy's student population, and with an increase in the number of teachers participating.
This study's intervention period was only 7-weeks so long-lasting shifts were excluded.	A longer period intervention would allow a review of any long-lasting effects of VPF on self-beliefs and mathematics classroom learning to discover if Year 10 students continue to experience shifts or whether these begin to plateau or even decrease. Additionally, it may help to identify if some shifts only begin to emerge after a longer period.
This study's methodology used self-reporting methods; hence responses were subjective and dependent on participants' personal interpretations of situations and interview/questionnaire statements	Due to the limitations of self-reporting, future studies could supplement the questionnaires and interviews with formal written observation methods to confirm or challenge students' and

(Winne, 2020). Therefore, the numerical value assigned to the questionnaire response may not be the same across all participants, as the perceived value could be inconsistent among students. Interview responses are also subjective as students perceive and interpret situations differently, either deflating or inflating their perceptions of their self-beliefs (Fadnes, Taube, & Tylleskär, 2009).	teachers' self-reported responses and perceptions to see if these align with their behaviour observed during classroom learning. To increase reliability, formal written objective observations could be completed by an independent teacher not involved in the study. Additionally, this would extend collaboration and encourage a more diverse set of perspectives and opinions to help form and validate any findings.
This study was completed part way through the academic year where different topics were taught pre-intervention and during this study's intervention. Therefore, it is difficult to state with certainty that increased self-beliefs were due to increase VPF during the intervention or due to students preferring particular topics.	A future investigation could review if particular topics and how they are taught influence student self-beliefs or run throughout the whole year to discover if any shifts occur when topics change.
This study only focused on two nurture classes in one year group in the middle of their education at The Academy. Therefore, it is unknown how students of a	Future studies could focus on nurture students in younger year groups to see whether they present with similar shifts as this study or if findings differ with age.

younger age would respond to this study's intervention.	
This study only focused on nurture classes. Therefore, it is unknown how students of different attainment settings would respond to this study's intervention.	Future studies could focus on students in different attainment settings to see whether they present with similar shifts as this study or if findings differ with attainment setting.
Due to the short time period of this study's intervention the majority of students' social comparisons remained downwards, however Student-1 (one of the student with the greatest increased shifts in self-concept) displayed signs of upwards comparisons, beginning to become a source of improvement.	There are two possible further investigations: 1. A longer period intervention enabling investigation of whether students require more time for their historical, deeply-rooted negative social comparisons to be overcome. 2. A study focused primarily on overcoming students' previous, historical, deeply-rooted negative social comparisons. This would help discover whether students are performing positive social comparisons, and if the upwards social comparison could shift to become improvement focused.

This study used in-class assessments to evaluate students' achievements, however there was no formal assessment during this study.	A future study could use assessment points throughout the academic year as data collection points to see if formal assessment influences students' self-beliefs.
Students continued to use expedient help-seeking throughout the present study.	To mitigate against this, VPF could be implemented to target encouragement of adaptive help-seeking, supported by teacher training. This was beyond the scope of this study but could be the focus of a future investigation.
Students were found to prefer to help-seek from their teaching assistant over their teacher. Due to my position as a practitioner researcher, I was unable to discover reasons for this.	An investigation into students' preferred person from whom to seek help would enable greater insight into why students prefer to help-seek from their teaching assistant. This could enhance future teaching as it could help teachers to adapt their teaching style to support students to feel more comfortable seeking help from the teacher, instead of primarily the teaching assistant. An important part of the study would be for the interviewer to be an independent interviewer who is not a member of The Academy community,

	providing students with the greatest opportunity to discuss openly.