Measuring Undergraduates' Gains in Learning and Evaluative Judgement; a Self-Regulated Learning Theory Approach.

Thesis submitted in accordance with the requirements of the University of Liverpool for the degree of Doctor in Philosophy by Mark Jellicoe.

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Doctoral studies require persistence. This persistence has not been all my own. I am grateful for those that have allowed me the intellectual space, and otherwise, to get to this point. The process has been valuable training in research and my own capacity for self-regulation. I have not at every point, been confident in this capacity to reach the end. Others have helped to support my belief in that capacity. I am glad to have reached this point, the following are those that have helped get me here.

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Abstract

This research programme investigated the incremental development of knowledge, skills and attitudes underpinning self-regulated learning gains. Findings propose tools enabling learners, educators, and researchers to measure and understand self-regulated changes during learning. These marginal gains support the evaluative judgement that is necessary within, and beyond, Higher Education (Ajjawi, Tai, Dawson, & Boud, 2018). In support of a first aim, two behaviourally anchored rating scales were developed and validated to bolster understanding of goal setting, and feedback integration in tertiary learners. A second aim considered how self-efficacy supported integration of feedback during post-task appraisal, and further how such evaluations contribute to goal setting. Third, the role of achievement goal theory perspectives, mindsets and goal orientations, in supporting incremental gains was also examined. A fourth aim examined the contribution of self-regulatory factors including mindsets, self-efficacy, and goal setting to medium and longer term outcomes, including grades, and employability perceptions.

Supporting the first aim, a linear path through five learner endorsed factors underpinned feedback integration. Learners who accepted feedback reported that the source of feedback provided credible challenge. Information from a credible source led to learners reporting greater awareness, and in turn increased motivational intentions. Motives led to learners reporting behavioural changes and developmental actions. The GLS established two learner endorsed goal setting factors, goal clarity and goal difficulty; factors reported moderate covariance.

In a second aim, as in the first, the same linear path was seen to motivational intentions. In later analysis paths diverged with motives also predicting higher levels of self-efficacy. Efficacy beliefs in turn predicted clearer goals. Clear goals led to greater feedback awareness in learners.

Findings support the cyclical nature of self-regulated learning. A growth mindset, mastery approach goal orientations, and to some extent performance approach orientations contributed in unique ways to self-regulation. Findings also largely supported an earlier approach and the third aim.

For the fourth aim, self-regulatory variables did not predict grades. However, mindsets, self-efficacy, and goal setting were related to, and supported, aspects of longer term perceptions of employability. The self-regulatory factors indicated may therefore act as a useful proxy of developing confidence in undergraduate learners, beyond grades.

In conclusion, findings from the current programme support self-efficacy and goal setting as key variables to track in developing self-regulated learning. For example, self-efficacy supports clear goals and increasing levels of awareness in responding to feedback. Additionally, goal setting and self-efficacy support learner perceptions of employability. Mindsets and goal orientations strengthened learner development in nuanced ways. Learners, educators and researchers should utilise these findings and supporting methods to identify and intervene in sub-optimal learning approaches. Replication in larger samples, and in other educational domains and geographies should be undertaken to bolster support for the approach reported here.

CHAPTER 1 – Literature Review: Preparation and Performance

Introduction

Theoretical approach

Evaluative judgement is a developmental skill that serves us for life (Joughin, Boud, & Dawson, 2018). The ability to see clearly where we have been and where we are heading, with confidence in our ability, suggests an important regulatory competence. Evaluative judgements are foundations that support gainful learning and the knowledge, skills and attributes that are prerequisites for graduate careers (Ajjawi et al., 2018; The Confederation of British Industry, 2017). The ability to plan what follows next following dispassionate reflection on our previous experiences, structuring our environment with motivational strategies that support growth and development is fundamental. However, tertiary learners are thought to lack the self-regulatory knowledge, skills and attributes to engage in these self-monitoring behaviours during learning (Peverly, Brobst, Graham, & Shaw, 2003; Zimmerman & Paulsen, 1995). These are key gains that ought to be developed by learners during undergraduate education.

The tertiary education sector in the United Kingdom came under increasing pressure to justify the return on investment, following the increasing costs to students and government (Evans, Kandiko Howson, & Forsythe, 2018). The Office for Students, through its predecessor HEFCE, commissioned up to 30 investigations of learning gain, focusing on the distance travelled by students in terms of knowledge, skills and attitudes (Kandiko Howson, 2019). Measuring learning gains accrued during tertiary education has, however, proved challenging. This may be due to the lack of clarity about what learning gains means. No definitive measure of learning gain has resulted from these investigations. An evaluation report concludes that learning gain may be most appropriately measured using surveys to

understand changes in soft skills, triangulated alongside objective attainment data and employability registrations as a mechanism for understanding the improvements by students during tertiary education. This approach to developing understanding accords with a holistic definition operationalising learning gain as *"a change in knowledge, skills, work-readiness, and personal development"* (Evans et al., 2018, p. 4). Kandiko Howson's (2019) final evaluation report of learning gain projects recommends the development of a measure of learning gain with students included as partners in its development. Structurally embedding these measures of learning gain in institutional processes and curricula, self-reflection and development planning is also highlighted. Such a developmental approach aligns closely with those enshrined in self-regulated learning, which proposes the reciprocal interaction of forces associated with the person, their behaviour and the environment of learning.

Recent suggestions are that self-control has become more difficult with the advent of technology (Duckworth, Taxer, Eskreis-Winkler, Galla, & Gross, 2019). In turn, the cognitions and associated attitudes embedded within self-regulated learning approaches are suggested to support resilience, acting as protective factors that promote persistence. Such self-regulatory perspectives have long been considered under the purview of Bandura's (1986) Social Cognitive Theory, and notably its key pillar, self-efficacy.

Self-efficacy is suggested to have a strong influence on motivational theories associated with "*development, adaptation, and change*" (Bandura, 2006, p. 164). For example in occupational domains, Locke and Latham's High Performance Cycle (HPC; 1990a), describes the dynamic processes that must remain balanced when the individual interacts with the task environment if high performance is to result. Agentic self-efficacy beliefs are suggested to act to influence post task appraisals in the HPC and guide the next steps taken by workers. Further, these agentic theoretical perspectives are similar in nature to Mischel and Shoda's (1995) proposed cognitive-affective system theory of personality. This theory suggests that encodings,

expectancies and beliefs, are dynamic forces that interact to mediate behavioural approaches that may vary with situations, despite normally stable behavioural traits. Many such influential theories that speak to human motivation and self-regulation during task performance (see Sitzmann & Ely, 2011 for a review). These include theories that discuss personal agency to achieve desired outcomes, for example, expectancy value theory (e.g. Wigfield & Eccles, 2000), and self-determination theory (e.g. Deci & Ryan, 2002); and the learner's ability to evaluate and manage emotions associated with learning, i.e. control value theory (e.g. Pekrun, 2000). There have been recent attempts to suggest unification of theoretical perspectives, due to conceptual overlap (Dweck, 2017a; Zusho, 2017). Despite confusion, self-regulated learning perspectives are useful in their largely holistic, integrated nature (Panadero, 2017). These self-regulatory perspectives, such as those espoused by Zimmerman (2000) during learning, align well with industry demands for emergent graduates who can employ the levels of evaluative judgement necessary to motivate and manage the rigors of the world of work with necessary levels of resilience (Ajjawi et al., 2018; The Confederation of British Industry, 2017). Self-efficacy beliefs sit at the heart of agentic self-regulated learning. This agentic approach suggests that a triad of influential forces associated with the person, their behaviour and the task environment coexist to create regulatory forces that determine performance (Bandura, 2006; Zimmerman, 2000). These self-regulatory influences have been explored in models that aim to explain self-regulated learning at a task level.

Panadero (2017) explored six models of self-regulated learning at different levels of abstraction and found no unitary model of self-regulated learning. Most models of self-regulated learning are cyclical in nature and converge around the idea of three phases; preparatory, performance, and appraisal (Bandura, 2006; Puustinen & Pulkkinen, 2001). Medium to large effects are reported for training in self-regulated learning in learners in primary and secondary education settings. These reported effects differ as a function of educational setting and theoretical underpinning. Evidence also suggests that interventions delivered by a researcher (Dignath & Büttner, 2008), and that are situated in context (Hattie, Biggs, & Purdie, 1996; Van

Merriënboer & Kirschner, 2017) deliver stronger effects. Learners with differing achievement, self-regulated learning and personality profiles may benefit from differentiated interventions (Dörrenbächer & Perels, 2016). From a social cognitive perspective, the influence of Zimmerman's (2000) cyclic model, perhaps due to its integrative nature, has led to it being the most cited in the field (Panadero, 2017; Panadero & Alonso-Tapia, 2014). This holistic approach considers the cognitive, affective and behavioural phases of self-regulation during learning. The phasic approach builds on Zimmerman's (1989) proposal that self-regulation operates within the triadic sphere of the person, behaviour and the task environment.

In a phasic model of self-regulated learning, Zimmerman and Moylan (2009), see Figure 1.1, indicate two preparatory components in the forethought phase describing a learner's ability to direct and energise learning through task analysis and self-motivation beliefs. During task analysis, two active sub-processes of goal setting and strategic planning are enacted. Self-motivation beliefs are influenced by five variables, including self-efficacy, outcome expectations, task value, interest and goal orientations. Together, these dynamic processes predict the performance phase.
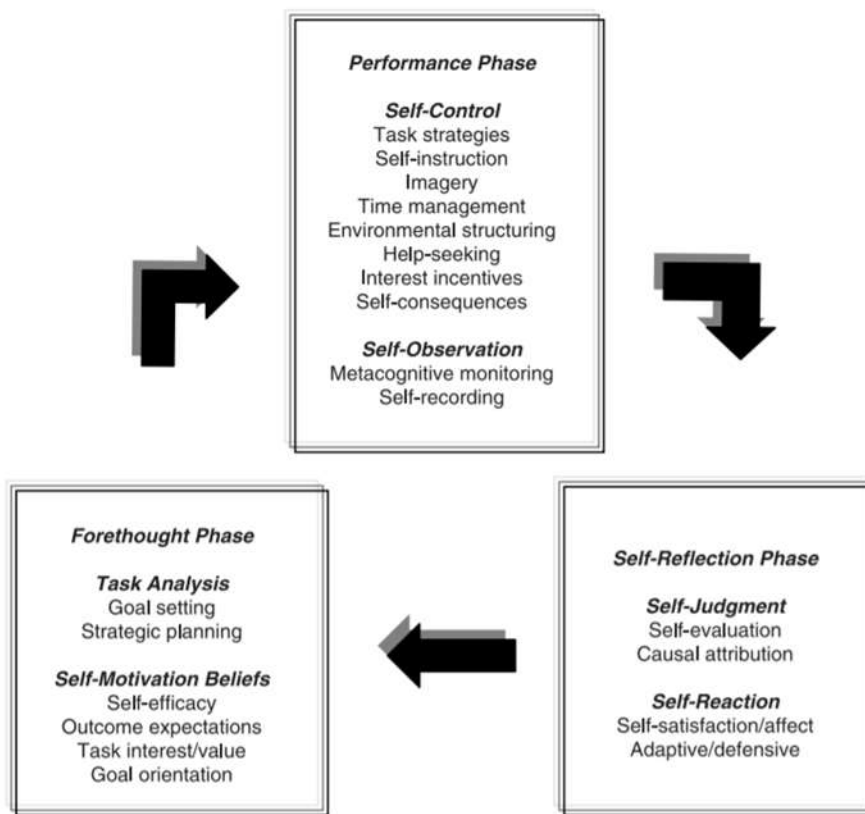
Figure 1.1 Phasic model of self-regulation. Note: figure taken from an original article (see Figure 1, Zimmerman & Moylan, 2009)

The performance phase requires learners to engage in judicious self-observation and self-control to ensure success during goal striving. Self-observation requires metacognitive self-monitoring and self-recording to evaluate goal progress. Informed by self-observation, to persist learners must engage in metacognitive and motivational strategising. Here, intrapersonal strategies include self-instruction, imagery and time management; extra-personal strategies include environmental structuring and help seeking. In Zimmerman's conceptualisation, recruiting an appropriate balance of metacognitive and motivational strategies leads to success in goal striving. Success leads then to an evaluation of the performance.

In the third self-reflection phase, learner judgements and appraisals are considered. When learner's judge performance they evaluate against personal and prescribed success criteria and consider causal explanations for the level of the performance. Self-reactions speak to how the learner experiences emotions in relation to goal performance, conjointly adaptive or defensive decision are made; together, these judgements lead to the next stages of the self-regulatory learning cycle with goal learner willingness to engage in future goals being adjusted according to their self-reflection.

The phasic model is a compelling and holistic explanatory framework that describes a simplistic and unidirectional trajectory. For many learners this journey, however, is not simple. Many variables, including for example affect, could confound the development of the evaluative judgement that is necessary to negotiate complex programmes of study, and beyond this, navigate careers that require graduates to negotiate uncertainty in ways that are unfamiliar. Nevertheless, the integrative phasic framework of self-regulated learning provides a simple, holistic level of explanation which also speaks to the development of gainful learning that is transferable to twenty-first century careers.

The remaining discussion evaluates evidence relating to some of these concepts and in particular the phases associated with self-regulated learning and further identifies areas that warrant investigation. These discussions follow the three common phases of self-regulated learning as identified by Panadero (2017) and which have clear alignment with Zimmerman and Moylan's (2009) phasic model identified in Figure 1.1. Preparation, Performance and Appraisal phases will therefore be discussed in turn.

<u>Preparation</u>

During the preparatory phase of self-regulated learning students must analyse the tasks that are necessary to perform and set out strategies that lead to success during goal striving. A complex mix of understanding and

motivations are necessary, see Figure 1.2. In the preparatory phase, amongst other factors, the combined power of goal setting, self-efficacy and achievement goal orientations make vital contributions to ready learners for performance. The following sections will critically review evidence relating to goal setting, self-efficacy, and goal orientations.
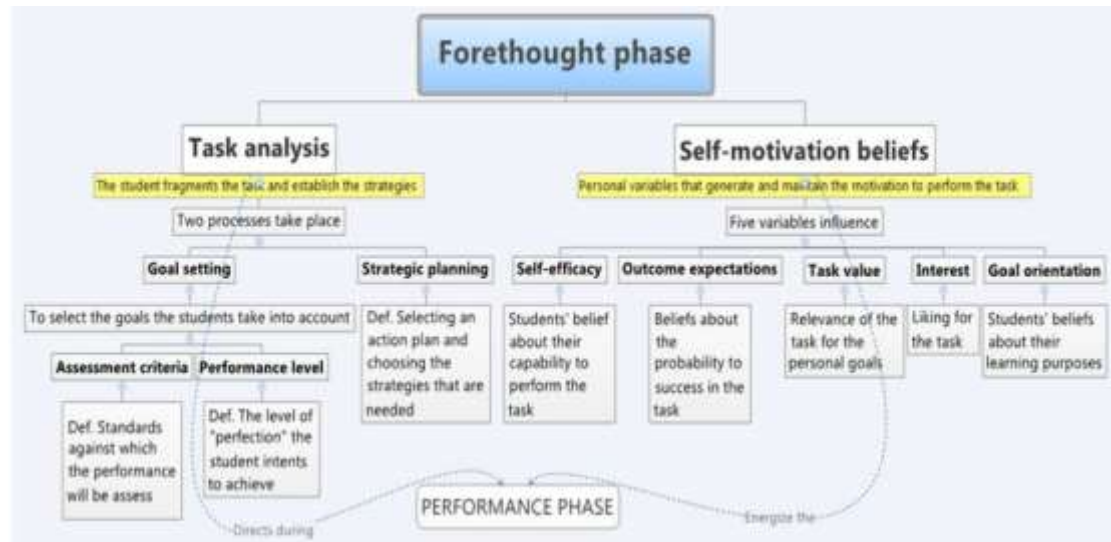
Figure 1.2 Forethought [Preparation] phase. Note: figure taken from an original article (see Figure 2, Panadero & Alonso-Tapia, 2014)

Goal setting

Goals are central organising mechanisms and have been described as critical to self-regulated learning (Winne, 2013). Goal setting research from a learning perspective in relation to Higher Education (HE) is scant, and the resulting association with other variables of interest in the preparatory phase, including self-efficacy and goal orientations, are not well understood (Morisano, 2013; M. Richardson, Abraham, & Bond, 2012; Travers, Morisano, & Locke, 2015). In fact, much research in relation to goal setting employs either achievement goal orientations (Payne, Youngcourt, & Beaubien, 2007; Wood, Whelan, & Sojo, 2013) or grade goals (M. Richardson et al., 2012; Zimmerman, Bandura, & Martinez-Pons, 1992) as

proxies of goal setting. These proxies of goal setting may present a challenge to full understanding. For example, goal orientations describe the why and the how of situated orientations, focusing primarily on an individual's conceptions of ability, whereas there are fundamental differences to the what motive of goal setting, which focus primarily on motivation (Seijts, Latham, Tasa, & Latham, 2004). Additional cognitive benefits of goal setting are also seen, in that difficult goals which are also specific, require a search for different strategies (Seijts & Latham, 2005). Some researchers report that goal orientations form part of the general network of constructs that surround motivated performance but goal orientations do not possess the specificity of set goals (Wood et al., 2013). Whilst goal orientations may have some motivating power, where these are used, their utility in performance terms is known to be weak. In part, it has been suggested that this weak utility is due to conceptual stability (Forsythe & Jellicoe, 2018; Payne et al., 2007). Although goal setting theory, developed in the occupational domain, and goal orientation theory, developed in the education domain, are clearly related, and both form major components in the preparatory stages of self-regulated learning, these perspectives are rarely considered in unison (Seijts et al., 2004). For grade goals, often representing the lower bound grade a learner is willing to accept, the case is not well established as a relatively low number of studies that have investigated these understandings (M. Richardson et al., 2012). Thorough task analysis and strategic planning indicated in the preparatory phase of self-regulated learning may not be fully explained by these proxies of goal setting.

Goals are proposed to connect what we want to achieve with the how and why of situated orientations, described by goal orientations (Kanfer, Frese, & Johnson, 2017). To set a goal is to make a prediction. This prediction requires an evaluation of the criteria we expect to perform against and the level at which we expect to perform. Locke and Latham (1990a) provide the most compelling explanatory theory of goal setting. Developed in a variety of domains, goal setting theory enjoys greatest attention in occupational research and practice. Central to the theory is the suggestion that specific goals provide challenge and offer more favourable operating

motives than goals that are either vague, easy, or where no goal is present. Focus, effort, persistence and strategy are the central mediating mechanisms of goals, and are indicated to combine in predicting performance levels (Wood et al., 2013). Goals set with a high degree of difficulty are suggested to hold a linear association with performance when there are corresponding levels of goal commitment (Klein, Wesson, Hollenbeck, & Alge, 1999). A recent study supports this association, suggesting that a greater sense of free will, mediated by higher levels of self-efficacy and goal commitment led to learners setting more difficult goals (Vieira & Grantham, 2011). There was no established reliability and validity for the outcome measure of goal difficulty used by Vieira and Grantham (2011), as it was constructed for the investigation. Nevertheless, taken together these proposals suggest that the structure of goals during the forethought phase provides essential motivating forces leading to goal striving.

Despite the importance of goals, it is suggested that of themselves goals do not necessarily lead to action. The extent to which goals are enacted is proposed to be related to the cognitions that learners hold in relation to goals (Oettingen, Wittchen, & Gollwitzer, 2013). Oettingen (2012) proposes during goal precontemplation that contrasting the vision that learners hold for their future with the reality of a situation acts as a facilitative process during goal setting, acting to establish realistic goals that provide motivation. Using 'mental contrasting' to engage in a consideration of the challenges associated with such situations, is tentatively suggested to act as a facilitative process that engages learners in setting goals that are more likely to energise motivational processes (Kappes & Oettingen, 2011). However, the authors suggest that research examining levels of task difficulty within these cognitive processes has been somewhat limited. Coupling mental contrasting with a reflection on the nature of the barriers to implementation and actions necessary to optimise action during goal striving is suggested (Gollwitzer, 1999; Gollwitzer & Sheeran, 2006). Reflections on the realistic nature of goals and contingencies during goal setting strengthen the important role of goal cognitions as facilitating mechanisms for action in

the task performance phase. Goal dependent cognitions, for example, the temporal nature of goals, such as the proximal and distal nature of goals (Fryer, Ginns, & Walker, 2014) may also contribute to difficulties and challenges experienced during goal striving. For example, distal goals, that is those that are further away in time, require greater levels of self-regulation (Bandura, 2013). Evidence also suggests that multiple goals marrying both proximal and distal goals, may harness the greater motivational forces. Exposure to feedback and taking resulting corrective action associated with proximal goals leads to improved confidence and strategy which then smooths the path toward distal goals (Latham & Seijts, 1999; Sun & Frese, 2013). From a social cognitive perspective, self-regulatory models of task performance position incremental increases in self-efficacy as driving forces together with goals, which propel learners towards optimal goal pursuit (Schunk, 1990; Zimmerman, 2000).

Supporting social cognitive processes associated with goals, Wood and colleagues (2013) suggest that strategies are important regulatory influences on goal level and engagement but that the role of strategies in goal setting research is limited. Strategies include those that are task specific, focus on strategy development, search and information processing, and self-regulation. Goals that are set for learning or performance are proposed to invoke different strategies and are often indicated to lead to positive and negative performance trajectories respectively (Seijts & Latham, 2005). Goals set for performance are more likely to recruit existing goal setting and monitoring strategies from long-term memory stores. Performance goals, and their associated strategies, are usually the first strategies learners attempt and may lead to tunnel vision. These goals can be effective when existing routines are established. When existing strategies are inadequate, and the task is novel or has a greater degree of difficulty, learners may use their problem-solving abilities and search for new strategies. Such strategies are associated with high learning goals and are associated with behaviours including knowledge acquisition, environmental scanning and feedback seeking (Seijts & Latham, 2005). Wood and

colleagues (2013) suggest that although learning goals are viewed as effective strategies, such goals, may not of themselves result in success.

In a review of such strategies, Wood and colleagues (2013) conclude that strategic effort, in particular, strategy development, contributes positively to performance when coupled with specific and challenging goals. Supporting Sitzmann and Ely's (2011) conclusions, findings also suggest that strategies associated with self-regulation, such as self-efficacy and goal level, have an additive effect to performance, as these strategies were seen to mediate mastery approach goal orientations in terms of performance. However, apart from relatively weak associations between search and information processing strategies on performance approach goal orientations, no significant strategies were reported in terms of other goal orientations. This evidence provides additional support to Locke and Latham's (1990a) fundamental principles of goal specificity and that suggested in experimental evidence in relation to the nature of self-regulation strategies, such as self-efficacy and goal types (Seijts et al., 2004). Despite this understanding, research on the practice of goal setting within HE has received little attention. A small number of recent investigations have provided tentative, but informative findings (e.g. Acee, Cho, Kim, & Weinstein, 2012; McCardle, Webster, Haffey, & Hadwin, 2017; Morisano, Hirsh, Peterson, Pihl, & Shore, 2010; Travers et al., 2015).

For example, McCardle and colleagues (2017) recently investigated the role of goal setting within an elective self-regulated learning programme in two cohorts of Australian undergraduate learners. Over the course of a semester, the first cohort of learners were exposed to self-regulated learning training including goal setting; each week learners were asked to reflect and set a single goal for the following week using a SMART goal framework. Although there is some variation (Playford, Siegert, Levack, & Freeman, 2009), SMART goals are generally held to be those that are specific, measurable, achievable, realistic and timebound (Kerr & LePelley, 2013; Matre, Dahl, Jensen, & Nordahl, 2013). After training, learners largely set vague goals that focused on behaviours, such as planning and intention to

set goals, without specific actions. This was despite learners opting into the programme. A second iteration refined the intervention. Learners reflected on their previous performance and were then encouraged to nominate a 'good' specific study focused goal. They were supported setting goals by programme tutors. Despite additional direction and support in the second iteration, which focused on connecting reflections and goals for action, only marginal and somewhat erratic improvements in goal setting abilities were seen over time. Researchers noted that goals set by learners were aligned with prescribed goals in organisational settings. The issue of prescription was highlighted as a cause for concern by researchers as prescription might enact extrinsic motivational forces. This idea is mirrored in findings from a recent longitudinal study which suggested that internally regulated goals, acted as a motivational force, where externally regulated goals had no effect on motivation. Neither type of goal held a significant effect in terms of achievement (Fryer et al., 2014). Findings reported above support Zimmerman and Paulsen's (1995) suggestion that undergraduate learners may not be well versed in self-evaluation and monitoring. This evidence provides a further indication that learners are not equipped with the skills, attitudes and volitional control necessary to enact strategies that lead to setting increasingly higher and more specific goals. McCardle and colleagues' (2017) intervention was scaffolded within Winne and Hadwin's (2008) cognitive model of self-regulation. This may have limited the intervention design as Zimmerman's approach has been considered more appropriate for undergraduate learners (Panadero, 2017; Panadero, Broadbent, Boud, & Lodge, 2018). It may be that within McCardle and colleagues (2017) study that the proximal nature of goals, which were somewhat limited as they focused on a single week, may have appeared unconnected to future orientations. These temporally limited goals might not have enacted the purposeful engagement necessary for development. Finally, it not reported whether the goal setting intervention described was delivered in a domain contextualised manner, however, where they are not, evidence suggests interventions focused on self-regulated learning are less effective (Van Merriënboer & Kirschner, 2017).

In a similar elective programme in the United Kingdom, Travers and colleagues (2015) examined the self-reflection, goal setting processes and performance, to further understanding of the type of goals that learners set and components that support effective goal setting. Ninety-two final year business undergraduates participated in a fifteen-week long programme. The programme encouraged learners to set three growth goals and reflect on goal progress. Growth goals in this study refer to goals that combine both mastery and performance approach, in an approach described elsewhere as a 'goal complex' approach (Senko & Tropiano, 2016). Learners' goals were generated following deep engagement with reflection exercises. Reflecting the real-world nature of the programme, learners set goals in a variety of combinations including those were both proximal and distal in nature and included personal mastery and performance outcomes. The combined effects of these goals were described as having an additive effect in terms of learner outcomes. To illustrate, proximal goals appeared to facilitate progress towards distal goals. The approaches predicated by Travers and colleagues (2015) programme and the reflection process enacted were reported to align with adaptive learning orientations including self-reported increases in self-efficacy and corresponding decreases in negative emotionality associated with learning. The findings reported here appear to support the additive effects of appropriate goal level and self-efficacy on other suggested components of self-regulated learning including planning and time management (Sitzmann & Ely, 2011). Travers and colleagues (2015) findings contrasted with those of McCardle and colleagues in a number of important ways. A focus on goals that have a greater degree of complexity and connect future vision with more immediate concerns, seemed to hold greater effect in addition to the holistic perspective described in the study. These more nuanced processes appeared to be notable in their absence from the intervention described by McCardle and colleagues (2017).

Another such intervention examined the role of a short computer based goal intervention in a group of undergraduate learners identified as being at risk of failure Morisano (2010). Eighty-five learners were either streamed into an intervention or control group. Learners in the goal setting

group were exposed to a comprehensive programme. Learners were tasked with envisioning a desired future state and asked to contrast that vision with their reality. Learners prioritised seven or eight personally selected goals for further exploration. Next, learners considered the importance of goals by creating a mental representation of the goal, and any sub-goals. Implementation plans then followed which required learners to consider barriers and mechanisms to ameliorate the barriers identified. Learners then set benchmarks for goal attainment, such as bounding the goals in time, to create a mechanism to monitor goal progress. Finally, learners stated indicated the level of commitment they held for each goal. The steps outlined mirror much of the SMART goal process described by McCardle and colleagues (2017) but also employed effective mechanisms associated with goal preparation and goal striving, including mental contrasting, i.e. contrasting vision and reality, and implementation intentions, i.e. if … then thinking (Oettingen et al., 2013). By current standards the intervention and control group sizes are relatively small, however, researchers reported three main outcomes. Learners in the intervention group enjoyed increased performance, were more likely to fulfil course obligations and indicated lower levels of negative affect than their peers streamed to the control group. For example, Seijts and colleagues (2004) indicate that selection of personally salient goals may induce a mastery approach goal orientation which may, in turn, spread this enacted orientation to other domains. Whilst Morisano and colleagues (2010) goal setting intervention perhaps went beyond the central pillars of goal setting identified by Locke and Latham (1990a), the perspectives included are clearly aligned. However, the authors recommend that further work should be undertaken to investigate the goal setting approach in other groups, together with an assessment of the importance and utility of underlying principles (Morisano et al., 2010). Overall, evidence from both Travers et al. (2015) and Morisano et al. (2010) indicate that complex goals developed using supported approaches, which also align distal and proximal goals appears to hold benefits for learners in HE settings.

Acee and colleagues (2012) also sought to investigate which mechanisms associated with goal setting were most beneficial in terms of

academic endeavours in HE. One hundred and thirty learners elected to participate in a 'learning to learn' programme in an American setting. At the start of a semester, learners were asked to list twenty goals. For each goal learners rated the value they placed in the goal, the expectation they held of success and the extent to which they felt autonomy (intrinsically motivated) or controlled (extrinsically motivated) motivation. Each of the learners' twenty goals were rated by researchers for specificity. Grade point average (GPA) was then regressed on the mean rating for each of the goal factors. Learners were not restricted as to the type of goal listed, however, the ratio of academic goals to non-academic goals was utilised in analysis. The resulting regression model predicted 19% of the variance in GPA. Controlled motivation was moderately, but negatively, associated with performance. Specific goals were the sole positive associate of end of semester GPA, albeit the association was lower in magnitude than for controlled motivation. Acee and colleagues (2012) findings may suggest the importance of personal goal setting in providing greater academic motivation (Hidi & Harackiewicz, 2000), which may be due to the spreading activation that such goals have in terms of other areas of achievement. Acee and colleagues (2012) findings lend weight to goal specificity as a fundamental component of goal setting, as indicated in goal setting theory (Locke & Latham, 1990a). Findings also support those of Morisano and colleagues (2010) indicating the role of greater specificity in enacting monitoring processes during goal striving.

The evidence from goal setting interventions reviewed above provides tentative and useful insights from goal setting interventions, in particular in relation to goal clarity. These largely qualitative investigations provide some useful insights, in relation to the specificity or clarity of goals, and their domain specific nature and how these affect outcomes. In the studies summarised, goals were classified by researchers in terms of their specificity, and by learners in terms of their value (Acee et al., 2012; McCardle et al., 2017), and commitment (Morisano et al., 2010). However, it may be that learner's written goals may not fully access their goal cognitions. For example, when McCardle and colleagues (2017) analysed learners

recorded goals, a low degree of goal specificity was noted. These researchers considered that learners may have sacrificed specificity as the goals were little more than placeholders for goals that the learners had a clearer cognitive representation that was not recorded. Whilst the investigations described have furthered understanding of goal setting mechanisms there may be difficulty associated with accurately capturing learner cognitions directly from the goals they set.

Capturing behavioural and cognitive representations of factors associated with the goal setting process using psychometrically valid measures has previously been attempted in the occupational domain (e.g. Kwan, Lee, Wright, & Hui, 2013; Lee, Bobko, Earley, & Locke, 1991; Locke & Latham, 1984). However, development of such scales is reported as being rather limited, and may be due to a lack of reported information on the psychometric properties of such scales, as indicated by Kwan and colleagues (2013). Locke and Latham's early iteration of the Goal Setting Questionnaire (GSQ) measured characteristics including the specific and difficult nature of goals in addition to supervisor support, worker participation, rationale and feedback on progress towards goals (Lee et al., 1991). Research has suggested that goals can have negative or unintended consequences, such as narrowing of focus or unethical behaviours in goal pursuit (Ordóñez, Schweitzer, Galinsky, & Bazerman, 2009), therefore later additions to the GSQ saw dysfunctional qualities of goals, goal stress and goal conflict added. However, model fit of the GSQ was not reported (Lee et al., 1991).

As a result, the GSQ was subsequently re-examined by Kwan and colleagues (2013). The scale employed ten factors in a revision of the goal setting questionnaire within confirmatory factor analysis based on an assessment of the logical validity of the measure. Adding to the ten identified factors, Kwan and colleagues also included four from six items from Lee and Bobko's (1992) measure of goal difficulty, that uses a typical co-worker as a point of reference. As a result, the hypothesised structure of the GSQ included eleven factors. Kwan and colleagues included the following factors

in the GSQ measure (2013) supervisor support / participation, goal stress, goal efficacy, goal rationale, use of goal setting in performance appraisal, tangible rewards, goal conflict, organisational conflict, dysfunctional effects of goals, goal clarity, and goal difficulty. The relationship of these factors to goal commitment was also examined, due to the reported positive conceptual convergence with goal specificity and difficulty (Klein et al., 1999). Across two samples, including Chinese and American participants, an acceptable factor structure was confirmed. Except for the goal efficacy in the US sample, all factors demonstrated acceptable reliability. In addition, and as hypothesised, relationships amongst the factors were moderate, suggesting separability of the factors. Whereas the relationships reported between goal specificity and goal commitment was positive, as expected, a negative relationship to goal difficulty was seen. Given the relative paucity of research in relation to goal commitment, including identification of factors that moderate the difficulty to commitment relationship in terms of performance, this finding was not necessarily unexpected.

In academic settings measuring goal behaviours and cognitions has, in large part relied on the ability conceptions bound within goal orientation, however, researchers have noted concerns in terms of conceptual clarity and measurement (Morisano, 2013). For example, goal orientation measures do not always ground items in language that is relevant to goals (i.e. Hulleman, Schrager, Bodmann, & Harackiewicz, 2010). Addressing such problems might provide greater understanding of learner behaviours and cognitions and the role of goal setting processes within self-regulated learning.

Developing a measure of goal setting for HE audiences was attempted by White (2002) who aimed to develop a measure based on Locke and Latham's (1990b) iteration of the GSQ. At the time of White's modified goal setting questionnaire (MGSQ), the original GSQ had already been subject to one revision which was not taken account of. The MGSQ was used to examine the convergent validity of a further student goals and behaviour questionnaire (SGBQ) with one hundred psychology undergraduates. The SGBQ was examined using principal component

analysis and findings in terms of psychometric properties were limited. Ten components of the SGBQ were identified. The reported structure of the measure appears problematic as 25 items load on to ten factors, with many factors represented by one or two items, which suggests a problematic structure (Kline, 2015). In addition, the item response formats appear problematic, with lack of consistent measurement points between factors. The SGBQ has rarely been examined in the literature. The potentially more interesting MGSQ, the modification of Locke and Latham's earlier measure, has largely been consigned to an appendix of the White (2002) paper. The psychometric properties and the utility of the MGSQ remain unexplored in academic HE audiences. In addition, as noted the version of the GSQ used by White was not the contemporary version at the time of modification (Kwan et al., 2013). This error of commission presents an interesting problem and an opportunity for research in HE. Although the GSQ has some pedigree in the occupational literature, evidence reviewed here suggests that there is scope to develop a psychometrically sound measure of goal setting behaviours and cognitions for a HE audience that does not have the issues that appear to be present in relation to the SGBQ. Further, such a measure may bolster understanding of cognitions in the preparatory phases of self-regulated learning, beyond what is known from goal orientation theory.

Taken together, the evidence presented here in relation to goal setting illustrates that the structural nature of goals is thought to be important due to its motivating effects on performance in the occupational domain (Latham, Seijts, & Slocum, 2016). Further, the role of goals has been placed front and centre within models of self-regulated learning (Zimmerman, 2000), and aligned models of feedback integration (Nicol & Macfarlane-Dick, 2006; Winstone, Nash, Parker, & Rowntree, 2017). Goals are considered fundamental to academic endeavour. Whilst this idea seems to have face validity, research on the nature of goals in HE remains limited (Morisano, 2013; Travers et al., 2015). Further as noted, the theoretical relationships between goals and some of the most important associates of HE academic performance, such as self-efficacy, are suggested in models of self-regulated learning, however, further research is necessary to establish the nature of

this association (M. Richardson et al., 2012). The prevailing understanding of goals in academic settings relates to attitudes, specifically the ability conceptions that are associated with achievement goal theory. Whilst the mindsets and orientations associated with these construct appear compelling, the direct predictive qualities of these appears limited (Burnette, O'boyle, VanEpps, Pollack, & Finkel, 2013; Payne et al., 2007). These constructs also appear to be undermined by a lack of conceptual and measurement clarity (Hulleman et al., 2010; Morisano, 2013).

Addressing these issues and considering the evidence presented from goal setting and self-regulation interventions discussed (Acee et al., 2012; McCardle et al., 2017; Morisano, 2013; Travers et al., 2015), the evidence reviewed above indicates that there may be utility in developing a cost-effective approach to measuring behavioural and cognitive characteristics associated with such goal setting interventions. Developing such a measure, based on a modification of the GSQ, to understand how behaviours and cognitions operate within the nomological network that underpins self-regulated learning, would appear to be a useful endeavour (Panadero et al., 2018) and answer the call of Richardson and colleagues (2012). Such a behaviourally anchored rating scale might then have utility in understanding how knowledge, skills and attitudes develop over time, and may also provide an indication of the gains associated with self-regulation. Subject to such a measure demonstrating reliability, validity and predictive utility, it may then be possible to use the measure to identify and intervene in learners' levels of self-regulation in a manner that is scalable (Schippers, Scheepers, & Peterson, 2015). Given the theoretically close relationship between goal setting and self-efficacy (M. Richardson et al., 2012), and their central importance in the preparatory phases of self-regulated learning (Zimmerman, 2000), it has been suggested that developing new measures developing a richer understanding of self-regulated learning and the predictive space that precedes achievement, but which supports learning, may be beneficial (Ackerman, Chamorro-Premuzic, & Furnham, 2011; Panadero, 2017). Using such an instrument may also clarify the relationships between self-efficacy

and goal setting in learning contexts and strengthen the role of such factors in models of self-regulated learning.

Self-efficacy

Set against the backdrop of behaviourism, Albert Bandura (1986) proposed a social cognitive perspective suggesting that an individual's agentic ability beliefs determine cognitive, affective and behavioural approaches toward effortful striving. Within the social cognitive view, self-efficacy is an individually held belief concerned with the learner's capacity to carry out the actions necessary to attain a desired outcome (Bandura, 1986, 1997). Self-efficacy beliefs are estimates of competence. Although self-efficacy beliefs do not assure success, low levels of efficacy beliefs are proposed to result in failure (Bandura, 1997; Winne, 2013). Crucially, levels of efficacy beliefs and goal specificity run in parallel (Pajares, 1996; Pajares & Schunk, 2001) and are mechanisms through which learners can control goal directed performance (Bandura, 1986, 1997). Illustrating this point, a recent study primed learners to believe they had low levels of self-efficacy which led to higher level of cognitive and behavioural avoidance and lowered levels of help seeking (De Castella, Platow, Tamir, & Gross, 2018), supporting similar earlier evidence (Pintrich & De Groot, 1990). Therefore, individually held beliefs, or those that are primed, can influence learners' self-regulated performance, including the goals that learners set, and the trajectory of that performance.

As Pajares indicates *"the higher the sense of efficacy, the greater the effort, persistence, and resilience"* (1996, p. 544). The associations noted by Pajares are supported in classic studies of goal pursuit in HE learners. When self-efficacy bridges the gap between past and future performance, greater strategic power directs motivation towards future difficult and challenging goals (Locke, Frederick, Lee, & Bobko, 1984). Self-efficacy beliefs are fundamental to self-regulated learning theory, and motivation and task performance in HE (Putwain, Sander, & Larkin, 2013; Zusho, 2017). These

agentic beliefs, however, may be differentially expressed depending on the profile of the learner (Dörrenbächer & Perels, 2016).

When self-efficacy beliefs are expressed at a high level, it is proposed that greater use of cognitive and metacognitive strategies are employed, leading to deeper levels of engagement and challenge. In turn, such beliefs may lead to greater persistence during task performance (Pintrich & De Groot, 1990; Putwain et al., 2013; Roick & Ringeisen, 2018; Zusho, 2017). Much self-efficacy research focuses directly on performance, the relationship between self-efficacy and cognitive and behavioural control in terms of goal attainment is little understood in academic domains (Jung, Zhou, & Lee, 2017). Supporting deeper cognitive engagement, researchers suggest that higher levels of need for cognition and academic interest, amongst other less prominent factors, are associated with higher levels of self-efficacy during the transition to tertiary learning environments (van Rooij, Jansen, & van de Grift, 2017). To support the development of self-efficacy researchers suggest setting challenging but attainable goals for learning that foster engagement and mastery (e.g. Linnenbrink & Pintrich, 2003).

In addition, personality factors from the Five Factor Model of personality (McCrae & Costa Jr, 1999) are suggested to be related to behavioural control. Conscientiousness, due to the planful self-discipline and preparedness which underpins it, and emotional stability are suggested as complementary associates of academic performance (Poropat, 2009). The relationship between conscientiousness and self-efficacy is supported in research on grit (Wolters & Hussain, 2015), however, grit is reported to be little more than a facet of conscientiousness (Credé, 2018; Credé, Tynan, & Harms, 2017). Recent cross-cultural evidence suggests that such dispositional factors are both mediated by self-efficacy, and bear direct associations with, academic performance in undergraduate learners (Stajkovic, Bandura, Locke, Lee, & Sergent, 2018). Although personality factors have been proposed as distal, or indirect, associates of academic performance, recent evidence proposed that self-efficacy may operationalise behavioural traits in terms of performance (McIlroy, Poole, Ursavas, &

Moriarty, 2015). Complementary evidence supports this suggesting that self-efficacy operationalises the self-discipline facet of conscientiousness in HE learners (Jung et al., 2017). Taken together this evidence tentatively suggests that self-efficacy may have reciprocal effects in terms of effortful performance, which has been associated with goal setting and conscientiousness (Ginns, Martin, & Papworth, 2014). These adaptive personality factors have been similarly associated with mindset theory (Satchell, Hoskins, Corr, & Moore, 2017). Although not all studies find this relationship (De Clercq, Galand, & Frenay, 2013), self-efficacy levels are also suggested to contribute incrementally to subsequent performance beyond prior academic performance, which is known to be a stable predictor of future performance (Zuffianò et al., 2013). This may be because previous performance is a measure that combines previously expressed effort and ability attributions (Gagné & St Père, 2001). Feelings of enacted mastery likely also support persistence in academic endeavour as self-efficacy beliefs are also suggested to predict retention in tertiary level programmes (Bowman, Miller, Woosley, Maxwell, & Kolze, 2018).

The studies referred to above indicate self-efficacy as a dispositional trait. Such beliefs may not be held globally, and may instead be dynamically expressed according to the learning environment, the value attributed by the learner and what they expect to achieve (Hulleman, Barron, Kosovich, & Lazowski, 2016). Personally held feelings of mastery are associated with efficacy beliefs (Pajares & Schunk, 2001). This is supported by meta-analytic evidence supports the notion that, irrespective of domain and educational level, mastery experiences account for a greater proportion of variance than other sources of self-efficacy (Byars-Winston, Diestelmann, Savoy, & Hoyt, 2017). Other sources of self-efficacy beliefs may also be crucial, for example, vicarious learning, in particular in novel task environments, for learners at lower stages of the educational spectrum and in non-STEM domains of learning (Byars-Winston et al., 2017; Pajares & Schunk, 2001). Two additional sources supporting self-efficacy beliefs include social persuasion, and physiological and affective states (Bandura, 1997; Lent, Brown, & Hackett, 2002). Byars-Winston and colleagues' (2017) analysis suggests that

affective states contribute more of the variance, albeit as a negative associate, to self-efficacy beliefs in undergraduate learners. As such, it is suggested that negatively held perspectives do not inspire changes in efficacy unless the learner considers them to diagnose a deficit or a change in their levels of ability (Klassen & Usher, 2010). Taken together, evidence reported here supports the crucial role of mastery experiences and affective evaluations associated with undergraduates' learning approaches.

Fong and Krause (2014) used a mixed methods approach to examine the role of the four sources of self-efficacy, e.g. mastery, social persuasion, vicarious experiences and affective evaluation. In a diary study, entries of learners at risk of underachievement reported significantly fewer mastery and vicarious experiences than their high achieving counterparts, despite similar levels of reported trait levels of self-efficacy. Self-regulated learning strategy deficits were related to an absence of clear goals which in turn acted as an impediment to mastery experiences. In terms of vicarious experiences, the ability of the learner to recognise feedback focused on developing competence was lacking. Fong and Krause's (2014) findings support recent proposals embedded within models of feedback integration, which propose goal setting and self-regulation as a central pillar (Winstone, Nash, Parker, et al., 2017). This evidence also partially supports Byars-Winston and colleagues (2017) suggestions about the importance of mastery experiences, but not specifically in relation to vicarious learning experiences. However, as participants were at risk of failure, learners in the current study may be more akin to novice learners for whom vicarious experiences are suggested to hold greater importance (Pajares & Schunk, 2001). Findings here also support the fundamental role that self-efficacy has in connecting previous and future learning, via clear goals which reference feedback that has utility. In addition, the evidence here provides additional support for the suggestion that learners may have different needs according to the sphere of learning.

Adaptive self-regulation has been examined by Wilson and Narayan (2016) who report findings that tentatively support associations between goals and self-efficacy. In a blended learning environment, the researchers

set two groups of students a learning goal made up of three sub tasks. Researchers measured learner self-efficacy for task, learning strategies used at three time points, and examined these constructs in relation to performance. Self-efficacy was measured using a validated scale, learning strategies were derived from content analysis of learner's self-regulatory strategies from posts on online discussion fora. Content analysis used self-regulatory classifications provided by Zimmerman (1989), however, researchers noted that using the classification approach described may not have accurately captured the use of strategies that were not disclosed by learners. Findings suggested that initial levels of self-efficacy and strategy use predicted higher levels of performance. In turn higher subsequent levels of self-efficacy, and selected learning strategies were seen. Wilson and Narayan's findings suggest the reciprocal, mediating nature of self-regulatory variables in managing feedback leading to higher use of such strategies in responding to future task goals. Taken together these promising findings support Bandura and Cervone's (1986) earlier suggestion that the use of goals and feedback in combination lead to improved levels of downstream performance and higher subsequent levels of self-efficacy in college students. Evidence reported here lends credence to the idea that evaluation of previous performance may act to contribute towards adaptive self-regulation.

The evaluations referred to above, in turn, support the notions in Zimmerman's model of self-regulated learning, and Locke and Latham's (1990a) HPC, where self-efficacy beliefs are informed following a self-assessment of previous performance. Supporting this, Pajares and Schunk (2001) indicate that self-efficacy mediates the attributions that learners make for performance outcomes. A recent meta-analytic cross lagged panel analysis of eleven studies tentatively supports the unique contributions, and reciprocal nature of the relations between self-efficacy and performance (Talsma, Schüz, Schwarzer, & Norris, 2018). Researchers found that the effect of performance on subsequent self-efficacy was three times stronger than the effect of self-efficacy on performance. It is noted that a reciprocal effect was not seen in children, where self-efficacy was not found to be

causally related to performance suggesting an age-related transition. The limited number of studies, and particularly those that include children, limits the extent to which such inferences can be made. The researchers also note that results are limited by the largely unidirectional cross-sectional nature of such research. For example, research generally examines how self-efficacy affects performance, however, it may be that the association between performance and self-efficacy may have greater value in contributing to subsequent learner performance. Talsma and colleagues (2018) research indicates the unique contribution of both directions of causality. Further studies from the same stable of researchers examine the nature of these findings indicating that learner's self-efficacy evaluations of task performance may be misaligned (Talsma, Schüz, & Norris, 2018). This work points to a nuanced perspective where an optimal level of beliefs may be adaptive, indicating that adaptive self-monitoring is recruited during performance. Talsma and colleagues found that some learners with high levels of efficacy beliefs are unable to perform in line with their expectations, and that learners with low levels of such beliefs outperform their evaluations. Attrition of low efficacious learners meant that these groups may have been under-represented in the data. Following transition to a higher educational stage, novice learners may need time to calibrate self-efficacy beliefs (Manzano-Sanchez, Outley, Gonzalez, & Matarrita-Cascante, 2018). At the same time findings indicate a non-linear association between belief and performance outcomes and provide evidence of incremental changes in learners' adaptive self-regulatory abilities. More research to understand nuanced post task appraisals and how these are borne out in terms of self-efficacy judgements and future performance goals during may be a useful avenue for further research. It is anticipated more detailed future understandings may reap benefits for learners in terms of pedagogical approaches and intervention.

Whilst cross-sectional research provides understanding in relation to between subject effects, there is a paucity of research that examines the nature of self-efficacy and thus self-regulation over time (Day & Unsworth, 2013). Whilst such research does exist, it is reported to be poorly designed and misaligns theoretical perspectives. Further, Bandura (2012) suggests

that the resulting findings have not contributed to understanding, for the most part. A vital future direction for research would contribute to knowledge by understanding the ipsative nature of self-regulation, including how such processes combine over time to support learner evaluations and judgements. This idea of marginal gains as a measure of gainful learning has recently been proposed by Winstone and Carless (2019a, 2019b).

Evaluation of performance outcomes, notably in relation to feedback, is proposed to up- or down- regulate the subsequent goal level during the forethought phase. Because of the importance of this evaluation, promoting the beneficial effects of cognitive, metacognitive and motivational strategies has been promoted to improve learner understanding. These motivational strategies include those associated with elaboration, problem solving, and planning when faced with feedback (Dignath, Buettner, & Langfeldt, 2008). These ideas are partially supported by Talsma and colleagues (2018) findings that performance evaluations in primary school aged learners are associated with subsequent levels of self-efficacy. Another recent meta-analysis reports a large effect of self-assessment of learning on self-efficacy, which has comparable effects to feedback on performance (Panadero, Jonsson, & Botella, 2017). Feedback did not moderate the association between assessment and self-efficacy but the monitoring of performance against expected standards did. The utility of these results may be limited as they were derived from studies where immediate feedback on simple tasks and may not mirror feedback processes seen in HE. Although results were not assessed as being subject to publication bias it was noted that inflated effect estimates, from a small subset of studies, may unduly influence the reported results. Results also tentatively support the idea of covert self-feedback in the performance domain in the manner suggested by Zimmerman (1989). The evidence reviewed here suggests the effect of other and self-feedback in learner assessment of learning are vital forces that contribute to learner evaluative judgement. In turn, these evaluations are suggested to inform levels of confidence during the appraisal and preparatory phases of self-regulation, however, more research is needed to

understand the impact of performance evaluations on subsequent levels of self-efficacy.

Emotional evaluation has been reported to be central in the recursive relationship to goals, bridging the appraisal and performance phase (Ilies & Judge, 2005). This finding contrasts with Locke and Latham's suggestion that self-efficacy provides the recursive factor that drives the High Performance Cycle. The idea of the recursive nature of self-regulated task performance through self-efficacy has been supported by Seijts and colleagues (2004) who demonstrated across three time points, up-regulation of goal level which was mediated by increasing levels of self-efficacy, during a challenging task. It is generally held that there is a strong positive association between self-efficacy and affect. The nature of self-efficacy as either a moderating or mediating mechanism is supported in many domains of functioning indicating the central role of self-efficacy beliefs. Notable examples include those in relation to health and wellbeing (Stefanie. Ashford, Edmunds, & French, 2010; Holden, 1992), endurance sports (Anstiss, Meijen, & Marcora, 2018), and individual and group performance in the workplace (Stajkovic, Lee, & Nyberg, 2009; Stajkovic & Luthans, 1998).

Much early work in relation to self-efficacy beliefs was carried out at primary and secondary levels of the education spectrum (Zimmerman et al., 1992). Further, this early experimental research examined self-efficacy in tasks that do not necessarily mirror the complex learning environments seen in HE. It is proposed that in HE, considering self-efficacy as a mediational influence in course design is crucial in assisting learners to develop self-regulated learning approaches (Russell & Warner, 2017). This is particularly the case when considering managing barriers and planning future learning using goals (Nicol & Macfarlane-Dick, 2006; Winstone, Nash, Parker, et al., 2017) and if learners are to develop agency that transcends academic ability conceptions into adulthood (Bandura, 1986). Within current assessment approaches, however, it is proposed that there is a failure to promote learner agency within pedagogical approaches (O'Donovan, Rust, & Price, 2016).

In HE, self-efficacy is consistently indicated as the strongest, albeit moderate, non-intellective associate of academic performance (Multon, Brown, & Lent, 1991; M. Richardson et al., 2012; Schneider & Preckel, 2017). The prominence of self-efficacy is also supported in similar culture specific meta-analyses of the construct in terms of academic performance (Manzano-Sanchez et al., 2018). It is suggested that complex nature of this efficacious belief system means that the scope for educators to intervene, over the short term, may be limited (Dignath et al., 2008; M. Richardson et al., 2012). A sixteen per cent difference in GPA is reported in highly motivated, self-efficacious learners when compared to their low efficacious colleagues. Researchers have pointed to low-cost scalable interventions based on mindset research to increase efficacious approaches (Fong et al., 2017; Yeager & Walton, 2011), in particular when learners are at risk of underachievement (Paunesku et al., 2015). The joint contribution of goal setting to self-efficacy in upregulating performance has been proposed in traditional tertiary (M. Richardson et al., 2012) and online and blended HE programme environments (Broadbent & Fuller-Tyszkiewicz, 2018; Tseng, Yi, & Yeh, 2018), demonstrating medium and large effects. Honicke and Broadbent's (2016) meta-analysis examined the role of self-efficacy in tertiary academic endeavour, broadly supporting the importance of the construct. Caution was suggested in interpreting findings as heterogeneity and temporal nature of self-efficacy measurement was indicated. To illustrate, in terms of temporality, when self-efficacy was measured in terms of general degree programme performance rather than specific outcomes, along with goal orientations, self-efficacy's impact was neutral (Bjørnebekk, Diseth, & Ulriksen, 2013). Supporting the measurement difficulties, it has recently been proposed that the self-efficacy factor in the Motivated Strategies for Learning Questionnaire, which is often reported to be the most well used measure of the construct, may, in fact, be two separable factors (Nielsen, Makransky, Vang, & Dammeyer, 2017). Further, a lack of clarity in the causal direction of associations to outcomes was indicated, supporting Talsma and colleagues (2018) findings of bidirectional utility in task performance. Despite these potential problems, Honicke and Broadbent

(2016) call for longitudinal research to unpick moderating and mediating mechanisms of self-efficacy, including the role of goal orientations.

Self-efficacy is a necessary substrate of self-regulated learning and is considered of vital importance during the planning phases of task endeavour. Due to the theoretical symbiotic relationship with goal setting, it has been proposed as a route to improving self-efficacy beliefs (M. Richardson et al., 2012; Schippers et al., 2015). The association described by Richardson and colleagues (2012), however, is predicated on the notion that grade goals hold an equivalent regulatory power as goals in their widest sense (i.e. Zimmerman et al., 1992). Recent research has demonstrated the grade goals that learners set are associated with the performances they subsequently achieve. When learners set high, or stretch, goals they performed better compared to learners setting lower goals who achieved lower grades. Results were however mediated by lower levels of self-motivation in those that held lower levels of self-motivations (Knouse, Feldman, & Blevins, 2014). Findings from Knouse and colleagues highlight the importance of setting goals that provide stretch. However, it is also important to note that within the reported model grade goal setting did not fully account for the variance in motivational problems experienced by learners. This situation may suggest that more holistic regulatory strategies should also be considered alongside goal setting to optimise learning.

Considering this evidence, goal setting is a potentially fruitful and underexplored area of enquiry, specifically in relation to HE as noted in Richardson and colleagues (2012) review. These notions in relation to goal setting have recently been echoed (Manzano-Sanchez et al., 2018). Although evidence is limited, there are notable examples of goal setting training in HE learners that support the contribution of goal setting to performance. In a first study, in a group of learners identified as being at risk of non-continuance, goal setting demonstrated utility in improving academic outcomes, when compared to a control group (Morisano et al., 2010). A second study noted that growth goal setting, i.e. those focused on personally referenced goals, in particular, held important influences on later perceptions

of self-efficacy and related performance (Travers et al., 2015). In their study Travers and colleagues point to evidence indicating personally referenced goals may resolve the dichotomous nature performance and mastery orientated goals, harnessing the power of both. Taken together these findings support the suggestion of a goal complex model that unifies both mastery and performance perspectives (Senko & Tropiano, 2016).

Contributing to understanding, Roick and Ringeisen (2018) examined the development of self-regulated learning and performance in undergraduate mathematic students. These researchers used a quasi-longitudinal programme to explore embedding of learning using cognitive and metacognitive strategies, including perspectives on goal setting and planning at two time points. Self-efficacy was measured at a single intervening time point. All variables were considered in a structural model in terms of final course grade. Cognitive and metacognitive strategies covaried at baseline, demonstrating stable associations between the time points, and were positive associates of the self-efficacy measurement. Self-efficacy mediated the effect of cognitive strategies on performance, having a positive association with performance. Whereas metacognitive strategies, of goal setting and planning, reported differential associations in terms of later performance, with the baseline and later measurements being positively and negatively associated with later performance respectively. Roick and Ringeisen (2018) attributed the pattern of associations to a shift in strategies over time in a manner consistent with self-regulated performance. For example, goal setting and planning are more appropriate in the preparatory phase of learning, however, as examinations loomed large, monitoring and evaluating associate with the performance phase acts as a facilitative strategy. Although multiple measures of strategy were taken, performance and self-efficacy were measured at a single time point, which limits any causal inferences associated with the model reported by Roick and Ringeisen (2018). Supporting previous findings, these results suggest that learners endorsing high level of self-efficacy select self-regulatory strategies appropriate to the stage of learning which equips them to manage learning in a manner that optimises learning and performance. These findings are

supported by earlier research with chemistry undergraduates (Zusho, Pintrich, & Coppola, 2003) where prior performance, and motivational variables measured across three time points were related to final performance. Findings indicated that self-efficacy, whilst bearing associations to cognitive and metacognitive strategies, dominated the model and was the strongest associate in terms of performance. In addition, task value, and rehearsal strategies were also significant, albeit weak, associates. Overall, self-efficacy was seen to increase over time for those with high baseline measures of the construct, where it was flat and decreased respectively for those with medium and low levels respectively. Most other measures, including goal orientations declined across time (Zusho et al., 2003). The evidence discussed here supports Sitzmann and Ely's (2011) review findings that self-efficacy is a more prominent predictor of self-regulated learning than other cognitive and meta-cognitive strategies.

From the evidence reviewed here, the role of self-efficacy in its direct relationship to academic (Honicke & Broadbent, 2016; Multon et al., 1991; M. Richardson et al., 2012) and task-based performance in the workplace (Sitzmann & Ely, 2011; Stajkovic & Luthans, 1998) is consistently supported. Whilst self-efficacy acts as an attitudinal self-regulatory belief, it is clear that the expression of this agentic belief may be dynamic, according to domain of interest, motivational beliefs, and goal relevant factors including specificity and difficulty (Klassen & Usher, 2010). Further, it is suggested that learner judgements of self-efficacy beliefs may be inaccurate and may, in turn, bias future performance outcomes (Talsma, Schüz, & Norris, 2018). Whilst many of these perspectives are understood and showed early promise in terms of regulating performance (Bandura, 1986) how such regulatory factors operate together to support self-regulated performance are less well understood. As a result, calls have been made to investigate how such factors work together, including an examination of the measurement approaches that support self-regulated efficacy (Klassen & Usher, 2010; Panadero, 2017). Given the central importance of self-efficacy, but the suggested difficulty in making timely and meaningful intervention (Dignath et al., 2008), understanding how such factors work together may facilitate practical interventions to increase

levels of self-efficacy. The theoretical relationship between goal setting and efficacy has been suggested as one source of possible intervention (M. Richardson et al., 2012). Whilst findings (Morisano et al., 2010; Travers et al., 2015) have illustrated positive effects of goal setting interventions, not all have (McCardle et al., 2017) and are somewhat limited in their scope because of the qualitative nature of research that has generated this understanding. This work may also be limited as a function of the groups being examined, i.e. those being identified as being at risk of failure. There appears to be a case for pedagogies that support learners in accessing self-awareness and practice in the use of self-regulated strategies. Developing engagement with feedback as a route to achieving greater self-awareness may be one fruitful avenue for further investigation (Forsythe & Jellicoe, 2018; Winstone, Mathlin, & Nash, 2019; Winstone, Nash, Parker, et al., 2017).

Achievement Goal Theory

Optimal performance is suggested to be determined by a sense of agency (Bandura, 2006) and free will (Feldman, Chandrashekar, & Wong, 2016). How beliefs are expressed when faced with challenge is proposed to determine performance, regardless of raw ability (Dweck, 2017b). Achievement Goal Theory originally proposed an adaptive maladaptive dichotomy of behavioural performance (Dweck, 1986; Nicholls, 1984). At the simplest level of explanation, the theory proposes two behavioural orientations, mastery and performance orientations, which generally held to support respective adaptive and maladaptive orientations (Senko & Tropiano, 2016). Two converging conceptualisations of goal orientations exist (Dweck, 1986; Nicholls, 1975, 1984), however, that proposed by Dweck has gained greater traction in the literature.

Dweck (1986) proposes that the positive : negative dichotomy of mastery and performance leads to differential trajectories performance. Mastery oriented learners seek increasing competence. Irrespective of level

of expression, this orientation leads to challenge seeking and persistence. Performance orientations are more complex. If expressed at a high level, and in the early conceptualisation of achievement goal theory, behavioural characteristics are indistinguishable from those seen in a mastery orientation. However, low expression of performance orientation can lead to helplessness, avoidance of challenge and low levels of persistence.

Early conceptualisation of achievement goal theory proposed that goal orientations mediate implicit theories of intelligence abilities in terms of behavioural approaches and learning outcomes (Dweck & Leggett, 1988; Schunk, 1990), and are suggested to be determined by the goals that learners hold (Elliott & Dweck, 1988). Implicit theories of intelligence abilities, now more commonly referred to as mindset beliefs, operate beneath the level of consciousness (Dweck, 2017b). Within mindset theory, learners who implicitly believe they have the freedom to determine their performance, endorse an incremental view. Alternatively, learners who believe that outcomes are predetermined by their abilities, hold an entity view. Subsequently, the nomenclature for incremental and entity beliefs are now known as growth or fixed mindsets, and these mindsets, in turn, determine adaptive and maladaptive behavioural trajectories respectively.

Dweck's (2016a) explanatory framework, and in particular growth mindset, is described as having remarkable reach. Interventions based on the mindset framework are proposed to be low cost and can be delivered effectively at scale (Paunesku et al., 2015). Such claims have been controversial because the direct relationship to achievement is not well supported in meta analytic and empirical investigations (Bahník & Vranka, 2017; Burnette et al., 2013; Sisk, Burgoyne, Sun, Butler, & Macnamara, 2018). However, recent narratives suggest that simple theoretical notions associated with mindset may be too ambiguous and a more nuanced explanation within the canopy of achievement goal theory may exist (Dweck, 2017b; Sisk et al., 2018; Tempelaar, Rienties, Giesbers, & Gijselaers, 2015). Lack of conceptual clarity may have given rise to measurement that fails to adequately capture the nuance that is now proposed (Forsythe & Jellicoe,

2018; Payne et al., 2007; Tempelaar et al., 2015). As with many implicitly held beliefs, it may be overly ambitious to suppose that direct relations to objective measures of performance, particularly when many such variables operate in the predictive space that precedes performance. This view of complexity is supported by Pintrich (2003) who suggests that a single theory or related construct is unlikely to provide a complete explanation for individual motivation. Some researchers have suggested, as a result, that it is necessary to look beyond grades when examining non-intellective traits (Ackerman et al., 2011). The notions introduced here related to mindsets and goal orientations will be discussed in turn.

Mindset

Recently, mindset theory has been extended into other domains of goal driven behaviour. Mindset has been proposed as a panacea to relationship problems, political unease, and racial and ethnic prejudice (Dweck, 2016c, 2017b; Rattan & Dweck, 2010). Mindset was first framed in terms of academic endeavour (Dweck, 2017b), and much of the mindset research remains focused on academic abilities, at the lower strata of the education spectrum (Burnette et al., 2013; Sisk et al., 2018). Adaptive mindsets are associated with healthy perfectionism in learners and greater levels of life satisfaction (Chan, 2012). The virtues of a learning mindset are also espoused in terms of organisational leadership (Heslin & Keating, 2017). In contrast, those with maladaptive, or fixed mindset beliefs are proposed to experience lower levels of regulatory self-efficacy, leading to avoidance and lower help seeking behaviours (De Castella et al., 2018). These appraisals following performance are thought to inform situational evaluations concerning subsequent task engagement. For these reasons, the mindset beliefs are suggested to be fundamental to optimal task engagement.

Mindset theory proposes two mindset beliefs, now known as growth and fixed mindsets. In a growth perspective, an individual believes that they

can develop their abilities. These individuals seek mastery and challenge because they provide a pathway towards development. Those with a growth mindset have a desire to learn and are suggested to be more resilient in the face of setbacks (Yeager & Dweck, 2012). Learners with a growth mindset seek feedback and learn from others modelling effective behaviours in their environment. Those with a fixed mindset hold a deterministic view, believing they possess all their abilities. Consequently, no amount of effort or helpful cues from the environment, such as feedback or behaviour modelled by others, will assist the learner in improving their performance. Learners with a fixed mindset tend to avoid testing because failure has the power to undermine their implicitly held beliefs. Endorsement of this belief leads to giving up easily. Respectively, growth and fixed mindsets are proposed to relate to adaptive and maladaptive approaches, with attributions and performance in a consistent direction (Robins & Pals, 2002; Sisk et al., 2018).

Two early studies tracked entrants to secondary education longitudinally. Findings indicated the often suggested association between the two mindsets and their respective trajectories (Blackwell, Trzesniewski, & Dweck, 2007). In the first case, learners with a growth mindset enjoyed an upward trajectory in performance, whilst learners with a fixed mindset saw a flat profile, over two years. In a second small intervention study, an experimental and a control group were exposed to a growth mindset or a neutral intervention across an eight week programme. A medium to large effect of the mindset intervention was found when the experimental group was compared to the control group. In this second part of the study the experimental intervention exposed the control group, along with the experimental group, to anti stereotyping discussions which are often cited as typical of growth mindset perspectives (Dweck, 2017b), In addition, the control group were exposed to what are known to be effective study strategies, i.e. time management and study skills, which are known to be effective skills during self-regulated learning and performance (Panadero, 2017). Although these findings may be inflated as a function of sample size, they have been taken as classic evidence to support the power of implicit

theories that are both personally held and experimentally manipulated. A modest 0.40 standardised mean difference in learner's mathematics GPA resulted when the groups were compared. In practice, this effect may be significant, however, the low sample size, and the methodological issues limit the utility of this evidence. Subsequent investigations have examined claims made in Blackwell and colleagues (2007) seminal research.

Research, for example, has examined behaviours that are integral to self-regulation, and therefore indirectly to performance. Learners with a growth mindset were more likely to exhibit deeper levels of cognitive engagement, collaborative learning (Stump, Husman, & Corby, 2014), endorse learning, or mastery goal orientations, and focus on increasing competence and skill development (Dupeyrat & Marine, 2001). Whereas those with a fixed mindset exhibit lower persistence motives than those with a growth mindset, however, a lack of persistence may result in those with a fixed mindset moving on to more fruitful tasks (Zuckerman, Gagne, & Nafshi, 2001). Contrasting with this, recent longitudinal research tracking persistence motives show that changes in growth mindset, but not increases in fixed mindsets, were associated with discontinuing studies (Dai & Cromley, 2014). These later findings indicated a calibration of mindsets over time by measuring and tracking both perspectives simultaneously. Growth mindset may also act as a protective factor in undergraduates facing challenging mental health circumstances, as learners with growth mindsets were more likely to engage in adaptive emotion regulation strategies, including cognitive reappraisal and support seeking (Schroder, Dawood, Yalch, Donnellan, & Moser, 2015). These may then support greater persistence. Greater complexity is also seen cross-culturally. Research investigating the relationship between mindsets to performance via goal orientations found high performing Chinese undergraduates with growth mindsets were more likely to see performance enhancements mediated via mastery and performance approach goal orientations. The more pragmatic association was attributed to cultural perspectives, however, similar complex patterns of beliefs are also seen in research investigating the strategies used by undergraduate learners. These results suggest that learner endorsement of

both beliefs in unison can provide a benefit to performance (Dai & Cromley, 2014; Tempelaar et al., 2015).

Learners with a fixed mindset are reported to endorse self-handicapping behaviours including procrastination (Howell & Buro, 2009), effort reduction and making excuses, in contrast to those with a growth mindset (L. H. Chen et al., 2008). Higher levels of self-handicapping were also seen in high performing students who were subject to a fixed mindset manipulation; this effect was also reported to be greater for females (Snyder, Malin, Dent, & Linnenbrink-Garcia, 2014). In addition, Ehrlinger, Mitchum and Dweck (2016) found that learners with fixed mindsets held avoidance biases. These avoidance biases led to overconfidence, and subsequently less attention being directed towards negative information and dealing with difficult problems. The opposite was seen in those holding growth perspectives and may support greater focus on mastering tasks. Supporting ideas central to mindset theory, undergraduate learners with a fixed mindset endorsed an external locus of control and spent fewer hours spent studying (Bodill & Roberts, 2013). Locus of control is also indicated to mediate fixed mindsets in relation to examination performance, is associated with greater behavioural disengagement, and lower levels of coping and acceptance (Doron, Stephan, Boiché, & Scanff, 2009). The studies reported here implicate the importance of control perceptions for learners with fixed, but not growth, mindsets (Bodill & Roberts, 2013; Doron et al., 2009). Where learners experience self-doubt and have lower ability, growth mindset endorsement has been seen to act as a protective factor and may motivate learners towards performance, suggesting positive attitudes when faced with a challenge (Zhao & Wichman, 2015). Further, research to experimentally induce a growth mindset in 'at risk' undergraduate learners led to increases effort and study related skills but no increase was seen in relation to academic performance (Sriram, 2014). Beyond academic performance, participation in a growth mindset enrichment programme during tertiary study has also been suggested to predict greater success in finding a job (Sulastri, Handoko, & Janssens, 2015). The evidence reviewed here endorses the central propositions in relation to the positive-negative dualism, i.e. that

mindset is a spectrum with opposing poles, and that mindset beliefs in undergraduate learners may have important implications in shaping self-regulatory processes which relate indirectly to task performance.

In an early investigation, and supporting the theoretical explanations, American and Chinese learners with a growth mindset were more likely to exhibit a positive suite of behavioural responses when responding to setbacks (Hong, Chiu, Dweck, Lin, & Wan, 1999). Growth mindset learners, in contrast to their fixed mindset colleagues, placed more weight in understanding negative outcomes, made positive effort attributions, responded adaptively to feedback and set more challenging goals to remediate performance deficits. Supporting these earlier findings, a recent investigation indicates that undergraduate learners endorsing a fixed mindset were less likely to adapt well to feedback. When feedback provided challenge, those learners with a fixed mindset exhibited lower response motives. Furthermore, learners with a fixed mindset exhibited defensive or negative attitudes (Forsythe & Johnson, 2017). However, the measure of mindset used in the study exhibited sub threshold reliability, which may limit the interpretability and utility of these results.

Two recent meta analyses have examined the nature of mindset in terms of academic strategies and performance. The first examined associations between mindsets and aspects of self-regulation (Burnette et al., 2013). The second, in a manner similar to Blackwell and colleagues (2007), examined trait and state manipulated mindsets (Sisk et al., 2018). In both meta-analytic reviews, support for mindset was weak. Although weak, evidential value for mindset theory was noted by Sisk and colleagues (2018), and elsewhere (Bahník & Vranka, 2017).

Burnette and colleagues (2013) examined mindset in relation to the self-regulatory aspects of Carver and Scheier's (1998) control theory. The control theory framework used examines self-regulated learning, in terms of the SOMA framework, which includes goal -setting (S), -operating (O), -monitoring (M), and -achievement (A). Weak significant associations were

found in relation setting, operating and monitoring with fixed and growth mindsets; results were negative and positive associates respectively, consistent with theory. All reported effect sizes were less than $r = .24$. A lower, but still significant, association was seen in relation to goal achievement. It is notable that the goal setting classification used in the SOMA approach refers to mastery and performance goal orientation rather than goal setting per se, addressing the conceptual misalignment discussed earlier. This subtle but nevertheless important distinction may provide an avenue for misdirection by confusing structural and content theories of self-regulation (see for example Diefendorff & Lord, 2008). Yet the findings reported by Burnette and colleagues (2013) may, to some extent, suggest the importance of goal setting in self-regulatory processes. Whilst there does seem to be some evidence supporting the role of mindsets, it does not appear to be clear how the proposed mindsets operate.

As a result of the lack of clarity reported, Sisk and colleagues (2018) aimed to update Burnette and colleagues (2013) earlier analysis. Sisk and colleagues (2018) extended the earlier meta-analysis by examining the operating mechanisms that characterise mindset interventions. Specifically, this latter group of researchers aimed to elucidate when, and under what circumstances, mindset interventions are most effective. Part of the aim of this second analysis was to examine whether the significant resources endowed on mindset are justified. It is reported that significant resources are committed to interventions where evidence supporting their efficacy is limited (Robbins, Oh, Le, & Button, 2009). Consistent with Burnette and colleagues earlier analysis, the mindset to performance association was negligible. Significant heterogeneity indicated that the averaged effect sizes could be unstable. Developmental stage significantly moderated the mindset to performance association, specifically for children and adolescents but not for adults, however, only a small number of adult studies were included in the analysis. Previously it has been suggested that being academically at risk or being from low socio-economic status might moderate the impact of mindset, that was not the case here. Neither, was type of measure of academic performance.

The second of these meta-analytic investigations examined the effectiveness of mindset intervention studies. Findings indicated no difference in academic achievement between control groups and experimental groups who received a mindset intervention. Again, significant heterogeneity was reported, indicating moderating effects. Largely, student factors were not significant, except for a borderline effect in relation to risk status, with high risk learners benefitting from intervention. Seven samples of learners from low socioeconomic backgrounds also experienced higher academic achievement when exposed to a mindset intervention. Effects were not moderated by control group, intervention type, the context of the setting or the length of intervention. A significant moderating effect was reported when reading mindset materials, but not in relation to other types of intervention. Results also indicated mixed results in mindset transfer, with a significant moderating effect seen when manipulation checks were not conducted. Conversely, no significant moderating effect was seen when manipulation checks were conducted. However, the absence of this effect may indicate methodological problems in the delivery and control of mindset interventions.

Another recent meta-analysis, albeit smaller in scope, supports the previously reported weak associations with academic achievement (Costa & Faria, 2018). Contrary to earlier analyses these meta analytic results indicate the possibility of publication bias. Costa and Faria's (2018) review highlights that mindsets operate beneath the level of consciousness and as a result are presumed to implicated in academic achievement indirectly, through the management of ego defences via a multitude of self-regulatory variables. This evidence supports a more nuanced approach, by investigating the factors that precede performance as part of a more holistic approach, as suggested by Pintrich (2003).

These findings demonstrate that the effect of mindset on performance appears to be weak, regardless of whether the belief is held or manipulated. Three from four (Bahník & Vranka, 2017; Burnette et al., 2013; Sisk et al.,

2018) review syntheses discussed here indicate that publication bias is not a major issue, suggesting evidential value for mindset. However, the research reviewed here may indicate policymakers should exercise caution in basing interventions on mindset theory. This caution is proposed by Sisk and colleagues (2018) despite the tentative suggestion that a growth mindset might have utility for learners at risk, or of low socioeconomic status. Nevertheless, Costa and Faria (2018) suggest that further investigations are warranted, as the mechanisms of mindset may operate in concert with other mediators and moderators. Although not restricted to mindset, examining a multitude of non-intellective factors in conjunction is supported by a number of researchers to elucidate the mechanisms that support the self-regulated nature of learning and in turn support optimal performance (Bandura, 2013; Panadero, 2017; M. Richardson et al., 2012).

Recent investigations have examined the nature of mindset measurement, beyond its relation with performance (Abd-El-Fattah & Yates, 2006; Forsythe & Jellicoe, 2018; Tempelaar et al., 2015). It is suggested that the customary approach to measuring mindset may create ambiguity in understanding. The typical, but not explicitly recommended approach, is to measure mindsets on a continuum with low scores indicative of fixed, and high scores indicating growth perspectives (Dweck, 2013; Hong et al., 1999). Bifurcating mindsets in practice and in measurement approaches, suggests a problem in classifying a learner with a midpoint response. As a result, some authors have examined mindsets using growth mindset items only, inferring that a low score relates to a fixed mindset. This approach with each mindset at opposing ends of a spectrum aligns with the typical measurement approach (Dweck, 2013). Other researchers (e.g. Abd-El-Fattah & Yates, 2006) have developed scales designed to measure fixed and growth mindset separately. This separation has allowed researchers to examine complex relationships which indicate calibration over time in undergraduate populations (Dai & Cromley, 2014). In some quarters it is suggested that complex mindsets develop during maturation, such that by the time learners reach undergraduate study that a more nuanced picture is present (Tempelaar et al., 2015). These suggestions by Tempelaar and colleagues

findings do not support oppositeness of mindset beliefs. Furthermore, they go on to suggest that effort beliefs may have more utility than mindsets in predicting achievement goals. The importance of effort beliefs over mindset tentatively supports Richardson and colleagues (2012) findings that effort regulation is a stronger predictor of performance than goal orientations, a close associate of mindsets. Others suggest that mindset self-report measures are problematic due to the low social desirability of endorsing a fixed mindset (J. A. Chen & Tutwiler, 2017). Due to these problems, it is likely that there may be issues with operationalising a measure of the mindset construct which might be attributed to its conceptualisation. How the measurement issues reported here impact prediction is unclear. Bandura (2013) indicates that elevating mindsets to a dispositional trait, as many researchers do, obscures variance in behaviour, as measurement reduces behaviour down to few generalisable items on a measurement scale. This decontextualization comes at the cost of prediction. Instead, Bandura suggests that mindsets should be viewed as a modifiable and teachable state. The issues of conceptualisation and measurement appear to affect goal orientations too. Given that both perspectives have the same origin, perhaps this is to be expected (Morisano, 2013; Van Yperen, Blaga, & Postmes, 2014).

Goal Orientations

Goal orientations as a fundamental motivating force during the forethought phase of Zimmerman's model of self-regulated learning is indicated, see Figure 1.2. Two related goal orientation concepts are discussed in the extant literature (Payne et al., 2007). Both have similar origins relating to either mastery or performance goal orientations (Dweck, 1986; Nicholls, 1975). Respectively, mastery or performance goal based motivations are proposed to be adaptive in nature or maladaptive. As situated orientations, goal orientations are proposed to refer to the why and how of performance versus the specific what of goal setting (Payne et al., 2007). As Bandura (2013, p. 152) emphasises *"there is a big difference*

between performance goal orientation and setting goals for performance". Such a distinction is echoed by Diefendorff and Lord (2008) who suggest that two types of self-regulatory theories, those that consider the structure of self-regulation, such as goals, self-efficacy, feedback, goal revision; and those that consider the content, such as goal orientations. Content theories, such as goals set are proposed to inform how the situation affects the goals individuals engage in, goal orientations. These authors, and others (e.g. Cellar et al., 2011), call for more research to understand the relationships between the two types of theory and their relation to self-regulation. Zimmerman's holistic approach marries both types of theory, however, investigations tend towards confusing goal orientations as a proxy for structural goals. Within Zimmerman's model of self-regulation, the goal orientations are referred to within Dweck's theoretical perspective (1986) rather than those of Nicholls (1975).

Within a performance goal orientation, the learner is focused on demonstrating competence and comparison. Learners endorsing a performance orientation manage impressions seeking to demonstrate high competence or avoiding the impression of low ability. Maladaptive strategies are associated with this orientation including, surface learning, negative emotional appraisals and lower levels of self-efficacy. By contrast, learners endorsing a mastery, or learning, goal orientation endorse adaptive strategies including higher levels of self-efficacy, engage in challenge and regulate their performance resulting in persistence. Competence is developed through learning, mastery of skills and knowledge, which leads to an enhanced sense of personal growth and development (Payne et al., 2007). A recent meta-analysis examining the associations between achievement goal theory and self-efficacy supported separate valences for performance goal orientations (Huang, 2016). In their original form, goal orientations were conceptualised with inherent approach valences. However, inconsistent predictive qualities associated with performance goal orientations, gave rise to an avoidance valence (Van Yperen et al., 2014). Later, Elliot and McGregor (2001) proposed a 2 x 2 goal orientation framework with two goal orientations, mastery and performance crossed with

two valences, approach and avoidance. To add to problems inherent in different measurement approaches, meta-analytic work has indicated more fundamental issues concerning conceptual clarity and resulting misunderstandings about the nature of goal orientations (Hulleman et al., 2010). As a result of the differences in conceptualisation described, caution is urged when findings are "*lumped*" together in analyses of goal orientated beliefs (Morisano, 2013, p. 499).

Meta-analytic work suggests that adaptive mastery approach goals hold positive, albeit generally weak, associations with performance. Avoidance goals, of both orientations, are reported to be negatively associated with performance outcomes (Payne et al. 2007; Richardson et al. 2012). Payne and colleagues suggest high levels of mastery approach and low levels of performance avoidance orientation, as an effective combination. At the time of Payne and colleagues analysis, evidence examining the role of performance approach was underexplored. Zimmerman and Dibenedetto (2008), for example, have suggested emphasis on goal orientations which address mastery in favour of the performance orientation. More recently, Van Yperen and colleagues (2014) have sought to further understanding. These authors report that the combination of mastery and performance approach orientations may lead to the use of both positive strategies, but also negative strategies. Focus on performance, for example, may lead to the use of unethical behaviours, such as cheating (Dweck, 2016b). Cultivating a mastery approach orientation is therefore suggested to reap most benefits during intervention. Mastery approach goal orientations have been found to add incrementally beyond measures of previous performance, and factors such as self-efficacy (De Clercq et al., 2013).

Following Diefendorff and Lord's (2008) call to understand the nature of the association between structural and content mechanisms. Huang's (2016) recent meta-analysis examined the nature of goal orientations in relation to self-efficacy. Describing self-efficacy and goal orientations as two major motivational theories concerned with perceptions and definitions of competence, respectively. Findings indicate moderate-strong, and low

positive associations in terms of self-efficacy to mastery and performance orientations respectively. The author reports that finding mirror earlier evidence from systematic reviews (Carpenter, 2007). In relation to approach and avoidance valences, the position was less clear. The association between mastery approach and self-efficacy resembled the moderate strong association of mastery orientation. These results are similar to those identified by Payne (2007) in terms of performance. Taken together, evidence reviewed here converges to support the adoption of a mastery approach orientation. Evidence in relation to other orientations was less clear, with low, or low moderate, associations reported in terms of performance approach / avoidance valences. Further the similar associations between mastery and performance avoidance orientations to self-efficacy, with each showing a similar pattern of negative association in the 2 x 2 model, appears to indicate that the more recent addition of mastery avoidance may not be separable or have utility. The continued lack of clarity in relation to avoidance valence supports Payne and colleagues (2007) results in terms of performance. The adoption of a performance approach is supported, albeit to a lesser extent. Relationships in terms of the dichotomous and trichotomous models of achievement goals were largely invariant to demographics factors, measurement of goal orientation, and publication status. Moderator analysis was not performed in relation to the 2 x 2 approach due to the low number of available studies. Nevertheless, the pattern of results discussed appears to provide additional support for the goal complex approach suggested by Senko and Tropiano (2016).

Mastery approach orientations were associated with adaptive approaches such as deeper engagement in learning, demonstrating differing effects depending on the outcome measure. Further, these adaptive mastery approach orientations have been associated with greater use of self-regulatory strategies including those that sustained effort and persistence (Wolters & Benzon, 2013). These approaches may be particularly beneficial to develop in learners given their later utility in the workplace (Lüftenegger et al., 2012). The idea of adaptive and maladaptive orientations has been supported in subsequent meta-analyses (Baranik, Stanley, Bynum, & Lance,

2010; Hulleman et al., 2010) which attempted to clarify specific canons of the theory.

Hulleman and colleagues (2010) for example examined the nature of goal orientations, and specifically if the same construct was accounted for in the terms used by different researchers within the umbrella of the theory. Their central thesis was that such mislabelling would undermine the relationships that operational measurement has to theory, as measurement is the main tool that connects theory to understanding. It has been suggested that tools of knowledge, such as psychological measures, are used until we reach a point of 'interactive stabilisation' (Pickering, 2015). Whilst disunity may be a strength of the scientific process, Pickering suggests that the best classification may depend on what we want from the instrument. Extending previous meta-analyses (e.g. Payne et al., 2007), Hulleman and colleagues (2010) used an operational definition of goals (and goal orientations) as *"a future-focused cognitive representation that guides behavior to a competence-related end state that the individual is committed to either approach or avoid"* (p. 423). The authors concluded that goal orientation researchers were indeed using same labels for essentially different constructs. Two main scales are used to examine goal orientations, the Achievement Goal Questionnaire (AGQ) and its revision (Elliot & McGregor, 2001; Elliot & Murayama, 2008) and subscales of the Patterns of Adaptive Learning Scale (PALS) (Midgley et al., 2000). Where the AGQ employs largely normatively referenced items, i.e. goals to goals; PALS is largely evaluative, referencing goals to outcomes. Differences in outcome reference point subsequently leads to different patterns of relationships in terms of performance, with the former rendering generally positive associations, and the latter rendering generally negative associations with performance outcomes. Taken together, findings reported here suggest that caution should be exercised when interpreting goal orientation evidence, particularly those providing evidence for the construct across time (Morisano, 2013).

Within the scope of their meta-analysis, Hulleman and colleagues (2010) also examined the content of the items in each of the scales that

purported to measure goals. An absence of goal relevant language in items from the scales examined was found. Approximately one third of performance approach items, two-thirds of performance avoidance item, just over one half of mastery approach items, and 92% of mastery avoidance items contained no goal relevant statements. One such example item cited by Hulleman and colleagues (2010, p. 433) states *"It is very important to me to feel that my coursework offers me real challenges."*, speaking more to cognitive and affective evaluations associated with goal striving. Authors also examined the mastery avoidance construct. Whilst there was evidence in the direction expected, that mastery avoidance would associate negatively with performance, this finding was moderated as a function of publication status. Few studies focusing on mastery-avoidance were in the scope of the review at the time of analysis, as a result, authors were unable to draw firm conclusions and caution in interpreting findings was recommended. Further recommendations suggest that researchers reach consensus on the conceptualisation of goal orientation theory and then develop measures according to that framework. There is recognition that in the short term, and in the absence of a unified view, that researchers be clear about the measures being used and provide explain the theoretical context of measurement clearly to avoid ambiguity.

Baranik and colleagues (2010) recent systematic review investigated the addition of mastery avoidance as part of the goal orientation framework. Until that point, such an investigation had been difficult due to the novelty of mastery avoidance, leaving an inconclusive picture in relation the construct (Hulleman et al., 2010; Payne et al., 2007). Research examined largely employed the AGQ and concluded that enough evidence existed to support the distinct nature and the utility of the construct, despite a low volume of studies in the scope of the review. Researchers also reported the moderating nature of mastery avoidance to growth mindsets when considering the behavioural approaches of learners. Findings indicated that mastery avoidance orientations were negatively associated with help seeking (i.e. feedback) and performance, it is therefore suggested as a useful behaviour to track and discourage in learners, in favour of mastery approach, as

indicated previously. Performance approach is seen as adaptive in some situations, for example, in relation to examinations that require surface engagement (Darnon, Butera, Mugny, Quiamzade, & Hulleman, 2009). However, the utility of performance approach orientations may be influenced by learner normative approaches (Crouzevialle & Butera, 2016). Baranik and colleagues (2010) review recommended that further work should be undertaken to examine suggested moderators of the achievement goal and outcomes relationship, such as task characteristics and situational contexts, for example task difficulty. This recommendation was echoed in Huang's (2016) recent broader meta-analysis. The author proposes more research is required to clarify the nature of 2 x 2 model of achievement goals (Elliot & McGregor, 2001; Elliot & Murayama, 2008), in particular in its relationship to self-efficacy. The reviews discussed provide a useful basis upon which to examine achievement goal orientation, and how these understandings relate to self-regulated learning. For example, examining the behaviours associated with the full range of goal orientations from a normative perspective and how situational characteristics such as goal difficulty moderates learner response during goal striving will strengthen understanding.

The relationship between the achievement goal theory has been considered in relation to learning approaches and outcomes. Mindsets, as described earlier, are indicated as antecedents to goal orientations. As such mindsets are distally related to achievement. Burnette and colleagues (2013), examined mindset associations within the SOMA self-regulatory framework, i.e. goal -setting (S), -operating (O), -monitoring (M), and -achievement (A). Weak relationships between mindsets and goal orientations were seen. In addition, goal orientations were shown to have no direct effect on achievement, nor did they moderate mindset beliefs. However, a small and very weak direct association between growth mindset and performance was seen.

Other reports are inconsistent, Dinger and Dickhauser (2013) support the idea of an adaptive self-regulatory approach in the adoption of both a growth mindset and a mastery approach orientation. However, these are

positive, but weak associates. The pattern of results between mindsets and performance goals is reported as inconsistent. Fixed mindsets were found to be weakly related to experimentally manipulated performance avoidance, but not once baseline measures of mindset were controlled for in hierarchical regression. These findings have been supported in other similar work (Dinger, Dickhäuser, Spinath, & Steinmayr, 2013), whilst other research findings are mixed, finding some support for these associations (Robins & Pals, 2002) or none (Dupeyrat & Mariné, 2005). In addition, a direct causal association to performance is not recommended by some, who suggest that goal orientations, and by implication mindsets, are mediated through self-regulatory structural mechanisms such as self-efficacy (J. A. Chen & Pajares, 2010).

As illustrated above, evidence appears to tentatively support aspects of the theorised associations between mindset and goal orientations in terms of performance. However, that may not be where achievement goal theory concepts hold power. That said, conceptual clarity appears to be problematic in terms of elucidating how achievement goal constructs operate during self-regulated learning. Whilst the direct association to performance may be attractive, it may be too simplistic as suggested by Chen and Pajares (2010). When proposed, achievement goal theory considered the affective, cognitive and behavioural patterns of response associated with learning, rather than achievement outcomes per se (Dweck & Leggett, 1988).

Bjørnebekk, Diseth and Ulriksen (2013) investigated the joint contributions of motivations towards success or avoid failure, a 2 x 2 goal orientation framework (Elliot & McGregor, 2001), and self-efficacy in terms of examination and assessment performance longitudinally. Using a path analytic approach, findings suggested only motivations towards success and performance avoidance, but none of the other potential associates, predicted performance in a gateway oral examination on the route to future performance. Here success and failure motives were measured alongside goal orientations, and self-efficacy, with some demonstrating high levels of correlation. Low level correlation between predictors is generally an

assumption of such regression models, high levels of relationship may result in multicollinearity, which may inflate estimates and cause problems in interpreting effects (Baird & Bieber, 2016). Bjørnebekk and colleagues did not indicate whether these assumptions were met. In addition, from the authors' description, alternative path models were examined but discarded as they did not generate significant results. It may be that the path analytic approach employed here and the potential overlap between variables might have presented problems in the analysis, particularly in relation to the neutral rendering of self-efficacy. However, results reported supported the idea that success motives positively associate, which may be a proxy for approach orientations, and performance avoidance goal orientations were negatively associated with a gateway examination, in terms of future performance. Similar recent evidence also supports the general nature of these motivations (Hangen, Elliot, & Jamieson, 2018).

In the occupational domain, goal orientations are not accounted for within Locke and Latham's High Performance Cycle. However, Latham, Seijts and Slocum (2016) point to goal orientation motivations as a missing personality component from the model. Although proposed to be closer in proximity to performance than mindsets, goal orientations have weak relationships in the presumed direction to academic outcomes, as reported in meta-analyses (Richardson et al., 2012; Van Yperen et al., 2014). However, Van Yperen and colleagues report that relationships may be stronger in work-based, compared to academic, settings as occupational environments require role-based behaviours, such as teamworking that are additional to performance. Therefore, domain specific differences may require fundamentally different motivational strategies.

Goal orientations, and in particular mastery approach orientations, are thought to relate to progress evaluations that are focused on improvement, in a manner consistent with Zimmerman's approach to self-regulated learning (Van Yperen et al., 2014). However, Honicke and Broadbent (2016) suggest that the precise nature of the association between goal orientations and self-efficacy lacks clarity. Other researchers have called for investigations that

clarify the precise nature of such dynamic relationships in self-regulated learning environments (Panadero, 2017; Zusho, 2017).

As indicated by Baranik and colleagues (2010) mastery avoidance is as a useful indicator of regulation failure. Howell and Buro (2009) investigated the role of mindsets and Elliot and McGregor's (2001) 2 x 2 goal orientation approach, and how this measurement approach mediated mindsets in terms of procrastination behaviours. Researchers found that mastery avoidance mediated a fixed mindset view and a greater propensity towards harmful procrastination. Conversely, mastery approach mediated growth mindset perspectives and was associated with adaptive self-regulation, in the form of lower procrastination propensity. These findings indicate endorsement of both mastery approach and growth mindset beliefs at high levels, are implicated in improved levels of goal directed thinking (Howell & Buro, 2009). Consequently, learners holding adaptive orientations were able to delay other gratification. A greater proportion of variance in findings was associated with goal orientations than mindsets. The research may be limited as the version of the AGQ used was subsequently revised as the measurement of mastery avoidance did not align well with the theoretical conceptualisation, in that the questions considered affective nature of responses. Further, mediation analysis using Baron & Kenny's (1986) hierarchical regression approach to mediation was used, and this approach may be limited (MacKinnon, Fairchild, & Fritz, 2007).

The importance of focusing on goal processes such as orientations, goal setting, and high levels of self-efficacy have been supported during the early stages of self-regulated learning to avoid poor regulation (Krause & Freund, 2014). Although an examination of a brief goal setting intervention, which considered procrastination mindsets based on Dweck's framework, but not goal orientations, did not find an effect of such interventions on reducing procrastination (Gustavson & Miyake, 2017). Findings indicated that growth procrastination mindsets were associated with raising procrastination levels, however, Gustavson and Miyake (2017) considered that the reported findings might relate to participants view that they could halt procrastination

at any point. In practice, however, they did not. The intervention may have been limited by its brief nature, being conducted for a period of three weeks. It may be that the length of the intervention reduced the salience of the goals, with a corresponding failure to enact self-regulatory processes.

Dinger, Dickhäuser, Spinath and Steinmayr (2013) conducted a comprehensive investigation of goal orientations, using a trichotomous conceptualisation of achievement goals in secondary school students in Germany. This research examined the role of mastery, performance approach and avoidance goal orientations as mediators of both mindsets, hope of success, fear of failure, and perceptions of competence in terms of intrinsic motivations and academic achievement as outcomes. Although growth mindset contributed positively to mastery (approach) orientations, it had contributed a small effect, alongside hope of success and perceived competence. Hope of success, fear of failure, and perceived competence each contributed to performance approach. Fear of failure only predicted performance avoidance. Both types of mastery and performance approach goals positively, and performance avoidance negatively, contributed to intrinsic motivation. Goal orientations combined to contribute 35% of the variance in intrinsic motivation, however, in turn, they were weakly related to academic achievement, accounting for 12% of the variance. Findings indicated several important points, that mastery was accounted for by mindsets, but more so in relation to hope of success and perceived competence, which may speak to self-efficacy. However, in this study performance goals of both types were unrelated to mindsets, although both goal orientations related directly in the expected directions to achievement. The findings reported by Dinger and colleagues (2013) may undermine the theoretical underpinnings of performance orientations to mindset theory. Nevertheless, findings relate to one single study and rely on a German measure of goal orientations, in a selective, high performing sample of high school students. This measure is utilised at a lower level of education than traditional measures of goal orientation. The cross-sectional nature of the research also measured several different constructs on one single occasion. It is therefore possible that measurement issues such as common method

variance, survey fatigue and response bias may be implicated in the results. Methodological issues discussed here may limit the causal inferences that can be made in relation to these associations, however, the causal directions indicated in the hypothesised model were nevertheless supported by acceptable fit measures.

Senko & Tropiano (2016), and others, have suggested that 'goal complexes', that is holding concurrent mastery and performance goals, may yield greater influence on performance than mastery or performance goals alone. Chen and Wong (2015) support the complex nature of goal orientations as mediators of mindset on academic performance. Using a trichotomous goal orientation framework, the authors found that both mastery (approach) and performance approach orientation, mediated growth mindset on the path to academic achievement. A performance avoidance orientation was negatively and directly related to academic achievement only.

Whilst there appears to be reasonably strong evidence to support the role of mastery approach goal orientations these appear to have greater influence in demonstrating self-regulatory competence, in terms its association with self-efficacy (i.e. Huang, 2016), than its direct relationship to performance (i.e. Payne et al., 2007). There are also suggestions that a performance approach orientation may also hold utility, but to a lesser extent than mastery approach (Huang, 2016). A more nuanced mindset may therefore be more beneficial to self-regulation during the preparatory phases alongside self-efficacy and goal setting approaches. However, more research is necessary to understand the nature of the associations discussed in self-regulated task performance (Panadero, 2017). In particular, contributing to the extant scientific knowledge by further explicating the nature of achievement goals in terms of the crossed orientations and valences, using the 2 x 2 framework (Elliot & McGregor, 2001; Elliot & Murayama, 2008) is clearly called for (Huang, 2016; Payne et al., 2007).

Preparation – summary

In summary, setting a goal during the preparatory phases of learning hardly seems a controversial proposition. Neither is the idea that personally held dispositional and situational cognitive, behavioural and affective reflections may dynamically, and differentially, impact goal striving and how learners regulate themselves towards goals. Zimmerman (2000) packages these within the preparatory phase of a phasic model of self-regulated performance. This proposes that during self-regulation, three elements chime together to guide the course of performance.

To begin, goals must be set at the right level. This proposal follows Locke and Latham's (1990a) theory of goal setting, which also necessitates a concomitant level of commitment to the goal. Aligned with goal setting, high levels of self-efficacy (Bandura, 1986, 1997) ensures persistence in the face of regulatory barriers. Evidence tentatively indicates that holding mastery approach goal orientations, and possibly those attitudes associated with approaching performance rather than avoiding it, would provide effective goal based beliefs. Finally, and supplementing Zimmerman's model, an implicit mindset that is focused on growth and learning in terms of demonstrating continuing increases in competence.

These approaches have enduring and intuitive appeal for intervention purposes. Evidence supporting the role of self-efficacy as both a regulatory force and in terms of performance seems relatively incontrovertible (M. Richardson et al., 2012; Schneider & Preckel, 2017), despite some relatively minor issues concerned with its measurement (Honicke & Broadbent, 2016). Researchers seem to concur that efficacy beliefs are unlikely to be disposed to short-term change (Dignath & Büttner, 2008), as a result, moderation of these beliefs through goal setting has been tentatively indicated within HE settings (M. Richardson et al., 2012).

Goals and goal orientations are conceptually, and unavoidably, related as they both speak to motivated performance. Nevertheless,

available theory suggests they are separable, albeit they have not necessarily been treated as such. However, these two goal based constructs are defined separately in Zimmerman's model of self-regulated learning. The investigation of goal setting, and the key driving forces of difficultly and clarity, have received little research attention in education research. The limited research that there appears to be in HE tentatively indicates promise but much relies on qualitative (Travers et al., 2015), or quasi-qualitative (McCardle et al., 2017) investigations, and focuses on discreet groups with relatively small samples of participants (Morisano et al., 2010). Goal based interventions and associated investigations require significant research resource. Such research based interventions may not be cost-effective to replicate or from a practical point lead to meaningful identification and intervention. Such investigations have been largely overlooked across the educational spectrum in favour of investigations that employ achievement goal theories, as proxies of goal setting (Morisano, 2013). This is a situation that may provide less than ideal conditions to drive forward the knowledge and practice of self-regulated learning.

Further compounding the possible erroneous decision to conceptualise achievement goal theory constructs as goal setting indicators, mindsets and goal orientations are beset by issues of theoretical clarity (Huang, 2016; Payne et al., 2007; Sisk et al., 2018). Empirical investigations often pitted achievement goal theory constructs in terms of their direct relationship to performance, which may not be appropriate (J. A. Chen & Pajares, 2010). Aligned with the lack of conceptual clarity, associated measurement is reported to be problematic (Huang, 2016; Morisano, 2013), and only specific tenets of the theories are reported to be clear. Nevertheless, associations are reported to be small or weak, in particular in relation to performance outcomes (Burnette et al., 2013; Huang, 2016; Payne et al., 2007).

Where measures are employed, many such investigations examine facets of the theorised relationships in isolation (Barger & Linnenbrink-Garcia, 2016). When taken together with the complex picture identified

above, such theoretical and measurement decisions may lead to findings that have low utility in terms of advancing knowledge and practice. Developing measures that contribute to a rounded understanding in terms of the preparatory phase of self-regulated learning appears to be a sensible next step. This is because self-regulatory processes do not occur in isolation, considering how these are informed by the evaluations made by learners during the appraisal phase of performance would also seem appropriate. Measurement clarity may then contribute to a complete picture of the evaluative judgements that learners make to secure gainful learning as they move into the next phase of performance.

<u>Performance</u>

Several moderating and mediating mechanisms must be negotiated during goal striving. The performance phase of Zimmerman and Moylan's model contends that the individual employs the dual influences of self-observation and self-control, see Figure 1.3. In self-observation, metacognitive self-monitoring occurs during performance and evaluates progress towards our vision (Panadero & Alonso-Tapia, 2014).

Figure 1.3 Performance phase. Note: figure taken from an original article (see Figure 3, Panadero & Alonso-Tapia, 2014)

During goal striving, self-control mechanisms are employed that are metacognitive or motivational in nature. From a metacognitive perspective, task specific strategies, self-instructions, imagery, time management,

environmental structuring, and help seeking are recruited to ensure persistence (Panadero, 2017; Zimmerman & Moylan, 2009). Interest incentives and self-consequences activate motivational resources by encouraging and rewarding individuals towards continuing performance. These proposals related to on task performance are synergistic with Locke and Latham's (1990b) High Performance Cycle which indicates that ability, commitment, feedback, task complexity and situational constraints moderate goal striving in the performance phase, whilst mediating mechanisms include direction, effort, persistence, and task specific strategies.

Sitzmann and Ely's (2011) meta-analysis identified up to sixteen heuristically defined constructs associated with all phases of self-regulation in terms of task based performance in the workplace and during learning. The findings indicated a high level of inter-correlation between factors and some conceptual overlap. In particular, Sitzmann and Ely (2011) report that goal level and self-efficacy are moderate to strong predictors of performance. This finding was later supported Richardson and colleagues (2012) in their review of the non-intellective associates of undergraduate academic performance who report that self-regulated learning factors associated with success in HE include goal level, effort regulation, persistence, and self-efficacy. Contradicting many theories of self-regulation, the results of Sitzmann and Ely's (2011) analysis did not support the role of planning, monitoring, help-seeking and emotional control. However, it may be that these self-regulatory processes are accounted for in constructs, such as self-efficacy and goal levels, which are promoted and are suggested to be associated.

A recent study by Henneke and colleagues (2018) examined the use of self-regulatory strategies when faced with tasks in an experience sampling paradigm. The experience sampling method required participants to report on in flight goal progress. Researchers found that those individuals higher in trait levels of self-control enjoyed greater success in task achievement and used self-regulatory strategies more. In a second part of the study, findings highlighted that situation level, monitoring strategies, including maintaining a

positive focus and managing emotions, but not goal setting, were related to greater self-reports of task success. Findings reported here may support earlier evidence suggesting that selection of self-regulatory strategies is associated with task requirement. Whilst results did not support goal setting as a regulatory force, Henneke and colleagues (2018) study asked participants to consider the aversive goals that they were engaged with in the moment and their levels of persistence. Findings may therefore be limited as participants were encouraged to categorise goals according to a predefined list of activities. As a result, goals may not have been set an appropriate level of challenge which acts to optimise the regulatory and motivational forces suggested to be important in goal striving and achievement. Distraction was related to lowering of success in achieving aversive goals. Researchers contrasted findings with classic evidence relating to the role of distraction in goal achievement (see for example Mischel, Ebbesen, & Raskoff Zeiss, 1972). In such research, where a pleasant goal end is anticipated, distraction supports goal striving. However, distractions reduce goal persistence in the face of an aversive stimuli, suggesting a differential pattern of response depending on the situational factors and dispositional level factors. Hennecke and colleagues (2018) novel research was taken to support theories of regulatory flexibility (for example see Bonanno & Burton, 2013). For example, Hennecke and colleagues (2018) posit that regulatory efficacy varies with situational factors and the individual's accumulated repertoire of strategies when responding to task-based feedback. Specifically, these findings presuppose during goal pursuit that selection of an appropriate mix of accumulated prior knowledge of strategy use together with contextual factors during task performance can be used dynamically to respond to feedback, to greater effect in those that have flexibility. The results here are encouraging as they suggest lower levels of trait self-control need not be a barrier to developing regulation, and in the moment, goal directed strategy use may independently support goal progress. In contrast, other researchers report that such metacognitive self-control strategies during task performance have weaker utility than goals set at an appropriate level and concomitant levels of self-efficacy (Sitzmann & Ely, 2011). Workplace (Pattni, Soutar, & Klobas, 2007) and academic (Morisano et al., 2010)

interventions have reported success in increasing levels of self-regulation. These interventions have focused primarily on goal setting, nevertheless it seems likely that these rely on a number of complementary factors and it may not be possible to isolate the individual supporting mechanisms that support success (Day & Unsworth, 2013). Results discussed here support Sitzmann and Ely's (2011) findings that whilst such self-regulatory strategies are highly correlated, that some have greater prominence than others. Taken together these findings support the need to broaden skills, knowledge and attitudes of learners across different levels of the task performance spectrum (Lord, Diefendorff, Schmidt, & Hall, 2010) and measure these as a route to understanding value added gains in learning (Forsythe & Jellicoe, 2018).

Duckworth and colleagues (2019), have recently reviewed the evidence base concerning self-control. The authors attempt to distinguish self-control as a moment by moment regulatory force that enables progress toward goals. They note many overlapping and analogous constructs including, amongst many others, personality theory, self-regulated learning, and executive control. Individual differences in self-control are proposed to predict differential patterns of response to transient, distracting stimuli that are incongruent with goal striving. Where those with high levels of self-control may avoid distraction, those low in self-control may not. Differing patterns of response, by learners to the same situation, are to be suggested to prompted by intra-individual differences in cognitions, affects and behaviours that learners bring to a situation (Dweck, 2017a; Mischel & Shoda, 1995). The review indicates that self-control may be a reliable dimension that independently predicts achievement, at least at levels comparable with prior academic performance, and cognitive ability. Evidence to support the findings of the review is drawn, at least to some extent, from the overlapping theories that are proposed to be distinct, such as conscientiousness from personality theory (Poropat, 2009), self-efficacy (Bandura, 1997), goal setting theory (Locke & Latham, 1990a) and theories associated with self-regulated learning (Zimmerman, 2000). In the review, Duckworth and colleagues note that self-regulated learning as a broader, overlapping theoretical perspective, analogous to self-control which has been

suggested to operate on a short-term temporal basis. Others do not make a distinction, for example, Day and Unsworth (2013) have proposed that self-control, self-regulation and self-leadership operate within a continuum. These three perspectives relate to application of external forces during task performance, regulating and managing the way in which tasks are carried out, and a consideration of what should be done and why, respectively. Goal setting is described as an implicit self-regulatory process (Locke & Latham, 1990a) and the volitional control that is necessarily associated with it may spread activation to other levels of the self-regulatory cycle. This proposal is suggested to be the case with goals that are set using mental contrasting and implementation intentions (Oettingen et al., 2013), where setting realistic goals and consideration of barriers lead to automatic selection of control strategies during goal striving. There have been suggestions greater theoretical unity may be possible, and it may be that fragmentation may be unhelpful. The authors call for research that focuses on the efficacy of interventions that increase regulation and optimise learning, in particular, research that crosses domains and theoretical traditions. In the absence of conceptual clarity, the resulting measurement and prediction that necessarily follows may be compromised. Lord and colleagues (2010) have explicitly considered the broadening of perspectives that operate at different levels of abstraction. A dearth of research is reported to examine the different levels of abstraction during self-regulated performance (Day & Unsworth, 2013).

CHAPTER 2 – Literature Review: Outcome Appraisal

<u>Appraisal</u>

At the simplest level of conception in Zimmerman and Moylan's (2009) model of self-regulated learning, self-reflection follows performance and precedes the commencement of new tasks, see Figure 1.1 and Figure 2.1. During appraisal, learners evaluate and reflect on achievement. Here evaluations are referenced against assessment criteria and by the task-based feedback that learners receive. Feedback can change the nature of in task performance, consistent with that more often seen in HE the evaluation described here is considered as a retrospective process, and is, in turn, a moderator of goals (S. J. Ashford & De Stobbeleir, 2013). Alongside such evaluations, learners make causal attributions for performance outcomes to provide a self-justification for the performance (Panadero, 2017). Motivation beliefs, such as goal orientations, in the preparatory stage, may be related to attributions learners make for success or lack thereof. When demonstrating competence is an issue, for example in a performance goal orientation, a learner may make less adaptive attributions if they compare their achievements to others. Learners seeking to develop competence, those with a mastery goal orientation, are suggested to make adaptive attributions, particularly when learners make progress towards set goals. Satisfaction with performance influences the emotional appraisals made by learners, leading to adaptive or defensive appraisals which inform responses to feedback (Forsythe & Johnson, 2017). See Figure 2.1 for a visual representation of the appraisal phase of Zimmerman and Moylan's (2009) model.
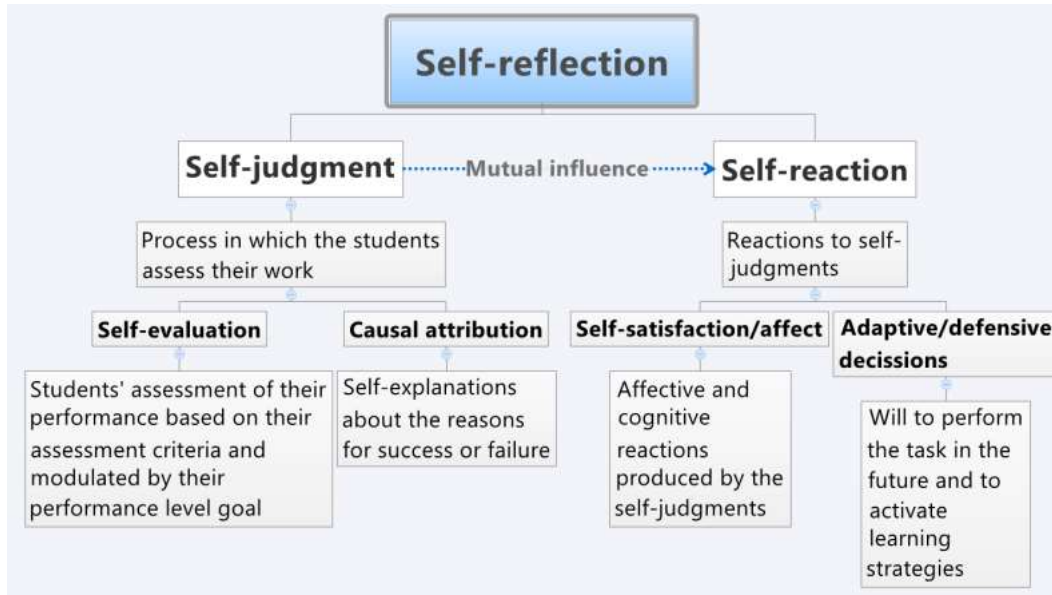
Figure 2.1 Self-reflection [Appraisal] phase. Note: figure taken from an original article (see Figure 4, Panadero & Alonso-Tapia, 2014), typographical errors are the authors own.

These are crucial lenses through which learners evaluate progress towards proximal and distal outcomes. Such outcomes may include feedback and grade, which may be proximal in nature. Distal outcomes of interest such as those relating to learner readiness for employment may include for example decision making abilities and perceptions of teamwork competence. These outcomes are discussed in turn.

Feedback

Learner competence in evaluating and making judgements about the courses of action necessary for progression relies on feedback that informs (Nicol & Macfarlane-Dick, 2006). This judgement relies on related, but separable, processes associated with receiving and transmission of feedback respectively (Winstone & Boud, 2019). A recent paradigm shift has seen a focus in research and practice from transmission to fostering knowledge, skills and attributes associated with receiving feedback as a route to development (Carless, 2015). Models and associated toolkits focused on pedagogies on learner engagement with feedback have been

developed (Winstone et al., 2019; Winstone, Nash, Parker, et al., 2017) reporting mixed but generally positive effects. Recent evidence suggests that the paradigm shift in research is not yet mirrored in practice (Dawson et al., 2019). Despite a lack of progress in this area, Carless (2019) indicates that developing such recipience practices may foster long term benefits for learners. Such approaches rely on a dialogue between the learner and the instructor (Nicol, 2010), but there is increasing distance in this relationship (Carless & Boud, 2018). This distance and other barriers including the content of feedback (Winstone, Nash, Rowntree, & Parker, 2017) and the learner's emotions and motivations may act as opposing forces to stunt learner engagement (Pitt & Norton, 2017). Ultimately, if educators are to develop lifelong learners with the ability to determine the course of their own learning and make judgements about the actions necessary to make development leaps (Ajjawi et al., 2018), engaging with feedback is a good place to start. Engagement therefore constitutes a new feedback paradigm (Carless, 2015).

It is well established that feedback can have a positive effect on subsequent performance. However, often low impact is reported from feedback (Sadler, 2010), with some suggestions that up to one third of feedback interventions have deleterious effects (Kluger & DeNisi, 1996), for example where feedback is related to the self rather than the task. Others have suggested that the complex nature of feedback means that there is no 'magic formula' (Sadler, 2010, p. 536), therefore differential effects of feedback on performance should not come as a surprise. Feedback is suggested to have two roles in task performance, to encourage future goal setting and to moderate performance during in flight task performance (S. J. Ashford & De Stobbeleir, 2013). Often in HE, assessment practice means that the former practice is seen more often. Often, however, the opportunity to act on feedback diminishes, as learners in modular programmes move on to different forms of assessment. Nevertheless, much research has focused on delivery of feedback (Evans, 2013; Hattie & Timperley, 2007), with an inherent assumption that learners have the necessary skills and motivations to engage in feedback, in an objective and dispassionate manner (Joughin et

al., 2018). If feedback is to have an effect, Hattie and Timperley suggest three questions must be addressed "*Where am I going? (What are the goals?), How am I going? (What progress is being made toward the goal?), and Where to next? (What activities need to be undertaken to make better progress?)*" (Hattie & Timperley, 2007, p.86). These evaluations support an ipsative self-regulatory approach, connecting previous and future learning.

In the workplace, managing the feedback loop is suggested to be integral to self-regulated approaches to performance (Lord et al., 2010). Feedback seekers that enjoy high levels of self-efficacy have been found to experience higher performance, however, this higher performance relies on goals set following feedback (Renn & Fedor, 2001). Researchers have called for more research to examine relationships between feedback, self-efficacy and future approaches (DiBenedetto & Bembenutty, 2013). Some in HE have suggested that formal goal setting plans be included in educator feedback (Evans, 2013). Engaging students in the development of adaptive knowledge, skills and attitudes that secure hard won gains in learning is crucial if learners are to develop the ability to manage themselves during the courses of their studies and into employment (Forsythe & Jellicoe, 2018). Recent qualitative reports indicate that learners in HE, even when approaching graduation, do not possess the emotional repertoire to manage and act upon feedback and are not enabled in doing so (O'Donovan et al., 2016; Pitt & Norton, 2017). Disillusionment with current feedback practices are reported (Rand, 2017) and summative written feedback often lacks specificity (Henderson, Ryan, & Phillips, 2019). Current assessment and feedback approaches may not, therefore, enable learners to engage in development in the manner expected by employers.

Despite an apparent engagement deficit, recent evidence suggests that learners are aware of and in many cases value useful feedback that provides challenge (Forsythe & Jellicoe, 2018; Winstone, Nash, Rowntree, & Menezes, 2016). It is suggested that heuristics and biases (Joughin et al., 2018), amongst other barriers (Winstone, Nash, Rowntree, et al., 2017), may prevent learners engaging in productive evaluation of feedback. These

evaluations may lead to adaptive or defensive evaluations made by learners during appraisal which may undermine decision making relating to feedback (Forsythe & Johnson, 2017; Panadero et al., 2018; Van Merriënboer & Kirschner, 2017). Such decisions are typified by dual processing theories of decision making (Kahneman, 2011; Kahneman & Tversky, 1979, 1984; Stanovich & West, 2000). In the first of these perspectives, described as system one thinking, reactive judgements are made quickly and rely on rules of thumb. In system one thinking, Joughin and colleagues (2018) indicate that learners may opt not to engage in the deliberate and resource intensive cognitive appraisals, typified by a system two approach, most suited to optimising gains in learning. In addition to stunting engagement, heuristics and biases are proposed to inflate learner evaluations of their work and the confidence they have in it (Peverly et al., 2003), however, fixed mindsets may also contribute to overconfidence (Ehrlinger et al., 2016). DiBenedetto and Bembenutty (2013) found that calibration of self-efficacy beliefs, which downregulated over the course of a semester, was associated with increased performance. These findings indicate a move towards adaptive self-regulation, with greater engagement in feedback, and the development of evaluative judgements that are analytical and deliberate in nature. In turn, such judgements support realistic levels of confidence which are then associated with future performance. Such appraisals, however, rely on costly cognitive resources. Learners may not be in possession of the resources necessary to engage in such appraisals, as they might prompt anxiety. Learners may not be adept at engaging in anxiety promoting evaluations and may instead look to invalid cues that typify system one thinking (Van Merriënboer & Kirschner, 2017). It seems then to optimise gains in learning that taking an objective and stance is necessary, however, widely reported barriers must be negotiated to engage in an adaptive manner (Winstone, Nash, Rowntree, et al., 2017).

Although overconfidence may result from ignoring useful feedback (Ehrlinger et al., 2016), often lack of engagement with feedback may result from defensiveness associated holding a fixed mindset (Forsythe & Johnson, 2017; Nussbaum & Dweck, 2008). Supporting this idea, feedback that

activates a need for remediation without threatening implicit beliefs has been suggested to generate motivation (Fishbach, Koo, & Finkelstein, 2014). Whilst in some cases disengaging from feedback might be an adaptive approach, generally, reflecting on feedback as a supportive mechanism in moderating future goals is widely supported (Oettingen & Reininger, 2016; Oettingen & Sevincer, 2018). A recent study of writing behaviours during college found that higher self-efficacy beliefs predicted higher levels of self-regulatory behaviours, however these behaviours were mediated via learners higher perceptions of feedback (Ekholm, Zumbrunn, & Conklin, 2015). The opposite relation was seen for learners low in self-efficacy. Findings support the joint role of self-efficacy and feedback in managing task-based self-regulation in undergraduate learners, and in particular the importance of encouraging productive perceptions and engagement in feedback. Supporting these ideas, positive feedback has been suggested to raise beliefs in task competence, particularly for novices (Fishbach et al., 2014) which may contribute to higher goals being set in the next cycle of performance (S. J. Ashford & De Stobbeleir, 2013; Bandura & Cervone, 1983). Negative feedback is proposed to have greater utility for experts, this may be related to levels of self-efficacy. For example, Bandura and Cervone (1986) suggest that high levels of self-efficacy held by experts, when paired with high levels of discontent hold the greatest levels of motivation to address perceived discrepancies. A discrepancy bias, also termed a negative feedback loop, is proposed to act as a regulatory motivating force in the workplace (Lord et al., 2010). In HE, it is suggested that self-evaluation, in particular, a sense of evaluative dissatisfaction creates a motivating force in considering feedback and future performance (Hart & Mueller, 2014). In summary, it seems that productive engagement with feedback that fosters a sense of anxiety can be effective. However, learner willingness to engage in the most effective manner may rely on confidence in their abilities and implicit beliefs associated with tasks.

Even if learners acknowledge the utility of feedback, managing barriers may be no easy task (Forsythe & Johnson, 2017). Winstone, Nash, Rowntree and colleagues (2017) indicate four main barriers to receiving

feedback well. Barriers relate to awareness, with learners reporting limited cognitive representations, and understanding of how to approach feedback; cognisance, refers to awareness of strategies and opportunities that support implementation of feedback; agency, relating to low levels of empowerment to enact change; and volition, speaking to lack of motivation and openness. Relationships between the sender and receiver are also suggested to be underpinned by evaluations of trust and credibility (Boudrias, Bernaud, & Plunier, 2014; Stone & Heen, 2015).

Neither party is said to understand who owns feedback, and neither are satisfied with it (Evans, 2013; Hughes, 2011). Compounding a lack of understanding, contextual and structural barriers have been suggested to provide a challenge to feedback use in HE (Henderson et al., 2019). It has been suggested that modelling feedback response by instructors could be enlightening for learners, particularly where there are structural barriers, such as learner remoteness from teachers (Carless & Boud, 2018). Associated with this challenge, characteristics of the feedback message and contextual factors associated with how these are transmitted by the sender and absorbed by the recipient may also act as enablers or disablers. Amongst others, these interpersonal perspectives are reported to lead to differential patterns in perceptions of confidence, competence, motivation and effort which may have downstream effects on performance (Pitt & Norton, 2017). Therefore, fostering an environment that encourages positive dialogue, is indicated as a pillar of good feedback practice (Nicol & Macfarlane-Dick, 2006). Feedback that that provides appropriate levels of challenge is endorsed by learners (Forsythe & Jellicoe, 2018; Winstone et al., 2016). A greater understanding of the mechanisms that support learners and that lead to feedback being integrated would appear to be important.

Developing this idea, Boudrias and colleagues (2014) developed a feedback integration measure for use in the occupational domain. This tool, based on earlier research (see for example Kudisch, 1996), examined candidates integration of feedback following individual psychological assessment at assessment centres. Boudrias and colleagues proposed

hypothetical causal paths predicting changes in behaviour and actions taken in response to feedback. Paths suggested that message valence and face validity predicted acceptance of feedback, and that source credibility and challenge interventions predicted greater awareness from feedback. Both acceptance and awareness were postulated as independent predictors of motivational intentions. Finally, motives were suggested to predict behavioural changes and developmental actions when responding to feedback. One hundred and seventy-eight observations were taken from 97 candidates, tested on two occasions separated by a three-month interval. Boudrias and colleagues' final model demonstrated excellent fit to the data, nevertheless it differed from their hypothesised approach. No significant path from feedback acceptance was found in relations to greater endorsement of motivational intentions. The authors included two separate paths not initially hypothesised, those between predictors assessment face validity and source credibility, in terms of the criterion variable motivational intentions. The findings indicated that the role of awareness and its direct and indirect antecedents had greater salience in terms of motivational intentions. In turn, greater awareness is proposed to lead to a desire to act. Motivational intentions demonstrated greater predictive utility in terms of behavioural change, with a weaker association to developmental actions in response to feedback. This pattern of results was proposed by Boudrias and colleagues (2014) to suggest that greater autonomy is held by candidates in changing behaviours, where undertaking developmental activities may require a suitable development opportunity to become available. This was framed by authors as being consistent with Ajzen's Theory of Planned Behaviour (1996).

Limitations were noted around the self-report nature of the instrument and low reliability relating to valence of the message. It is worth noting also that inaccurate estimates may be possible as a function of the small sample used in this investigation (n = 97). Anywhere between 5 (Bentler & Chou, 1987) and 20 (Tanaka, 1987) observations for each free parameter is indicated. Kenny (2015) also suggests that a sample size of 200 is considered optimal. With these recommendations in mind, the study under

consideration employed somewhere between one half and one quarter of the optimal sample size required given the number of free parameters in the model of 38. Boudrias and colleagues (2014) did not examine the latent factor structure, as a result of sample size concerns. Support for the reliability of the factors drew on analysis of Cronbach's alpha coefficients. It has been suggested that over-reliance on such metrics, particularly when refinements are made to measures may be inadequate to provide evidence of construct validity (Flake & Fried, 2019; Flake, Pek, & Hehman, 2017). Taken together, the evidence discussed suggests that there is a case, to further examine the factors structure of Boudrias and colleagues measure and its application to theory.

Boudrias and colleagues findings are interesting from a HE perspective as similar learner evaluations are necessary integration of feedback for development. As a result, examining the structure of feedback integration, albeit noting the limitations of the measure, may lead to greater understanding of assessments made by learners and their ability to absorb useful messages from the learning environment. Specific feedback that leads to greater awareness is indicated within the occupational realm to support evaluations that motivate and guide developmental striving (S. J. Ashford & De Stobbeleir, 2013). Theoretical frameworks of feedback integration and recipience in HE learners have recently emerged (see for example Nicol & Macfarlane-Dick, 2006; Winstone, Nash, Parker, et al., 2017) however, understanding in relation to feedback integration in HE is nevertheless under-represented in research. Furthering understanding in by developing measurement tools will also further scientific knowledge in self-regulation during learning in HE (Panadero et al., 2017).

Behavioural endorsement of measures of feedback integration should provide utility as a mechanism for understanding whether students are prepared to make the marginal, or incremental, learning gains that are required for progression (Winstone & Carless, 2019b, 2019a). Refinements to the original measure would be necessary to ensure its usefulness in undergraduate populations. Such a measure would further understanding of

the self-awareness element of the feedback integration model proposed by Winstone and colleagues (2017). Considering factors associated with feedback integration alongside the goal setting and volitional engagement aspects of the model would appear to be sensible. This idea has been supported within the occupational domain. For example, the crucial role of goal setting and feedback in goal revision processes has been noted (Ilies & Judge, 2005), and has been suggested to be mediated by levels of self-efficacy (VandeWalle, Cron, & Slocum Jr, 2001). This latter evidence draws on an achievement goal theory perspective on motivation. Both factors are provided for in the preparatory phases of self-regulated learning (Panadero, 2017; Zimmerman, 2000). Taking the lead from the evidence discussed and recipience models of feedback integration (Winstone, Nash, Parker, et al., 2017), to explore the notion of self-regulated gains in learning, the motivational power of goal setting and achievement goal theory, including goal orientations and, perhaps mindsets, are indicated. These non-intellective constructs are perhaps underexplored in undergraduate populations and may lack specificity and adequate theoretical application. Such instruments, if supported and endorsed appropriately by learners, may act as tools to diagnose learner levels of self-regulation. These tools would also appear to have utility in intervening in self-regulated learning approaches. This is particularly the case as undergraduate learners are suggested to find self-regulation challenging when they move towards greater independence (Zimmerman & Paulsen, 1995). Recent indications support the notion that self-regulatory skills are increasingly challenged by environmental distractions, compounding the earlier reported issues (Duckworth et al., 2019). Nevertheless, evidence from interventions that examine the perspectives under discussion are limited.

Panadero and colleagues (2018) propose that learners can develop evaluative judgements by being engaged in formative assessment that encourages self-regulated learning. In such a pedagogical approach, learners must understand how a piece of work sits within its context, develop the expertise that is necessary to understand the qualities and standards against which the work is being judged and how these relate to assessment

criteria. This proposal converges with Winstone and colleagues' (2017) SAGE model of feedback recipience. The SAGE model indicates to optimally engage in the feedback conversation, that learners must be versed in four instrumental processes. In the SAGE model, 'self-appraisal' (S) enables learners to understand and reflect on the deficits in knowledge, skills and attitudes they have in order that they can make gains in learning. 'Assessment literacy' (A), aligned with previous assertions, supposes to be optimally engaged in understanding and receiving feedback well, that learners can evaluate their performance in relation to assessment criteria and judge the required standards (see for example, O'Donovan et al., 2016). Following the previous processes, 'goal setting and self-regulation' (G) enables learners, to explicitly identify what is necessary and how they will remediate previous deficits to ensure gains in learning (see for example, Carless & Boud, 2018). Finally, 'engagement and motivation' (E) processes indicate that learners need to be in possession of necessary attitudes that enable engagement in a dialogue about feedback and development. This useful framework describes an applied approach which supports students to develop the self-regulated learning skills necessary to engage in receiving feedback well.

Despite the prominent role in the SAGE model, the relative dearth of evidence supporting the role of goal setting and action planning, in favour of processes and interventions supporting motivation and engagement is noted (Winstone, Nash, Parker, et al., 2017). This research focus may be due to the differences in expression of individual differences, such as self-efficacy (e.g. Fong & Krause, 2014) and goal orientations which are also central to models of self-regulation. Furthermore, action planning is also supported in Hattie and Timperley (2007) recommendations for feedback practice that references next steps (see also Brooks, Carroll, Gillies, & Hattie, 2019). Hughes (2011) however indicates that lack of alignment in teacher and learner goals adds to this confusing picture.

Whilst motivational forces may underpin one half of the equation in the preparatory phases, it is surprising that goal setting, whilst acknowledged as

a crucial process or skill, is largely neglected in research focusing on self-regulatory processes in HE (M. Richardson et al., 2012; Travers et al., 2015). Addressing these deficits in the foundational blocks of self-regulated learning are likely necessary if learners are to take on board developmental messages in their environment. As the aphorism, often attributed to Benjamin Franklin, suggests, it may be that *'failing to plan is planning to fail'*.

Whilst there has been a call to arms in relation to the role important supporting role of goal setting, this has largely gone unheeded (Nicol & Macfarlane-Dick, 2006; M. Richardson et al., 2012; Winstone, Nash, Rowntree, et al., 2017). However, if this omission is addressed, this understanding may contribute to the learner's ability to engage fully in learning in HE and enter the world of work with confidence. Addressing these ideas may be supported by engaging learners in understanding cognitive and behavioural aspects associated with goal setting. As a result, there has been a call to train learners in receiving feedback (Hughes, 2011; Winstone, Nash, Rowntree, et al., 2017). Interventions and toolkits have been developed for intervention purposes in HE (Winstone et al., 2019), aiming to develop in learners' short and long term strategies that add value in terms of learners' knowledge, skills and work ready attitudes (Carless, 2019). Although there is much discussion of these issues in the educational literature, Evans (2013) reports that much research is opportunistic, suffers from low power and makes unwarranted causal assumptions. In addition, as reported here, the processes and mechanisms that underpin goal setting in cementing improvement may not be clear. How these associations relate to the much-lauded agentic approach that supports the confidence to engage in development also lacks clarity. There are reasonably strong theoretical suggestions that they might, particularly in domains of functioning beyond HE.

Grades

Cognitive ability is a key determinant of future academic performance, and as a result, academic performance is often taken as a proxy for cognitive ability. However, as learners move through different academic stages the predictive power betrayed by measures of this ability diminishes as the ability pool narrows. Therefore, the ability to distinguish between those learners that will be successful and those who will struggle becomes more difficult. Objective grade outcomes have clear importance to undergraduate and employers, however, as an outcome they are an amalgam of ability and non-ability factors (Gagné & St Père, 2001) that may be expressed differently, leading to similar outcomes. Further, there are suggested linear increases in cognitive ability with exposure to education (Ritchie, Bates, & Deary, 2015). For this reason, and the resulting range restriction in the upper levels of the educational spectrum, it is suggested that considering relationships that operate in the predictive space to academic achievement, warrant investigation as an important and legitimate activity (Ackerman et al., 2011). Further, it is contended that measures of performance outcomes in HE may be poorly defined and as a result comparisons using such performance measures may lack utility (De Clercq et al., 2013). This suggestion is indirectly supported by Richardson and colleagues (2012) meta-analysis, which examines measures of entry performance in terms of HE performance outcomes, identifying heterogeneity of predictor effect in terms of outcome.

Instead, Cellar (2011) recommends a focus on the psychology of personal change and attaching greater significance to perspectives including self-efficacy and self-regulation. In so doing they suggest that it would be possible to further focus in on the micro successes associated with incremental improvement, as these mastery experiences are those that are suggested to enable greater persistence. The idea of understanding marginal gains has recently been supported by Winstone and Carless (2019a, 2019b). Whilst ability may open a door to opportunity (Tymon, 2013), and may indicate upper-bound performance, attitudes will determine typical and sustained performance (Ackerman et al., 2011). Grade outcomes are often

taken as a proxy of cognitive ability. Whether this proposition holds for prediction purposes may be subject to debate. Nevertheless, whilst employers value degree outcomes, they indicate that values and attitudes have greater importance, particularly those concerned with self-management and resilience (The Confederation of British Industry, 2016). The commodification of HE leads to a necessary, albeit, obvious and important focus on grade, focus on attitudes may therefore be of greater importance (Evans et al., 2018), particularly if learners are to graduate with those adaptive evaluative judgments that support them to manage the changing world of work (Joughin et al., 2018). However, key social cognitive variables that are thought to be related to performance both during learning and in the workplace, such as self-efficacy, are proposed to hold similar predictive utility to cognitive ability or prior performance (Klassen & Usher, 2010).

Employability

In a practical sense, evaluative judgements are proposed to support learner's longer-term career goals (Ajjawi et al., 2018). This proposal is supported by Lent and colleagues (2002) Social Cognitive Career Theory (SCCT) which suggests that the development of learner's regulatory beliefs is associated with their career choices. SCCT relates to the goals that they set for themselves, which are in turn related to the decisions that learners make. As indicated, skills associated with evaluative judgement and attitudes that underpin self-management and resilience; are those that employers prize (Ajjawi et al., 2018; The Confederation of British Industry, 2017).

Development of personal attributes associated with labour readiness and employability receive less attention than the acquisition of transferrable skills necessary to prepare graduates for the labour market. Such attributes necessary for employability include perceptions of control (Forsythe, 2017). Such attributes associated with employability may lead learners to greater levels of persistence, they may be more accepting of challenge, and are more willing to learn from feedback and those that demonstrate success in

the task environment (Bandura, 1997; Forsythe & Jellicoe, 2018; Forsythe & Johnson, 2017).

Such factors support undergraduate learners in managing uncertainties associated with entering the world of graduate employment. (Fugate, Kinicki, & Ashforth, 2004; Rothwell & Arnold, 2007). These adaptive perceptions associated with employability are reported to have benefits for graduates and employers alike (Deer, Gohn, & Kanaya, 2018; Jackson & Wilton, 2017). Research also supports the role of academic performance in learners' employability beliefs (Pinto & Ramalheira, 2017). At least in part, such beliefs may hold importance because the strategies necessary for successful academic outcomes complement those that enhance learner employability perceptions. Where self-efficacy and control perceptions are suggested to support academic outcomes (M. Richardson et al., 2012), they are also proposed to be related to career readiness (Deer et al., 2018; Zhou, Guan, Xin, Mak, & Deng, 2016). Undergraduate learners' personally held beliefs may therefore prove to have utility as an indicator of the development of these career ready attitudes (Rothwell, Herbert, & Rothwell, 2008).

Perceived teamwork competency

Graduate employers prize teamworking ability as an indicator of readiness to enter the workforce (Britton, Simper, Leger, & Stephenson, 2017). Graduate employers prize teamworking ability as an indicator of readiness to enter the workforce (Stevens & Campion, 1999). Effective quantitative and qualitative outcomes are indicated to result from teams that work together well as they adapt more flexibly to their environment (Aguado, Rico, Sánchez-Manzanares, & Salas, 2014). Given the multiplicity of factors associated with teamworking, it is no surprise that these attributes are prominent in empirical and graduate employability frameworks (Harvey, 2001; Tymon, 2013). Measuring teamwork competency has been reported to present a challenge in the employment domain (Aguado et al., 2014; Varela

& Mead, 2018). This is also challenging in undergraduates populations, not least because teamworking experiences may be limited. For example, in groupwork projects, undergraduate learners are suggested to focus on an assessment goal, rather than developing teamworking skills and the associated attitudinal factors (Chang & Brickman, 2018). Despite undergraduates limited experiences, such groupwork assessment approaches may foster changes in perceptions of teamwork competence. Measuring these shifts learner confidence judgements may prove a useful indicator of readiness to enter the workforce.

Decision Making

Deciding to take a course of action leads to an outcome. Yet the consequences associated with decisions can be aversive (Kahneman & Tversky, 1979, 1984; Tversky & Kahneman, 1981). Negotiating decisions under uncertain and complex conditions recruits problem-solving skills (Chemers, Hu, & Garcia, 2001), is indicated to be central to undergraduates abilities to think critically (Reid & Anderson, 2012). Negotiating such complex decisions is a fundamental graduate skill that demonstrates a learner's ability to exercise evaluative judgement (Ajjawi et al., 2018). Decision making processes may therefore provide a key indicator of the confidence learners hold in their ability to regulate themselves during learning and in twenty-first century workplaces (Lodge, Kennedy, & Hattie, 2018). These decision making evaluations should therefore be a key focus for educators. For example, attitudes and attributes associated with self-management are prized by employers (The Confederation of British Industry, 2016). Such decision making evaluations are supported by the judgements and associated actions taken during self-regulated task striving (Panadero & Broadbent, 2018).

A recent systematic review has supported the role of self-efficacy in both academic performance and learner decision making abilities. The transferable nature of regulatory beliefs in graduate careers was noted

(Manzano-Sanchez et al., 2018). Self-efficacy beliefs mediated the learners' response to the emotions associated with performance and the decisions learners make following feedback, following (Bandura, 1991) proposals. A large Chinese study investigated decision making through career exploration and career goal shifting in a large sample of undergraduate learners. Findings indicated that feedback received on progress, suitability and suggested improvements, were mediated by self-regulatory factors, such as self-efficacy, career related anxiety, and goal commitment in terms of career decisions made (S. Hu, Hood, & Creed, 2018). The results of the study suggested that negative feedback, for example on career goal suitability and required improvements, generated a higher level of engagement in goal shifting by prompting greater anxiety and lowering commitment to previous goals. However, negative feedback on goal progress resulted in a reduction in goal shifting and exploration. The associations reported were mediated via raised levels of commitment and lowering of self-efficacy respectively. These findings lend weight to the importance of regulatory processes, such as goal setting and feedback, in terms of learners abilities to regulate decision making approaches. These findings are supported by recent evidence which indicates that confidence judgements may be attenuated through regulatory processes associated with learning (Talsma, Schüz, & Norris, 2018). The impact on career decision making confidence in undergraduate learners and subsequent career pursuit intentions have also been related to reducing anxiety via positive feedback interventions (Deer et al., 2018). Controlling for baseline measures of work-related experience and confidence, self-efficacy predicted a large proportion of the variance in pursuit of career focused goals (Deer et al., 2018). However, differences in career decision making profiles have been identified in cross-cultural investigations, with greater desire to please and nurture social relationships impacting on decision making in collectivist cultures in a manner that is not experienced in individualistic cultures (Lihui Ye et al., 2018). Despite nuances in the approaches summarised here, evidence suggests that self-efficacy supports confident task-based performance and the decisions about the next steps to take. As a result, understanding attributes that contribute to the incremental gains in

learning may also be useful as an indicator of readiness to enter the workplace.

CHAPTER 3 – Research Aims

The literature reviewed in chapters one and two highlights a number of lines of enquiry. The research questions identified aim to facilitate a deeper understanding and investigate a network of knowledge, skills and attitudes central to self-regulated learning and thus gainful learning. As a primary concern, the current research programme focuses on the appraisal and performance phases of the self-regulated learning cycle. Answering the call of a number of researchers (see for example Evans et al., 2018; Hattie & Timperley, 2007; Winstone et al., 2019; Winstone, Nash, Parker, et al., 2017) the current research programme seeks to bolster understanding in relation to the role of goal setting and how associated processes relate to integration of feedback. The investigation will also seek to examine supporting non-intellective perspectives, including self-efficacy and those from achievement goal theory. Whilst such factors appear to hold compelling explanatory power, as previously discussed, these often suffer from ambiguities of theory and related measurement. Whilst clarifying theory per se is beyond the scope of the current investigation, additional support in terms of measurement may shed light on associations that underlie marginal self-regulatory gains (Winstone & Carless, 2019a, 2019b). Clarity in this area has been suggested as an important future direction in a recent review of research of self-regulated learning (Panadero, 2017). Specifically, the current research programme seeks to supplement the extant scientific knowledge in these areas by understanding how:

1. behaviourally anchored rating scales can be employed to measure cognitions and behaviours associated with:
   a. goal setting; and
   b. feedback.

   These measures aim to provide diagnostic tools that aid learner's evaluative judgement during appraisal of task performance, and support task preparations. To support this

understanding, measures relating to each aspect under investigation will be developed and confirmed;

2. behaviourally anchored rating scales associated with feedback and goal setting can be used during the appraisal and preparation phases of self-regulated learning to reinforce understanding of gainful learning. Here, the underexplored association between goal setting and self-efficacy will also be explored;

3. associations with achievement goal theory constructs operate, to understand how, and if, these support learner self-regulation in the manner proposed; and

4. aspects documented above, and associated with self-regulated learning, support learners proximal and distal outcomes. These outcomes include grades and work readiness, operationalised by decision making abilities, and perceptions of employability and teamworking abilities. The contribution of grade to decision making ability will also be considered. In addition, the contribution of goal setting, self-efficacy and mindset to grade and work readiness outcomes will be examined.

CHAPTER 4 – Predicting Gainful Learning in Higher Education: A goal orientation approach

Abstract

We present data that may not only provide direction to those who are interested in developing a measure of learning gain, but also provide a route for those wishing to directly enhance student performance through gainful learning. Richardson and colleagues (2012) found that student performance showed moderate correlations with only three self-regulatory variables academic self-efficacy, grade goal and effort regulation. We examine how student self-regulatory behaviours predict feedback engagement and behavioural change. Data provide converging evidence suggesting that mastery approach goal orientations, challenging interventions from feedback, and motivational intentions are essential personal constructs linked to behavioural change. These tentative findings support the suggestion that measures of gainful learning could be operationalised as 'self-reported behaviours that suggest the productive acquisition of beneficial skills, knowledge and attitudes through study and experience'. Evidence is also offered indicating that more research is necessary to understand the measurement of mindset.

Introduction

In Psychology, we typically observe human behaviour as a way of assessing unobservable psychological attributes such as intelligence, depression, ability or knowledge. In most cases, we identify patterns of observable behaviour that may represent the unobservable psychological attribute, state or processes. We strive to develop measurement tools purporting to tap into the unobservable psychological characteristics that we think may be reflected in measurable behaviour. This means that the first step in developing any new measurement tool is that the domain of interest needs to be thoroughly understood, as well as any measurement issues in sampling that the construct may engender. It is from this approach that we examine the utility in the measurement of learning gains. The HEFCE (2017) operationalisation of Learning Gain as "*the improvement in knowledge, skills, work-readiness and personal development made by students during their time spent in higher education"* is broad in concept but a useful starting point for debate and discussion. This is what we call in psychology 'scale dimensionality', and this dimensionality will ultimately reflect the number and nature of the variables that any measure of learning gain will assess, but also the extent to which it is a useful measure by which to predict learning gain in future cohorts.

Measure what you value

One place to start with learning gains would be to examine what students value from their learning. Asking students and academics what their self-identified values are related to learning gain perhaps encourages breadth, authenticity and a critical personal construct facet to the process (Kelly, 1955). However, some values are more generally accepted in the mainstream as normal or important and will therefore obtain higher evaluations; some things are just easier to say yes to. For example, when

asking students to identify dimensions of their degree that were of value to them, an item such as 'critical evaluation' would likely emerge as highly important because students receive regular feedback on this dimension and therefore it is deemed to be of value. The terminology is very available to the student lexicon and because grades are associated with the term it has significant positive valence. This bias in psychology is known as the availability heuristic and explains how humans have a propensity to rely on examples that come immediately to mind when evaluating topics, constructs or making decisions. Asking students and academics what they value perhaps adds some authenticity to the measurement process, but because people rely on mental shortcuts (Ajzen, 1996; Fishbein & Ajzen, 1975; Kahneman & Tversky, 1979, 1984; Tversky & Kahneman, 1974), such information is not necessarily a good place to start with measurement development. Even if those insights are critical and insightful, some items are clearly more powerful and valuable than others (thus ipsative or most preferred) and a measurement tool constructed on those principles could drown out the variance of other important factors.

Grade point average (GPA) is often considered to be the clearest indicator of student success and is valued by students, academics and employers. The extent to which GPA is a useful barometer for students advancing learning is, however, debatable. Recent systematic reviews show the range of effects of GPA as indicators of performance vary from small (M. Richardson et al., 2012) to moderate (Schneider & Preckel, 2017). However, derived prior performance is suggested to aid future performance in a reciprocal way because it draws on knowledge (prior achievement and intelligence) and strategies (self-efficacy and goal directed use of learning strategies) (Schneider & Preckel, 2017). For example, in England and Wales A-level grades operationalise prior performance and are considered a proxy for cognitive ability, however, Richardson and colleagues found small weighted average correlations from a limited number of studies examining the association between A level grades ($r = .25$), measures of general intelligence ($r = .20$), and GPA (M. Richardson et al., 2012). This low-level association appears to be attributed to range restriction which attenuates the

predictive utility of measures of cognitive ability (Jensen, 1980; Poropat, 2009). These meta-analytic findings suggest that traditional measures indicating students' cognitive ability account for 25% of performance variation, however, up to three-quarters of the variation in performance remains unexplained.

Despite the wealth of empirical testing that has been devoted to understanding graduate performance, only a few variables seem to be reasonable predictors of academic performance. Demographic and psychosocial variables are at best small predictors of student performance and scores on secondary education standardised tests or A-levels are at best moderate predictors of tertiary academic performance (M. Richardson et al., 2012). The non-intellective constructs that Richardson et al., found that predicted GPA (modestly), were self-efficacy (one's belief in one's ability to succeed in specific situations or accomplish a task), effort regulation and grade goal.

Self-regulation: goal orientations, mindset and academic performance

Using GPA to set distal performance goals may present too many self-regulatory challenges to be efficacious in the long term (Bandura, 2013). However, goal orientation in the right combination may tap individual and situational mechanisms of motivation and self-regulation leading to achievement. Goal orientation is characterised by two fundamental approaches. Mastery orientation focuses on demonstrating competence and is traditionally associated with adaptive approaches. The less adaptive performance orientation focuses on demonstrating ability which exceeds those of peers or expected standards of performance (Elliot & Harackiewicz, 1996; Payne et al., 2007).

Experimental studies (Komarraju & Nadler, 2013; Morisano et al., 2010) and meta-analyses over the past seven years, provide compelling evidence that specific goal orientations are related to academic performance

(Huang, 2012; Payne et al., 2007). In some cases, these indicate that goal orientations extend even beyond that of personality and intelligence (Steinmayr, Bipp, & Spinath, 2011). Richardson and colleagues (2012) report relatively low-level associations between mastery and performance orientations and GPA. However, the theoretical underpinning and subsequent measurement of goal orientations may not have reached a point of stability (Payne et al., 2007). This may, in turn, impact the performance of the construct over time.

The ambiguous predictive validity of performance orientation led to revisions based on valence (Elliot & Harackiewicz, 1996). The revision speaks either to the motivation to approach a desired level of performance, described as a performance approach orientation, or avoid performing poorly, resulting in a performance avoidance orientation. Mastery orientation has been subsequently revised to mirror this approach, with the 2 × 2 goal orientation framework, with mastery and performance orientations associated with both approach and avoidance valances, is proposed (Elliot & McGregor, 2001). Although evidence supporting the four possible goal orientations is equivocal, for mastery avoidance and performance approach, endorsing a combination of high mastery approach and low performance avoidance is postulated to predict higher levels of performance (Payne et al., 2007).

Supporting this, mindset theory is suggested to precede goal orientation. Mindset theory is underpinned by two conceptually related but distinct factors, growth and fixed mindset. Researchers propose these are related to adaptive or maladaptive motivations, strategy use and subsequent behavioural trajectories (Dweck, 2017b). Growth perspectives are typically associated with adaptive self-regulatory behaviours (Robins & Pals, 2002). These include intrinsic motivations towards learning and mastery of task, possessing higher levels of self-efficacy and setting achievement goals (Dinger & Dickhäuser, 2013; Furnham, 2014; Zhao, Zhang, & Vance, 2013). Conversely, it is suggested that those endorsing fixed perspectives regulate behaviours less well, select strategies associated with avoidance, helplessness and self-handicapping. Those with fixed mindsets are less

likely to take appropriate remedial action when faced with feedback following failure (Forsythe & Johnson, 2017; Rickert, Meras, & Witkow, 2014; Zhao et al., 2013).

Longitudinal research in middle school children supports the idea that adaptive growth mindsets are related to performance improvements (Blackwell et al., 2007). However, recent meta-analytic evidence suggests low-level associations with performance and higher, but still moderate, relations with self-regulatory processes including goal setting, operating and monitoring (Burnette et al., 2013). Despite the expected behavioural patterns, research findings also indicate that growth perspectives may not contribute to performance where competence beliefs are high (Bodill & Roberts, 2013). This suggests that in groups of highly able students, such as in Higher Education, that growth mindset may be of limited use. A recent large cohort study in HE indicates that incremental beliefs are less strongly related to achievement than was reported by (Bahník & Vranka, 2017), however, mindset measured in this study used a two-item dichotomous scale, which may be a limitation.

Simple conceptualisation and measurement of mindset theory suggests the two belief factors as antipoles, however, more nuanced perspectives and measurement approaches appear to be emerging in the literature. In specific HE domains, it is postulated that individuals can endorse both mindsets concurrently and that neither remain stable over time (Dai & Cromley, 2014; Zuckerman et al., 2001). Although there is some support for a more nuanced perspective within HE samples this is rarely examined (W.-W. Chen & Wong, 2015; Tempelaar et al., 2015). As discussed previously, complex behavioural patterns are also seen in relation to effort attributions and goal orientations which are proposed as close associates of mindsets (Dupeyrat & Marine, 2001; Tempelaar et al., 2015). Taken together the evidence reviewed suggests that measurement of mindset may not, to this point, have captured the complexity of interacting beliefs, behaviours and strategies and their joint contribution to outcomes. This may go some way to explaining the low level of utility seen in the

literature for mindset. That said, whilst modest effects are reported, even modest effects may be meaningful to individual gains in learning.

A measure that can be acted upon

Focusing on the measurement of the various non-intellective factors thought to be important to performance is academically interesting but to what extent can the data be acted upon? Constructs such as mindset and self-efficacy, for example, are slowly wired from early childhood (Bandura, 1982, 1977). So, one could argue that developing a high impact pedagogical framework to increase gains in learning based on increasing efficacy, growth mindset or other psychosocial skills would not necessarily provide much utility in a typical three-year degree programme. Psychometrically then, clarifying the purpose of learning gain measurement is essential because poorly considered measurement systems come with unintended consequences (Gray, Micheli, & Pavlov, 2014) and people will work to the measure for better or worse.

We approach the examination of gainful learning with the priority of identifying what we can as academics proactively act upon. As such, we offer an extension of the HEFCE (2017) operational definition for the measurement of a 'gainful learning' as: 'reported behaviours that suggest the productive acquisition of beneficial skills, knowledge and attitudes through study and experience'. The development of a gainful learning evaluation tool which tracks student perceptions of changes in their behaviour could be encouraged academically through a theoretically driven toolkit that supports student self-regulated approaches that facilitates integration of feedback through goal setting. Together with effective pedagogies, encouraging receptive feedback behaviours should result in more positive behavioural change in students, however, such methodologies have not been rigorously and systematically researched to provide effective support for this approach (Winstone, Nash, Parker, et al., 2017).

Such an approach would drive the development of pedagogical frameworks based on performance management theories, such as the high-performance cycle, that have stood the test of time (Locke & Latham, 2013). It is suggested here that measuring student self-reported behavioural change could then become not only a tool for the evaluation of gainful learning across programmes of study but also a teaching philosophy that can be acted upon. Such an approach makes prediction possible and prediction is an imperative criterion for a psychological approach to learning gain. Prediction is valued over measurement description because it leads to a greater understanding of human behaviour. In this case, the encouragement of adaptive student approaches should result in more self-reported positive behavioural changes and development. Then learning gain scales developed on one cohort, should be able to predict the performance of other students in subsequent cohorts.

In pursuit of this, Forsythe and Johnson (2017) applied the Boudrias, Bernaud, and Plunier (2014) feedback model in the analysis of students' personal dispositions and self-reports of their post feedback behaviours. Generally, students fostered self-defensive and self-deceptive behaviours that fail to nurture remediation following feedback, and there was some evidence to support the arguments by Dweck and her colleagues that students who see their intelligence as a fixed entity are more likely to adopt these types of behaviours. This study reported offers preliminary data on a revision of the Boudrias et al. (2014) feedback measure for use in student populations. The Boudrias et al. (2014) measure was originally designed for use in industrial settings to evaluate the effectiveness of feedback procedures related to psychometric developmental review meetings, however there is some evidence that it could be usefully adopted in the student population to encourage and measure behavioural change in students (Forsythe & Johnson, 2017). The Boudrias et al. (2014) measure suggests nine dimensions of attitudes towards feedback. Four of these are 'process' characteristics associated with the delivery of the message. These include message valence, face validity, the credibility of the source delivering the message, in addition to whether the message provides an intervention

that is appropriately challenging. These lead in turn to cognitive appraisals in terms of feedback acceptance and greater awareness gained from feedback. Integrating these effectively leads to greater motivational intention and two active performance outcomes, behavioural changes and developmental activities. Integrating feedback through these mechanisms is suggested to support higher levels of task performance.

The objective of this study was to further test the validity of the Boudrias et al. (2014) measure for use in student evaluations and to determine the extent to which mindset and goal orientation predict positive changes in student self-reports of their behaviours. Such data could then lend support to our argument that learning gains could be measured through student self-reported changes in their behaviour in the spirit of what are described in psychology as Behaviourally Anchored Rating Scales (BARS). Such scales were developed in response to dissatisfaction with traditional self-report measures which are subjective and less able to directly measure target performance or behaviour dimensions. BARS have a particular advantage in determining and targeting what is needed to perform, rather than looking for examples of more general student characteristics such as self-efficacy or satisfaction. As in industry, academics could potentially use such measures to evaluate progress at modular and programme level and adapt their pedagogical approaches to support students in adapting behaviours that will challenge maladaptive behaviours and support greater leaps in personal performance. A secondary aim in this study was to examine the measurement approach, particularly in relation to the predictive utility of mindset, which has been the subject of much recent criticism (Visser, 2017 and others).

Method

<u>Participants and procedure</u>

One-hundred and sixty-three students were recruited from the second-year psychology undergraduate cohort from the University of Liverpool. Ages were commensurate with those expected at this academic stage ($M = 20.20$, ± 3.52). There was an unbalanced gender split with 88% of the participants being female. This study had the relevant University of Liverpool ethical approvals. Data were collected and collated through the online survey platform provider Qualtrics (2018) and to meet regulations regarding the storage of data, retained on European Union Servers.

<u>Design</u>

A cross-sectional correlational design was employed in the current study to examine the nature of the relationships between identified variables.

<u>Materials</u>

Two coefficients were used to assess the reliability of measures in the current study, Cronbach's α and Guttman's λ^6. Reports indicate that Guttman's λ^6 is superior to Cronbach's α (equivalent to Guttman's λ^3) when the factor under consideration is multifaceted, whilst Cronbach's α is superior to Guttman's remaining lower bounds of reliability when factors are unidimensional (Revelle, 2019).

The psychological assessment feedback questionnaire

A nine-factor measure of feedback integration proposed by Boudrias and colleagues (2014) was utilised in this study. Four 'process' characteristics associated with feedback were measured. Of these, message valence, is the extent to which the feedback message is positive or negative, with students responding more positively to the former; face validity, or

perceived legitimacy of the feedback message; source credibility, this speaks to the extent to which the deliverer of the message can be trusted; and challenge interventions, which may be targeted feedback that confronts students, in a constructive manner, prompting them to consider how to remedy their blind spots. Five 'action oriented' factors that relate to integration of feedback were also assessed. These relate to feedback acceptance, fundamentally whether the student agrees with the feedback after considering process characteristics; awareness from feedback, or the extent to which feedback enhances ones understanding of the performance and knowledge demonstrated; these lead in turn to motivational intentions, which is the extent to which one is prepared to act based on that information. Finally, two outcome measures indicate the extent to which students are likely to make behavioural changes and undertake developmental activities. A Likert scale using six anchor points strongly disagree (1) to strongly agree (6) was used by respondents. Internal consistency was assessed for each factor using Cronbach's α, all factors exceeded the cut off threshold ($\alpha = .70$) for reliability (ranging between $\alpha = .72$ - .87). Exploratory factor analysis (EFA) was performed using the Minimum Residual (minres) extraction method (Jöreskog, 2007), varimax rotation, eigenvalues above 1 and factor loadings above .40. This suggested the omission of awareness from feedback and combining two outcome variables, behavioural and developmental changes into a single factor.

2 × 2 Goal setting framework

The 2 × 2 framework (Elliot & McGregor, 2001) was designed specifically to assess achievement goals. The measure operates through independent competence dimensions; mastery-approach, performance-approach, mastery-avoidance and performance-avoidance. Those with a mastery-approach orientation seek to develop competence. Where those with a performance-approach orientation focus on achieving performance benchmarks; mastery-avoidants focus on avoiding task-based or intrapersonal competence, and those who have a performance-avoidant

focus on avoiding normative incompetence. The measure was revised and modified by Elliot and Murayama (2008) to improve the precision of the instrument and reports reliabilities (Cronbach's α) from .84 to .98 on each of the factors. A five-point Likert scale is used here with responses ranging from strongly disagree (1) to strongly agree (5). "My aim is to completely master the material presented in this class" is an example of a mastery approach goal. With the exception of the mastery approach, which demonstrates internal consistency slightly below the expected threshold (Cronbach's $\alpha =$ .65; Guttman's $\lambda^6 = .56$), all factors demonstrate reliabilities above .70 using Cronbach's α and Guttman's λ^6.

Mindset

The eight-item measure of mindset proposed by (Levy & Dweck, 1998) was employed in the current study. This measure has been used widely and (Hong et al., 1999) report this measure as having solid internal consistency in undergraduate students, this is mirrored in the current study (Cronbach's $\alpha = .91$; Guttman's $\lambda^6 = .93$). In this measure, four items speak to a fixed mindset with the remainder addressing growth mindset. Reversing of scores ensures that all items load on to a single factor. Mean score from this ipsative measure indicates endorsement of one of the two mindsets. A Likert scale with six anchor points strongly disagree (1) to strongly agree (6) are used in this measure. A high score on this scale indicates endorsement of a fixed mindset.

In addition, the Implicit Theories of Intelligence Scale (ITIS) measure of mindset was employed to examine differences between the two measurement approaches (Abd-El-Fattah & Yates, 2006). Two factors, each formed of seven items, measure fixed and malleable (growth) mindsets. High scores in each record endorsement of both types of mindset. To illustrate an item endorsing a fixed mindset suggests 'If I fail in a task, I question my intelligence'. A seven-point Likert response format 'strongly disagree' (1) to 'strongly agree' (7) is employed despite the original scale referencing four

anchoring points. Reliabilities were recorded for Egyptian and Australian samples respectively, all demonstrating good levels of internal consistency (Fixed: Cronbach's α = .83 and .78; and Growth: Cronbach's α = .75 and .76). In the original study, a significant low negative correlation ($r = -.33$) is mirrored in the current study $r = -.31$, $p < .001$. Internal consistency in the current study is acceptable for fixed mindset endorsement (Cronbach's α = .71; Guttman's λ^6 = .70), whereas subthreshold reliability was associated with growth mindset endorsement (Cronbach's α = .55; Guttman's λ^6 = .66). One item from the growth mindset subscale 'If you fail in a task, you still trust your intelligence' appeared to result in a lowered level of internal consistency.

Results

In this set of preliminary results, one feedback outcome: behavioural change and developmental action was regressed on feedback characteristics, mindset and achievement goal orientations. Within the model proposed by Boudrias and colleagues, behavioural change and developmental action are postulated as two separate outcomes. However, preliminary data analysis indicated that these outcomes were highly correlated, this was supported by EFA which suggested collapsing these into one superordinate outcome. As a result, the outcome was collapsed into one item after removal of one question, however, the remaining predictors were retained in the regression model. Table 4.1 presents descriptive statistics for, and correlations between, each of the factors examined. In addition, assumptions of multi-collinearity were met.

Table 4.1

Correlation Matrix Feedback Message Characteristics, Goal Orientations and Mindset

	Mean (±)	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Message valence	2.81 (±0.83)	.16*	.33***	.10	.27**	.08	.18*	.08	.03	.04	.03	-.05	-.22**
2. Face Validity	3.59 (±0.87)		.32***	.28***	.32***	.14	.16*	.11	.19*	.17*	.04	-.01	-.17*
3. Source Credibility	4.07 (±0.62)			.61***	.36***	.28***	.42***	.22**	.18*	.24**	.04	-.02	-.22**
4. Challenge Interventions	3.91 (±0.79)				.14	.45***	.48***	.35***	.21**	.28***	.10	.02	-.04
5. Feedback Acceptance	3.72 (±0.90)					.05	.14	.05	.12	-.02	-.01	.03	-.13
6. Awareness	4.52 (±0.69)						.41***	.35***	.16*	.04	.05	-.08	-.08
7. Motivational Intentions	4.65 (±0.74)							.51***	.42***	.24**	.20*	.02	-.27**
8. Beh. Change and Devt. Activity	3.75 (±0.84)								.43***	.13	.15	-.03	-.29***
9. Mastery Approach	4.04 (±0.70)									.34***	.21**	-.01**	-.16
10. Mastery Avoidance	3.45 (±0.86)										.19	.30***	-.07
11. Performance Approach	3.91 (±0.81)											.65***	-.03
12. Performance Avoidance	3.92 (±0.83)												.09
13. Mindset	2.81 (±0.91)												-

$* p < .05; ** p < .01; *** p < .001$

The combination of message characteristics, motivational intentions and achievement goal orientations explained 36% of the variance in the collapsed outcome variable 'behavioural change and developmental activity', $\Delta R^2 = 0.36$, $F (11,130) = 6.82$, $p < .001$. Students' willingness to make active changes resulting from feedback were positively predicted by motivational intentions ($\beta = 0.30$, $p < .001$), mastery approach goal orientations ($\beta = 0.29$, $p < .001$) and challenge interventions ($\beta = 0.20$, $p = .048$) with higher endorsement of each predicting a greater likelihood of taking positive incremental steps because of feedback.

Behavioural change and developmental activity was not associated with other feedback characteristics including valence of the message ($\beta = 0.06$, $p = .456$), face validity ($\beta = -0.04$, $p = .630$), acceptance of feedback ($\beta = -0.06$, $p = .423$) or source credibility ($\beta = -0.12$, $p = .246$). Nor was it associated with the endorsement of mindsets ($\beta = -0.15$, $p = .053$), with mastery avoidance ($\beta = -0.06$, $p = .490$), performance avoidance ($\beta = -0.03$, $p = .741$) or performance approach ($\beta = 0.03$, $p = .742$) goal orientations.

Measuring mindset, two mindset scales were employed, the first betraying the greater nuance that appears to have emerged in the literature where both types of mindset can be held concurrently and endorsed at different levels. The second mindset measure aligns to the simple, ipsative, conceptualisation of mindset which forces a choice, proposing endorsement of one or other of the mindset beliefs along a continuum. An interesting pattern of findings emerged within these preliminary results. The ipsative measure of mindset held a highly significant yet moderate relationship with outcomes, see Table 4.1. However, this relationship attenuated somewhat when entered into the regression model with a borderline significant association reported. Interestingly concurrent measures held lower, albeit significant associations, with making adaptive changes (Fixed $r = -.17$, $p = .031$; Growth $r = .22$, $p = .006$). Neither of these concurrent approaches

approached a significant association in the regression model. Endorsement of the two types of mindset measurement approach by the same participants was further explored in Figure 4.1.
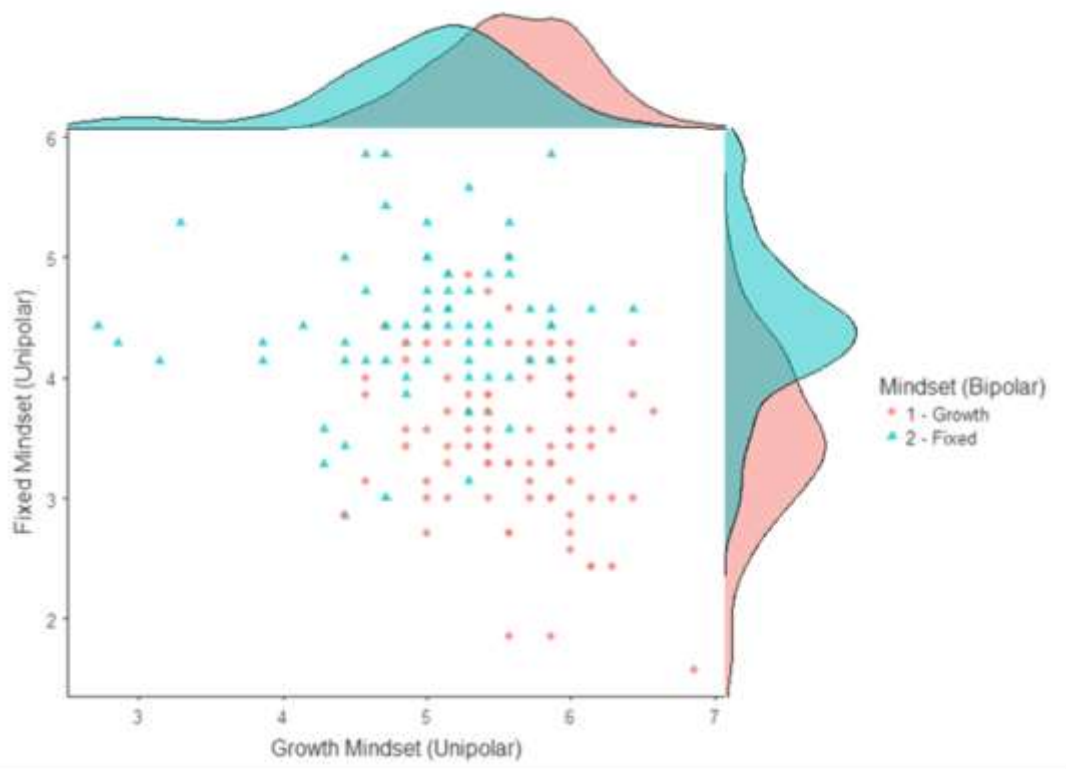
Figure 4.1 Scatterplot indicating within participant endorsement of concurrent and ipsative mindsets

The scatterplot at Figure 4.1 identifies on the x and y axes observations reported for concurrent measures of fixed and growth mindset. In addition, participant's observations on the ipsative measure are then colour-mapped on to observed responses. For this measure, a single cut point was made at the midpoint of participant scores, with scores attributed to respective fixed and growth mindsets. Within the two sets of measures clear patterns emerge. Smaller clusters of participants clearly endorse one of two mindsets. However, this also indicates a large central cluster with a more nuanced endorsement of the two approaches. This may counter the commonly received simple conceptualisation of mindset theory. In turn, this may go some way towards explaining its low level of predictive utility.

Discussion

These preliminary results support the hypothesis that a crucible of adaptive, action oriented strategies are associated with making behavioural and developmental changes resulting from feedback. Specifically, mastery approach goal orientations and 'action focused' feedback characteristics, including motivational intentions and challenge interventions, were all associated with this adaptive approach. The remaining 'process focused' feedback characteristics including valence, face validity, acceptance and source credibility were not associated with making change following feedback, nor were any of the other goal orientations. Despite being a diagnostic hallmark of mindset theory, none of these process-focused theoretical approaches was associated with making beneficial changes.

As suggested by the literature, approach goal orientations focused on mastery of task, rather than on a specific performance outcome per se, are positively associated with making changes that persist (Martin & Elliot, 2016). In this way, these adaptive strategies are endorsed by those who relish the challenge that mastering a learning outcome offers. Mastery experiences are reciprocally related to future mastery approaches and are thought to underpin self-regulatory models of learning (Zimmerman, 1998). Therefore, it is unsurprising that those who relish mastery and make behavioural and developmental changes also possess higher levels of motivational intention. Mastery experiences are fundamental to efficacious behaviours and as suggested by Richardson et al. (2012), interventions that promote goal setting may be the route to increasing these most crucial behaviours. These results support the spirit of a recent systematic review of feedback recipience (Winstone, Nash, Parker, et al., 2017) and diverge in that only actionable strategies around goals, mindset and motivational intentions are systematically supported in making behavioural change where process-related feedback characteristics are not.

These results also partially replicates Forsythe and Johnson's (2017) finding that motivational intentions were significantly and positively associated with the making of behavioural and developmental changes after receiving feedback. Interestingly, sample characteristics meant that this finding related only to those participants endorsing a fixed mindset. In contrast, for the study reported here, those that positively embraced challenging interventions were also more likely to change behaviour and seek out approaches that foster development. Further, those embracing this challenge may be more willing to manage the incongruence that may result from feedback to make a constructive realignment on the route to future performances. This is therefore aligned with the two previous complementary approaches, mastery approach goals and motivational intentions. However, within the current sample, unexpectedly this is not related to endorsement of fixed or growth mindsets.

Two measures of mindset were taken in the current study. The preliminary findings indicate that neither approach to measuring mindset has utility as a predictor of action following feedback. This is despite research suggesting those endorsing a growth perspective embrace challenge and take heed of useful feedback (Dweck, 2017b). This perspective has not emerged in these preliminary results. It may also be that that moderating factors, for example, competence beliefs as suggested by Bodill and Roberts (2013) attenuate the direct effect of mindset. Although not directly measured here, participants of the current study have successfully managed their way through four semesters of an undergraduate programme in a selective tertiary setting and competence beliefs may as a result be high. The mixed results for mindset here may be particular to the sample and in other samples or with a larger pool of participants, different results may emerge reinforcing the need for further replication studies in the area. However, these tentative findings may support the suggestion of greater nuance in measurement of mindset than the approaches that appear to prevail allow for (Tempelaar et al., 2015). This greater nuance appears to be betrayed in the contemporary narrative on mindset (Dweck, 2017b).

Limitations and future research directions

As with any study, the research here is limited. It is based on preliminary results and may benefit from greater statistical power that a larger sample would afford, using structural equation modelling. As is tentatively indicated above, mindset measurement may not have reached a point of stability, or utility, that allows mindset to predict behavioural outcomes with the simplicity that appears to be inherent in the narrative on mindset, as has previously been indicated (Tempelaar et al., 2015). The growth mindset factor from the ITIS measure exhibited subthreshold reliability, as a result, caution should be exercised when interpreting these results. Finally, whilst there has been some attempt made here to validate the Boudrias et al. (2014) model of feedback integration in undergraduates, only one other study has examined this in these populations that we are aware of (Forsythe & Johnson, 2017). As a result, longitudinal research examining these factors and psychometric evaluation of measurement approaches piloted here are strongly recommended. In summary, this study found a combination of actionable strategies to be tentatively associated with positive remediation following feedback. These include mastery approach orientation, and action focused feedback characteristics comprising challenge interventions and motivational intentions. Whilst these results are not surprising, the mixed results in relation to mindset were unexpected, given what is suggested about mindset elsewhere (Dweck, 2017b; Tempelaar et al., 2015), indicating that more research is necessary to understand measurement and prediction issues in relation to mindset. Nevertheless, the results do suggest other factors that may be utilised either by practitioners in interventions or by students in their approach to receiving feedback that encourages incremental learning gain.

Conclusion

A goal orientation approach has a sound pedigree for improving human performance and we should build on such knowledge to develop

pedagogical frameworks that support students to develop a mastery approach to their learning. We argue that the key to measuring learning gains is to evaluate student progress through the measurement of self-reported positive changes in student behaviour, rather than incremental changes in their grades. This strategy is likely to have greater effect in producing incremental gainful learning behaviours than focusing on the influence of non-intellective factors such as mindset and self-efficacy which appear to be difficult to operationalise and suffer from poor predictive validity. However, it is recognised that this strategy may reciprocally influence these non-intellective factors.

To meet this objective, scales that tap into student behaviour in the spirit of what are described as BARS should be further developed and evaluated. Such scales were developed some time ago in industry in response to dissatisfaction with subjective measures which are less able to directly measure or target performance. Measurement based on behaviour dimensions has the advantage in determining and targeting what is needed to perform, rather than looking, for example, at more general student characteristics such as self-efficacy or satisfaction. The strength of the Boudrias et al. measure is the breadth of dimensions it seeks to evaluate with the goal of predicting behavioural change and the seeking of developmental activities, however, simply measuring changes in behaviours needs to be supported through a pedagogical framework which supports productive change. Educators would require support in developing such a framework through, for example, a toolkit with accompanying training that fosters understanding of the cognitions and behaviours allied to goal setting. By applying a revised definition of learning gains as 'behaviours that suggest the productive acquisition of beneficial skills, knowledge and attitudes through study and experience', academic programmes can be evaluated by the extent to which they are able to afford the desired behaviour change in their students. Such a measure has more utility because it becomes possible to use data from one cohort to predict the future behaviour of other students, and shifting focus in this way drives pedagogical advances by engaging

academics to design frameworks to better help support positive behavioural change in students driven by a sound theoretical framework.

Developing a measurement system which targets behaviour has stronger theoretical and practical application to students and academics. Traditional predictors may diagnose what a student may achieve and non-intellective strategies may even have greater utility in predicting what a student will go on to achieve (M. Richardson et al., 2012; Schneider & Preckel, 2017), however, both may be very difficult for academics to effectively measure and influence. Positive changes in student behaviours brought about through a goal mastery pedagogy could present an opportunity for learning gain measurement because we know that such behaviours are linked with the productive acquisition of skills, knowledge and attitudes. However, measuring changes in feedback-triggered behaviours needs to be supported through a pedagogical framework which supports productive change.

CHAPTER 5 – The acquisition of productive knowledge and
attitudes through learning

Abstract

A two-part investigation examined whether student confidence levels and performance outcomes predicted accurate decision making on complex tasks, and whether productive knowledge, skills and behaviours predicted performance and employability perceptions. Results indicate that students make more accurate decisions than the general population, but not as a function of confidence or measures of performance. A nuanced set of relationships demonstrate that goal setting, academic self-efficacy and mindsets were related to student's perceptions of employability and teamwork competence. Non-intellective factors were unrelated to GPA, with one exception of employability perceptions, which was a weak negative associate. These results indicate that student's self-endorsed goal setting abilities, academic self-efficacy and adaptive mindsets may be beneficial to student perceptions of work-readiness. Further, it is suggested that changes over time in the productive factors identified here may provide measures of gainful learning having utility beyond GPA as an outcome measure. Practical implications are discussed.

Introduction

In the United Kingdom, in 2016-17, 71% of graduates achieved an upper-second class degree or higher in their first degree (Higher Education Statistics Agency, 2018), equivalent to a lower bound grade point average (GPA) of 3.3 (Fulbright Commission, 2019). This narrowed range of performance outcomes makes the employers' task of differentiating between graduates based on GPA in a competitive labour market increasingly difficult. The real-world impact is that the extent to which students gain and sustain employment is no longer determined by the outcome of their degree category, rather it is the way in which they can deploy their knowledge, skills, and attributes in the labour market (Forsythe, 2017).   This means that students need increased support to be able to provide evidence of work-related competencies. Supporting this, developing such competency has been a focus of HEFCE's (2017) learning gains project. As a result, Universities have been working to provide evidence that graduates have the necessary knowledge, skills and attitudes that prepare them for graduate employment (Kandiko Howson, 2019).

At the same time, managing the psychosocial development of students at University has become more challenging. A good degree outcome is an expectation, and soft skills, including self-management and positive attitudes are increasingly prized alongside, or in favour of, traditional factors such as grades or domain knowledge (The Confederation of British Industry, 2016; Tymon, 2013). At a high-level, stakeholders may take different perspectives on the purpose of developing employability in undergraduate populations, however, pragmatically, there appears to be a common understanding of the personality attributes, skills, and attitudes that most benefit graduate entrants into the labour market (Tymon, 2013). Moreover, the benefits derived from increasing employability attributes also benefit programmes of study. In a labour market context, developing and demonstrating effective self-regulatory skills is now more important than ever (Ajjawi et al., 2018). From this perspective, learning gain is defined as the "*self-reported behaviours that suggest the productive acquisition of beneficial*

skills, knowledge and attitudes through study and experience" (Forsythe & Jellicoe, 2018, p. 86).

<u>Valued outcomes</u>

The measurement of performance indicators

The factors predicting performance in higher education are well known. Self-regulatory factors such as self-efficacy, grade goals, and effort regulation are amongst that strongest associates of GPA (M. Richardson et al., 2012; Schneider & Preckel, 2017). These factors are firmly embedded in theories of self-regulated learning and models of high-level performance (Locke & Latham, 1990a; Panadero, 2017; Zimmerman & Campillo, 2003; Zimmerman & Moylan, 2009). What is not always clear is whether GPA, of itself, is a good predictor of employability outcomes, for example, employers indicate greater emphasis on graduate attributes (The Confederation of British Industry, 2016). In addition, research suggests that students do not always see the direct link between performance outcomes and employability, although note that a successful outcome is an essential entry point to the workforce (Tymon, 2013). However, Pinto and Ramalheira (2017) suggest that if employment readiness activities are held constant, academic performance has greater importance in predicting job suitability. These problems are further compounded by the way in which employability outcomes are traditionally measured.

Perceived employability

In the UK HE sector, developing personal characteristics associated with success in graduate employment receives less attention than skills development for the same purpose (Forsythe, 2017). Yet it is known that when learners hold agentic beliefs, persistent engagement is encouraged and chances of success are optimised (Bandura, 2006). This may be because those learners high in agentic beliefs seek to learn from messages

in the learning environment, such as feedback, which for those with lower levels of agency might act as a barrier to success (Forsythe & Jellicoe, 2018; Winstone, Nash, Rowntree, et al., 2017). These perspectives are as relevant to the world of graduate employment as they are to the learning domain (Forsythe, 2017).

Multidimensional psychosocial factors underpin perceptions of employability. In turn, these psychosocial factors are suggested to assist graduates in proactively managing the uncertainty associated with entering the employment domain (Fugate et al., 2004; Rothwell & Arnold, 2007). These same adaptive perceptions are reported to have benefits for graduates and employers alike (Deer et al., 2018; Jackson & Wilton, 2017). Research also supports the role of academic performance in learners employability beliefs (Pinto & Ramalheira, 2017). At least in part, this may be because the strategies necessary for successful academic outcomes complement those that enhance learner employability perceptions. For example, perceptions of control and self-efficacy are suggested to be associated with career readiness (Deer et al., 2018; Zhou et al., 2016) and academic outcomes (M. Richardson et al., 2012). Employability perceptions may therefore provide an effective indication acquisition of productive attitudes through learning (Rothwell et al., 2008).

Perceived teamwork competency

Teamworking ability is a highly-valued indicator of employment readiness in the modern, team-oriented workforce (Britton et al., 2017). Stevens and Campion (1999) report that employers value team based skills that include conflict and problems resolution which necessitate communication skills, in addition to self-management skills that include planning and setting goals, task co-ordination processes that support performance management in teams. Teams that work together effectively are suggested to adapt more effectively to their environment, create more and produce effective outcomes (Aguado et al., 2014). Taking this Gestalt

perspective, it is not surprising that teamworking is central to many empirical and employer graduate employability frameworks (Harvey, 2001; Tymon, 2013). Multiple authors have reported problems in measuring perceptions of teamwork competency (Aguado et al., 2014; Varela & Mead, 2018). In group projects, which likely accounts for the sum of learner teamwork experience, the focus on completing the product of the assessment, rather than the regulatory forces that are involved with teamworking may be foremost in the minds of learners (Chang & Brickman, 2018). Nevertheless, exposure to such opportunities may change self-reported perceptions of teamwork competence. In turn, these perceptions may provide an indication of learner held confidence to enter the workforce.

Self-regulatory predictors

Decision making

Developing the ability to evaluate and judge the best course of action is a key graduate skill and continuing professional development (Ajjawi et al., 2018). Making such decisions often under uncertainty, whilst using problem-solving skills (Chemers et al., 2001), are suggested to be integral to critical thinking abilities (Reid & Anderson, 2012). However, when making such decisions the consequences, particularly during uncertainty, can be aversive (Kahneman & Tversky, 1979, 1984; Tversky & Kahneman, 1981). Learning how to critically evaluate evidence and confidently judge the best course of action is necessary for success. For this reason, such judgements are suggested as a major educational outcome, and these judgements are thought to be informed by self-regulated approaches developed during learning (Panadero & Broadbent, 2018). Recent research also indicates that decision-making may be associated with perceptions of employability, however, findings from an Australian sample and did not replicate in a UK sample (Jackson & Wilton, 2017). This decision making perspective relates explicitly to employability domain decision learning, as identified in the DOTS model of employability (Watts, 2006). DOTS refer to Decision making,

Opportunity awareness, Transition learning and Self-awareness. Application of the DOTS model in its widest sense, making informed decisions and being accountable for them is undoubtedly an important undergraduate skill. Deer and colleagues (2018) also recently examined student confidence in making career decisions. Self-efficacy associated with career decision making contributed much of the variance in students suggesting they would pursue career focused goals, beyond baseline levels of confidence and work-related experience. Talsma and colleagues (2018) suggest that undergraduates' confidence judgements do not always align well with their performance outcomes and that students may down-regulate their confidence judgement, betraying a more humble perspective than their ability would suggest. Despite this evidence suggesting nuance, it is suggested that self-efficacy supports confident task-based performance and future decisions about those goals to pursue. These beliefs may be key attributes that indicate value added gains in learning.

Goal setting and self-efficacy

Goal setting theory proposes that setting specific, difficult goals leads to higher levels of motivation and performance than vague or no goals (Locke & Latham, 1990a). The contribution of goal setting behaviours as a self-regulatory mechanism to the complementary outcomes of academic performance (Morisano, 2013; Richardson et al., 2012) and employability (Clements & Kamau, 2018) have not been thoroughly examined in HE. In secondary school students, goal setting has been proposed to increase adaptability and achievement outcomes alongside self-efficacy and aspects of social support (Burns, Martin, & Collie, 2018). Recent data have also suggested that self-regulatory factors such as goal setting and self-efficacy contribute to students' self-reported perceptions of readiness for employment (Clements & Kamau, 2018; Deer et al., 2018). Clements and Kamau's (2018) findings suggest a greater role for tutors in delivering goal setting training to increase students' career preparations, particularly in developing skills and building networks. In turn, tutor support may make a joint

contribution to student effectiveness towards studies and employability perceptions, including those of teamwork competency. However, Clements and Kamau's (2018) study measured mastery approach goal orientation, from achievement goal theory, as a proxy for goal setting. Some have suggested that goal orientations may be inappropriate as a proxy goal setting (Morisano, 2013; Seijts et al., 2004). Whilst related, these two goal based processes have different origins and may operate at different levels of specificity. Richardson and colleagues (2012) tentatively propose goal setting as the most effective mechanism to tap levels of self-efficacy, the strongest positive non-intellective associate of undergraduate academic performance. Supporting Bandura's (1982, 1977) suggestion, researchers note that self-efficacy is slow to change and difficult to intervene in, as a result, goal setting might be the vehicle that secures changes over time, due to significant conceptual overlap between goal setting and self-efficacy. In addition, self-efficacy in combination with goal setting, act as foundational factors in the forethought phase of self-regulated approaches to learning and task based performance, that are subsequently associated with higher levels of performance (Locke & Latham, 1990a; Panadero, 2017; Zimmerman, 2000). As indicated earlier, higher levels of self-efficacy are associated with reduced anxiety and employability preparations (Deer et al., 2018). Such self-regulatory factors are suggested to be positively associated both with learning (Panadero & Broadbent, 2018) and employability (Ajjawi et al., 2018).

Mindset

Part of achievement goal theory (Dweck & Leggett, 1988), and an antecedent of goal orientations, mindset has been postulated as an associate of effective workplace behaviours (Heslin & Keating, 2017). Those endorsing a growth mindset believe intelligence abilities are mutable; they focus on mastery, make effort attributions, and learn from useful feedback and behaviours modelled by others in the task environment (Dweck & Molden, 2008; Wood & Bandura, 1989). Whereas those students endorsing

a fixed mindset make attributions for their performance based on their inherent abilities. Deploying effort, learning from others and useful messages in the task environment is unlikely to change their baseline levels of ability. Aligned with these proposals, those endorsing a fixed mindset approach are reported to avoid negative information and attend less to stimuli that provides challenge. In turn, a fixed perspective can reinforce overconfidence in abilities and lack of engagement (Ehrlinger et al., 2016). Mindset theorists propose respective positive and negative performance trajectories stemming from these implicit beliefs. Researchers have aligned the adaptive traits associated with mindsets to perceptions of control postulating that adaptive attributions may reduce uncertainty. Researchers have proposed the importance of such self-theories in employability skills development because these may cause individuals to make adaptive decisions about next steps (Knight & Yorke, 2003; Yorke & Knight, 2007). Control beliefs are suggested to direct an individual's approach to events. For example, those who hold an internal locus, versus those with an opposing external view, believe that they can control their response to challenges (Rotter, 1966). Illustrating this, meta analytic (Kanfer, Wanberg, & Kantrowitz, 2001) and experimental (Vîrga & Rusu, 2018) evidence supports the role of expectancies, such as control perceptions, and self-efficacy beliefs as antecedents of job search behaviours. These agentic evaluations about employability (Fugate, Kinicki, & Scheck, 2002) may also support those in undergraduate learners. For example, Gbadamosi and colleagues (2015) found that growth mindset is associated with part-time employment during studies, yet mindsets were not related to long term career aspiration. However, research examining employability and self-theories, such as mindset, is relatively sparse. Further such research has been criticised as it generally proposes the use of limited item scales and binary forced choice responses which may not capture the complexity of self-theories (Turner, 2014). A nuanced approach, which suggests a calibration of approaches, has been proposed in relation to career outcomes (Heslin & Keating, 2017; Heslin, Keating, & Minbashian, 2018) supported by others in relation to undergraduate performance (Tempelaar et al., 2015). Further, such a nuanced approach to mindset

measurement (e.g. Forsythe & Jellicoe, 2018) is supported in relation to goal orientations, a close associate of mindsets (Senko & Tropiano, 2016).

The current study

The choice of variables employed in the current study was based on the outcomes of the meta-analytic review by Richardson et al. (2012) and a careful analysis of key factors linked to human performance in areas such as sport and industry. Given the importance that students may attach to university grades, the current study focused on the utility of GPA as a proxy measure of gainful learning. For GPA to operate with utility however, it should also predict some superordinate competency or attitude that is of importance, independent of the score itself. This is particularly important because without such behavioural anchors it will not be possible for subsequent researchers to validate these predictions. The aim then is to specify the extent to which GPA predicts real world valued behaviour, in this case, decision making competence. Secondly, much of the research relating to undergraduate performance in HE is of cross-sectional design. In their recent meta-analysis, Richardson and colleagues (2012) indicate that correlational study designs may under or over inflate reported effects. Based on this knowledge, our second objective was to determine the extent to which previously identified non-intellective factors predict academic performance, real world attitudes and skills when vulnerabilities to systematic error variance are reduced. A longitudinal measurement design is used to reduce the influence of spurious variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Richardson, Simmering, & Sturman, 2009). To achieve this, students took part in data collection at different time points in their university education, see Table 5.1. The aims of this study are twofold, to:

1. analyse the extent to which GPA and decision-making confidence predict decision making accuracy.

2. analyse the extent to which:

a. self-regulatory factors (mindset, academic self-efficacy, goal setting), and work-related attitudes and skills (perceived employability and teamwork competency), are associated with GPA performance; and

b. work-related attitudes and skills (perceived employability and teamwork competency) can be predicted by a network of self-regulatory factors (mindset, academic self-efficacy, goal setting), see Figure 5.1.

To examine the above aims, two studies will be conducted. In relation to the first aim, we hypothesize that GPA and confidence about decisions will not predict decision making accuracy in undergraduates. In a second phase, it is firstly anticipated that work-related attitudes, skills and non-intellective factors will not make a meaningful contribution towards GPA and will present a poor proxy for the measurement of gainful learning. Again in the second phase, examining research aim 2b, it is further hypothesized that self-regulatory factors will make positive contributions towards more general work-related attitudes which may speak to the development of knowledge, skills and attitudes that prepare undergraduates for the world of work (Forsythe & Jellicoe, 2018). Based on the evidence reviewed, eleven paths are specified using a path analytic approach, see Figure 5.1. First, it is predicted that fixed and growth mindsets will covary. Second and third paths predict that fixed mindset will be negatively associated, independently, with both academic self-efficacy and goal setting. Fourth and fifth paths predict that growth mindset will positively predict, independently, both academic self-efficacy and goal setting. The sixth path hypothesises that academic self-efficacy will positively predict goal setting. Next, paths seven and eight propose that academic self-efficacy will independently predict perceived employability and perceived teamwork competency. Paths nine and ten propose that goal setting will independently predict perceived employability and perceived teamwork competency, respectively. Finally, an eleventh path suggests that perceived teamwork competency will predict learner employability perceptions.
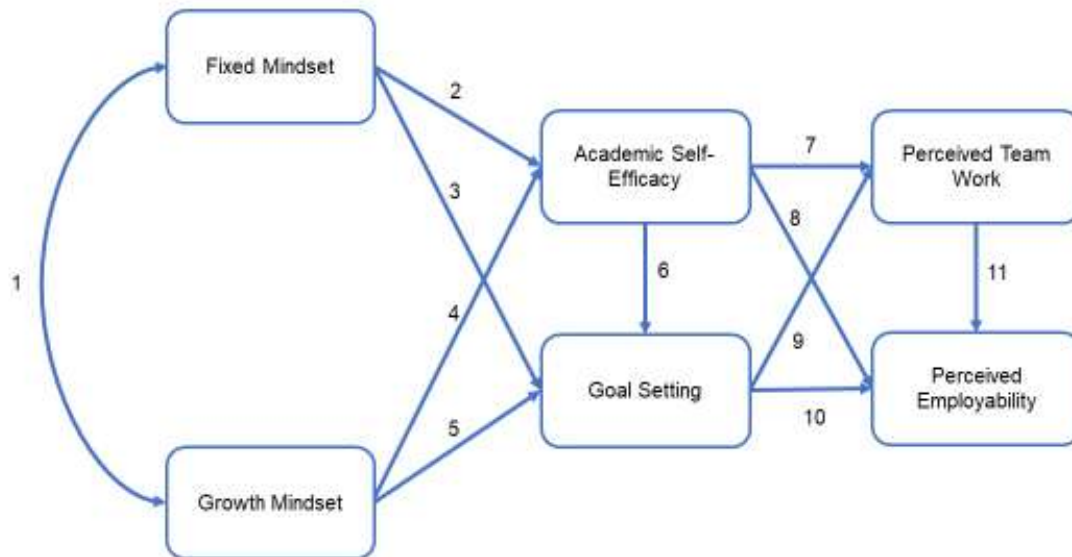
Figure 5.1 Hypothesised path model

Method

<u>Participants</u>

In total, 277 psychology students participated in this study at different times in their education. The sample was largely female (n = 245) with 31 males and one participant of undisclosed gender. Of the total sample, 211 students consented to their grades being associated with their endorsement of the selected psychological measures. Of the sample, 198 of the students completed all measures, and as a result, these participants were used in analysis for study two. In study two, students were asked to complete measures of mindset and goal setting tendencies in the first academic semester of their first year of study. Following completion of an employability module, in semester two, students were tested for their perception of their employability, see Table 5.1 for a summary of the measurement timeline. Testing during year 1 for perceptions of employability were felt to be more representative during year 1 because students may increase in employability related anxiety as they progress through their degree (Race, 2000), thus data may pick up spurious variance related to performance anxiety.

As students moved through the degree programme, the sample was tested on skill development, which included teamwork competency, and the Decision Analysis Test (DAT). This data was collected at the end of semester two, in the second year of study, for the original set of students. However, a smaller number of students from the original sample participated in the DAT, likely due to the time-consuming nature of the task. At this measurement point, a further set of third year students was recruited to the DAT who also consented to their grades being associated with their endorsement of the selected psychological measures. In total, 144 students (M_{age} = 21.03; SD_{age} = 4.85; 88.9% Female) contributed a score in the DAT, in pursuit of the first research aim. No differences were found between the year 2 and year 3 groups for stage of degree and as such the participant pool is treated as a unified data set, see Table 5.1 for a summary of the measurement timeline. Nine students with a raw score below ten on decision-making accuracy were excluded from the analysis as there were indications that students were guessing or not engaged with the test below this threshold. The remaining sample of 135 students was included within the analysis. Ethical approval was granted by the relevant University of Liverpool ethics committee. Participants indicated informed consent, approximately three quarters of students provided consent to allow access to academic records.

Table 5.1

Measurement Timeline

Measurement Occasion Research aim	Year 1, Semester 1	Year 1, Semester 2	Year 2, Semester 2
1 (n = 144)	-	-	Decision Analysis Test*
2 (n = 198)	Mindset Academic Self-Efficacy Goal Setting	Perceptions of Employability	Perceptions of Teamwork^ Competency

* Year 2 and 3 Students; ^ Year 2 Students only

Materials

Outcome Measures

Grade Point Average (GPA)

Mean degree stage outcomes for the academic year 2016 were obtained from those students providing consent to access academic records. This measure of performance conforms to those used widely in UK tertiary settings (Fulbright Commission, 2019). An outcome greater than or equal to 70 percentage points denotes a first-class result and a result less than 40 per cent results in failure, with 10 percentage point strata between denoting, third class (< 50%), lower second class (< 60%) and upper second-class outcomes (< 70%).

The Decision Analysis Test (DAT)

The DAT examines candidates' decision making abilities, in terms of accuracy and their confidence about decisions, in situations of uncertainty (Team Focus, 2015). It tests areas of cognitive function that are important in real life because it requires the extraction of critical pieces of information from what can be incomplete, ambiguous and sometimes contradictory information. The DAT moves beyond the typical ability test which measures verbal or numerical reasoning, by removing the boundaries of where information is held, decision rules the management of ambiguous information by deciphering codes and thus requires the participant to move from logical judgements through increasingly difficult levels of personal judgment. The underlying premise of DAT has been developed from research on complex thinking in the areas of industrial diagnosis and fault identification, managerial decision making and stratified systems thinking (Team Focus, 2015).

DAT is a controlled test licensed for recruitment, development and guidance, and is not available in the public domain. The test is normed on UK graduates and the internal consistency for DAT is reported at .75. Whilst this level of reliability is well within acceptable levels, it is lower than other tests of cognitive ability. However, DAT is shorter than mainstream tests of reasoning (30 items) and shorter tests are known to have lower levels of reliability (Kline, 2015). A novel aspect of the DAT is that it asks participants to make confidence judgements related to the accuracy of the decisions they make. Therefore, the DAT enables a diagnosis of candidates who may be prone to over-confident judgement patterns, even when they are inaccurate and under-confident judgement patterns, where candidates doubt accurate judgements that they make.

Perceptions of Employability

As a proxy for confidence, 16 items from the Student Self Perceived Employability Scale (Rothwell et al., 2008) were used. This confidence is indicated in a sample item from the measure 'the skills and abilities that I possess are what employers are looking for'. A six-point Likert scale from strongly disagree (1) to strongly agree (6) was employed in the current study. Acceptable levels of reliability were seen in the current study (Cronbach's α = .84; Gutmann's λ^6 = .87).

Perceptions of Teamwork Competency

Assessing teamwork competency, 29 of the 36 items from the Teamwork Competency Test were used (Aguado et al., 2014). Factors surveyed include collaborative problem solving, communication, goal setting and performance management, and planning and task coordination. 'I provide my peers with relevant information on how well I think the team tasks are progressing' illustrates these factors. The current study used a 5-point Likert scale response format indicating strength of agreement; strongly disagree (1) to strongly agree (5). Acceptable reliability coefficients for the

overall scale were reported by the authors, with similar reliabilities reported in the current sample (Cronbach's α = .81; Guttman's λ^6 = .85).

<u>Predictors</u>

Goal Setting

A subscale of generalised goal orientation, as a proxy for goal setting, was taken from the revised Connor Davidson Resilience Scale (Dong, Ablah, Nelson, Shah, & Khan, 2013). Ten items measured on a 5-point Likert scale with 1 being 'not true at all' to 5 'true nearly all the time'. The measure depicts goals in terms of personal challenges 'I have a strong sense of purpose'. Acceptable reliability is reported for the full measure. Reliability reported for the subscale used within the current study is also acceptable (Cronbach's α = .83; Gutmann's λ^6 = .83).

Academic Self-Efficacy

A ten-item domain specific measure of academic self-efficacy is used in the current study (McIlroy, 2000). Solid reliability for the measure was established in a sample of Irish undergraduates, and recently in a sample of secondary school students in North West England (McIlroy et al., 2015). A 7-point Likert response format 'strongly agree' (1) to 'strongly disagree' (7). Seven items were reverse scored, with a sample item 'I expect to give a good account of myself in my end-of-semester exams'. Within the current sample acceptable reliability is reported (Cronbach's α = .80; Gutmann's λ^6 = .83).

Mindset

Abd-El-Fattah & Yates' (2006) Implicit Theories of Intelligence Scale was used to measure two factors associated with fixed and growth mindset. A total of fourteen items, with half of the items loading on to fixed and the

remaining half loading to growth mindset. A growth mindset sample item is 'When you learn new things, your basic intelligence improves'. A 7-point response format indicates strength of agreement for the individual mindsets from 'strongly disagree' (1) to 'strongly agree' (7). A low negative correlation in the current study between the two mindsets $r = -.32$, $p < .001$ converges with the findings from the test developer ($r = -.33$). Reliability reported in the current study acceptable for fixed mindset endorsement (Cronbach's $\alpha = .71$; Guttman's $\lambda^6 = .71$), however, subthreshold reliability was associated with growth mindset endorsement (Cronbach's $\alpha = .55$; Guttman's $\lambda^6 = .58$). A single item from the growth mindset subscale 'If you fail in a task, you still trust your intelligence' appeared to result in a lowered level of internal consistency. As a result, caution should be exercised when interpreting results.

Data analysis

For the first research aim, examining the relationship between decision-making confidence and GPA in terms of decision-making accuracy, analyses were conducted in SPSS 24. Analyses for the second research aim, non-intellective associates of employability indicators, analyses were conducted within a Jupyter notebook environment with an R (R. Core Team, 2013) kernel. The *lavaan* package (Rosseel, 2012) was used to conduct structural equation modelling. All necessary assumptions to allow structural modelling to proceed were met. As a result, the hypothetical model outlined in Figure 5.1 was specified. Modification indices will be examined to refine the model where appropriate and paths align with theory.

Results

Study 1: Decision making accuracy regressed on Grade Point Average and decision-making confidence (research aim 1)

Table 5.2 presents the summary data as both raw scores and percentiles. Figure 5.2 and Figure 5.3 provide a visual representation of the

distribution of the percentile scores for students in terms of decision accuracy and confidence.

Table 5.2

Summary data for the Decision Analysis Test[1]

	Mean (±)	Skewness[2]	Kurtosis[3]
Decision accuracy (raw)	14.51 (±2.39)	.19	-.41
Decision accuracy (percentiles)	75.87(±17.49)	-.80	-.27
Decision confidence (raw)	31.22 (±6.19)	-.21	-.44
Decision confidence (percentiles)	40.36(±30.18)	.27	-1.41

1. n = 133 students to completion; 2. Standard Error of Skewness = .21; 3. Standard Error of Kurtosis = .42

Student decision making accuracy was much higher than the normal population (Team Focus, 2015). One-hundred and seven students scored between 67 and 98 per cent, higher than the average population, see Figure 5.2.
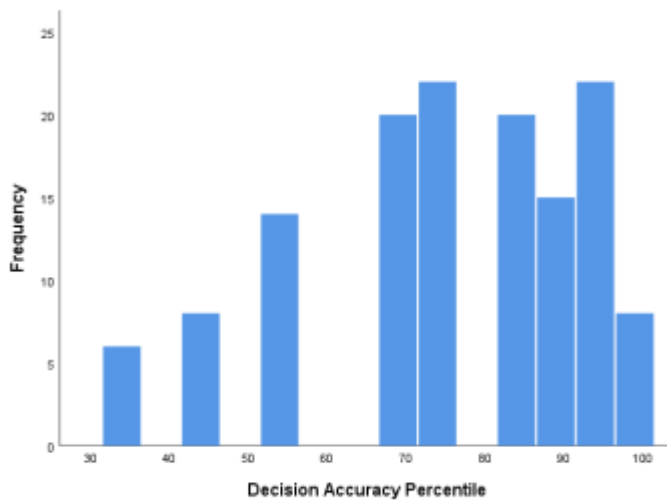
Figure 5.2 Frequency Distribution: Decision Accuracy Percentiles

Despite decision accuracy being high, according to norms provided by the test publisher (Team Focus, 2015) decision confidence was low with only 38 students expressing confidence above the 67th percentile, see Figure 5.3. This data indicates that students made accurate decisions when faced with

complex information in an abstract environment, however, their confidence in their ability to make such decisions was generally lacking.
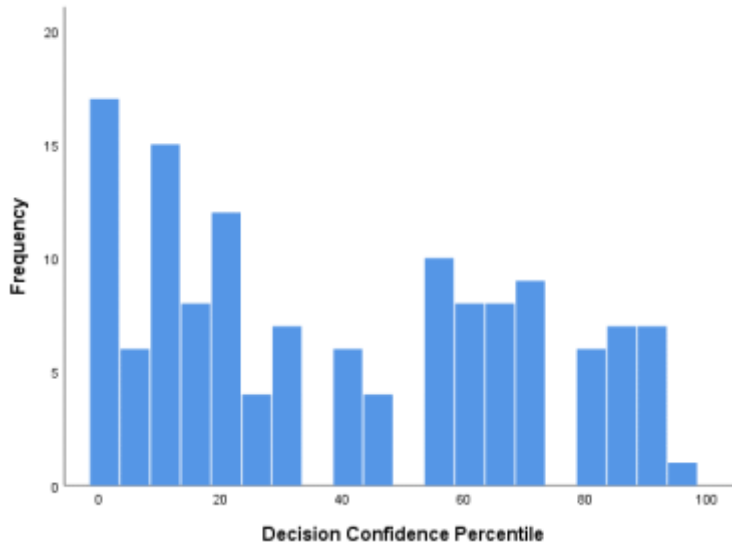
Figure 5.3 Frequency distribution: Decision Confidence Percentiles

The necessary assumptions to perform regression were met. Decision making accuracy was regressed onto GPA and decision making confidence with no significant effects ($\Delta R^2 = .002$, $p = .317$). These results support the hypothesis that GPA and decision making confidence are not significantly related to students accuracy in decision making.

Study 2: Non-intellectual factors associated with perceived employability indicators

Table 5.3

Correlation Matrix of non-intellective predictors of GPA, Employability and Perceptions of Teamwork Competency (n = 198)

	Mean (±)	2.	3.	4.	5.	6.	7.
1. GPA	63.80 (±9.80)	-.15 *	-.14	.06	.08	-.02	-.09
2. Perceptions of employability	4.15 (±0.55)		.48 ***	.49 ***	.47 ***	-.11	.40 ***
3. Teamwork competency	3.64 (±0.34)			.55 ***	.29 ***	-.04	.37 ***
4. Goal setting	4.52 (±0.60)				.65 ***	-.37 ***	.44 ***
5. Academic self-efficacy	5.02 (±0.75)					-.40 ***	.46 ***
6. Fixed mindset	3.75 (±0.88)						-.28 ***
7. Growth mindset	5.01 (±0.62)						-

* $p < .05$; ** $p < .01$; *** $p < .001$

Research aim 2a: Predictors of Grade Point Average

Table 5.3 demonstrates that the sole significant correlate of GPA is a weak negative relationship with Perceptions of Employability, $r(196) = -.15$, $p = .04$.

Research aim 2b: Path Analytic Model

For the second part of this investigation, a path analytic approach was employed to examine the hypothetical model proposed at Figure 5.1. The following measures were used to determine model fit. Firstly, the normed χ^2 statistic (χ^2/df) (S. Ullman, 2001); the Tucker Lewis Index, and the Comparative Fit Index (TLI; CFI; Bentler, 1990; L. Hu & Bentler, 1999); the Root Mean Square Error of Approximation (RMSEA; MacCallum, Browne, & Sugawara, 1996); and Standardized Root Mean Square Residual (SRMR; L. Hu & Bentler, 1999). Normed χ^2/df less than two (S. Ullman, 2001), and TLI and CFI above .90 (Bentler, 1990), are considered acceptable. RMSEA values indicate a good- ($< .05$), fair- ($> .05, < .08$), mediocre- ($> .08, < .10$)

and poor- fit (> .10) respectively (MacCallum et al., 1996). SRMR less than .08 are deemed a good fit (L. Hu & Bentler, 1999).

A first iteration of the measurement model resulted in a sub-optimal fit to the data. As a result, modification indices were examined alongside a consideration of theory, leading to the inclusion of a twelfth path, suggesting a direct association between fixed mindset and perceived teamwork competency. However, a further iteration of the model, again reported suboptimal fit to the data, suggesting the inclusion of a thirteenth path, a direct association from growth mindset to perceived teamwork competency. The final modification resulted in mostly good or acceptable fit indices. Using a Maximum Likelihood approach, fit measures, except for RMSEA, were mostly either good or acceptable, normed χ^2 (χ^2/df) = 3.34, RMSEA (90% CI) = .109 (.024 - .205), CFI = .988, TLI = .907, SRMR = .026. Whilst the RMSEA and normed χ^2 exceeded generally accepted rules of thumb, there is a lack of clarity in relation to these measures. For some, these measures remain within acceptable ranges (Marsh & Hocevar, 1985; J. B. Ullman & Bentler, 2012).

Table 5.4 summarises individual relationships in the path model, grouped by outcome variable, in descending order of the proportion of variance explained by the outcome of interest. For a graphical representation see Figure 5.4. Denoting a large effect, goal setting was predicted most strongly by a positive association from academic self-efficacy. Both growth and fixed mindset were associated with goal setting, albeit less strongly, demonstrating positive and negative associations respectively. A moderate to strong effect was seen when perceptions of teamwork competency were regressed on goal setting, growth and fixed mindset, and academic self-efficacy. Except for academic self-efficacy, all associates of teamwork competency perceptions were significant, and positive, with goal setting being the strongest associate. Academic self-efficacy held a non-significant relationship with teamwork competency perceptions. Next, a moderate-strong effect was seen when perceived employability was regressed on

perceptions of teamwork competency, academic self-efficacy, and goal setting. Significant positive associations were seen from perceptions of teamwork competency to perceived employability, which was the strongest predictor, and academic self-efficacy. However, goal setting was not significantly associated with perceived employability, despite being significantly correlated, see Table 5.3, being fully mediated by perceptions of teamwork competency. Next, a moderate effect was seen when academic self-efficacy was regressed on growth and fixed mindset, with growth mindset reporting the strongest association. Growth and fixed mindset demonstrated significant positive and negative associations on academic self-efficacy respectively. In the model specified, a complex pattern of relationships is seen in relation to academic self-efficacy. Academic self-efficacy contributes indirectly through goal setting to perceptions of teamwork competency, which is the strongest predictor of perceptions of employability. In addition, academic self-efficacy predicts perceptions of employability independently of goal setting, and perceptions of teamwork competence, at a level comparable with perceptions of teamwork competency. Finally, a moderate covariance was seen between fixed and growth mindset ($cov = -.28$, $p = .002$).

Table 5.4

Direct paths non-intellective factors associated with perceptions of employability specified in the measurement model

Path	Determinant		Outcome	Standardised estimates (β)	R^2
6	Self-Efficacy	→	Goal Setting	.53***	.46
5	Growth Mindset	→	Goal Setting	.16*	-
3	Fixed Mindset	→	Goal Setting	-.12*	-
9	Goal Setting	→	Teamwork Competency	.61***	.37
13	Growth Mindset	→	Teamwork Competency	.21***	-
12	Fixed Mindset	→	Teamwork Competency	.20***	-
7	Self-Efficacy	→	Teamwork Competency	-.12$^{n.s.}$	-
11	Teamwork Competency	→	Perceived Employability	.33***	.36
8	Self-Efficacy	→	Perceived Employability	.30***	-
10	Goal Setting	→	Perceived Employability	.11$^{n.s.}$	-
4	Growth Mindset	→	Self-Efficacy	.38***	.29
2	Fixed Mindset	→	Self-Efficacy	-.29***	-

* $p < .05$, ** $p < .01$, *** $p < .001$; R^2 values reported alongside the strongest predictor, in order of variance explained of the response variable. Paths 2 to 10 indicate those included in the initial model, see Figure 5.1. Paths 12 and 13 indicate modifications to the initial model.
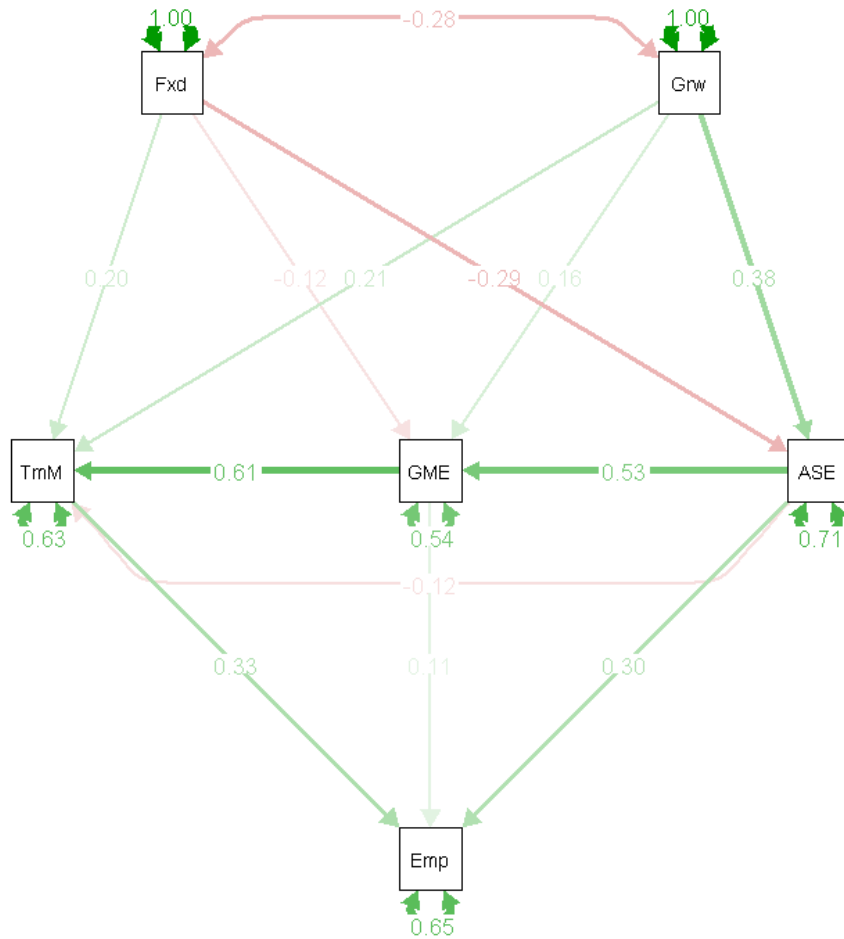
Figure 5.4 Path model of non-intellective factors associated with perceptions of employability. Unidirectional arrows indicate direct paths, with bidirectional arrows indicating covariances. Note: factors in Figure 5.4 are represented by the following key: Fxd = Fixed Mindset; Grw = Growth Mindset; ASE = Academic Self-Efficacy; GME = Goal Setting; TmM = Perceived Teamwork Competence; Emp = Perceptions of Employability

Discussion

The current study examines the extent to which identified performance and non-intellective factors predict carefully selected real-world skills, attitudes, and abilities that are valued by students, academics, and employers. Factors such as GPA have long been valued by students and employers as being indicative of student performance, and thus incremental changes in GPA could be used as a proxy measure for a meaningful

measure of gainful learning which predicted some valued competency. Non-intellective factors such as goal setting, academic self-efficacy, and mindset have been linked to academic performance, however previous research has often relied on cross-sectional design studies, which may over or under inflate the proportion of variance these variables account for. However, in the current study, common method variance was controlled for by collecting data from students during different points in their academic journey (Podsakoff et al., 2003; Richardson et al., 2009).

These results suggest that students make complex decisions accurately and well above normal expectations (Team Focus, 2015). Supporting our hypothesis for the first research aim, the results indicate that neither confidence judgements nor GPA are adequate predictors of student ability to make accurate, complex decisions. Throughout degree programmes, students engage in the productive acquisition of skills, knowledge, and attitudes which form part of the picture that relates to outcomes. These results indicate that although the students in the current study made accurate decisions, above that expected for a normal population, an objective measure of performance was unable to predict which students would make accurate decisions. Further, despite high levels of accuracy, the data reported in the current study indicates that students may lack confidence in their capacity to make these accurate decisions when faced with uncertainty. According to data provided by the Decision Analysis Test developers, the pattern of results reported in the current study indicates low confidence, failure to act and risk aversion (Team Focus, 2015). It is also proposed that student confidence in decision making capacities are impacted by the mindsets they hold, with those with a fixed mindset attending to easier solutions (Ehrlinger et al., 2016). Reports indicate that students confidence judgments in relation to their academic work may be misaligned (Kruger & Dunning, 1999), and these may have a deleterious impact on students learning and development. Talsma and colleagues (2018) report that under-confident students, using a measure of self-efficacy, often produce performance beyond their expectation and vice versa. Such biases that

impact evaluative judgements in and of task performance have been linked to students capacity to engage as lifelong learners (Joughin et al., 2018).

As in the previous set of results, the findings in relation to the second research aim indicate that non-intellective factors were not meaningfully associated with GPA. Correlational analysis indicated that only perceptions of employability were weakly associated with GPA, at a relatively marginal significance level, with an alpha level approaching, albeit below .05. Growth and fixed mindsets, academic self-efficacy, goal setting, and employability outcomes held no significant associations with GPA, see Table 5.3. However, the reported results may be a function of characteristics associated with the current sample and should be investigated in other samples. Taken together, results indicated GPA would seem to be a poor associate of real-world decision making, non-intellective factors and employability perceptions and as such will be a poor proxy for the measurement of gainful learning; supporting the contention in our first research aim. It has been suggested that such non-intellective factors may hold weaker relationships with distal performance outcomes (Bandura, 2013; M. Richardson et al., 2012). In addition, results also have implications for employers as GPA may indicate a level of performance but may not indicate how graduates will perform. It has been suggested that non-intellective factors become more important as the predictive validity of ability measures recedes with increased exposure to educational instruction (Ackerman et al., 2011).

Corresponding with this notion, more optimistic findings relate to the second aim in study two, which examined the role of self-regulatory factors in relation to later employability perceptions. Using structural equation modelling, a series of paths between identified non-intellective factors and student perceptions of both teamwork competency and employability were hypothesised. Supporting the first hypothesised path, there was significant covariance between both types of mindset. In turn, fixed mindset was negatively associated with academic self-efficacy, and goal setting; supporting both hypotheses two and three. In a modification of the model, both fixed and growth mindset, independently, and positively predicted

perceptions of teamwork competence; indicating the complexity of implicitly held self-beliefs. Growth mindset, additionally, contributed positively to academic self-efficacy, and goal setting, lending support to paths four and five. Path six indicated that academic self-efficacy would predict goal setting, this relationship was supported. Next, paths seven and eight suggested that academic self-efficacy would predict both perceptions of teamwork competency and employability respectively. The results supported path eight but not path seven. The specified model then predicted two paths from goal setting to both perceptions of both teamwork competency, path nine, and employability, path ten. Path ten was supported, however, path nine was not. The hypothesised path, eleven, supported a positive association from perceived teamwork competency to perceived employability.

Results reported in the current study largely supports the paths hypothesised. A more complex picture was seen in relation to academic self-efficacy, and to some degree goal setting, than had been anticipated. Hypotheses proposed that academic self-efficacy would be associated with both employability factors, however, it was only related to perceptions of employability. Goal setting fully mediated the relationship between academic self-efficacy and perceptions of teamwork competency. Perceptions of teamwork competency was, in turn, the strongest associate of employability perceptions, closely followed a direct path from academic self-efficacy to employability perceptions. However, goal setting was not significantly associated with employability perceptions, being fully mediated by perceptions of teamwork competency. These results suggest that both academic self-efficacy and goal setting, are important factors direct and indirectly in relation to students' perceptions of employability. These results lend support to the suggestion that self-efficacy and goal setting are closely related. Such associations have been previously suggested to support academic endeavours, albeit with limited evidence in tertiary settings (M. Richardson et al., 2012).

A nuanced view might suggest that endorsing a fixed mindset may prove beneficial to perceived employability outcomes, specifically

perceptions of teamwork competence, perhaps assisting clarity and focus when aiming to achieve a known performance benchmark. This finding is supported by evidence indicating that nuanced approaches may provide a better explanation when considering the complexities of performance (Heslin & Keating, 2017; Heslin et al., 2018; Senko & Tropiano, 2016; Tempelaar et al., 2015).   This supports earlier evidence indicating that learners may possess mindsets specific to the domain of learning (Dweck & Molden, 2008). Tempelaar and colleagues (2015) called for additional work in undergraduates to further understandings which indicate that learners can hold seemingly opposing mindsets concurrently. As a result, in the current study, a measure of mindset was used that explores both facets of mindset separately. Both mindsets contributed positively to employability outcomes, this suggestion extends work which suggests a calibrated perspective in undergraduate students (Tempelaar et al., 2015) and in relation to workplaces (Heslin & Keating, 2017; Heslin et al., 2018). However, others have found that this nuanced approach is analogous to the traditional measurement approach (Satchell et al., 2017), others have questioned this approach (Forsythe & Jellicoe, 2018). Therefore, the nature and measurement of mindsets requires further clarification.

The current results suggest that non-intellective factors, including both growth and fixed mindsets, goal setting, and academic self-efficacy appear to contribute to increased assessments of personal competence and readiness to work as part of a team in nuanced ways (Forsythe & Jellicoe, 2018; Komarraju & Nadler, 2013; Morisano, 2013; M. Richardson et al., 2012). These findings lend support to the development of pedagogies focused on employability that includes goal setting and other constructs associated with self-regulation. Further, evidence suggests that goal setting training encourages personal and team effectiveness through setting goals which foster cognitions that may assist in managing both the self and others in team settings (Gibson, 2001; Gist, Stevens, & Bavetta, 1991). This evidence suggests that goal setting encourages adaptive cognitions and behaviours associated with graduate success. If academics are to add value, pedagogies that support the development of optimum levels of confidence

may benefit students both in terms of their approach to academic work and into the world of work. Students will thus benefit from situations where they learn to recognise that they can make sound judgements so that they are ultimately able to act with an optimal level of confidence. Pedagogies that foster teamwork, and development of self-regulatory abilities, for example, problem-based learning may provide such an authentic approach. The accumulated skills, attitudes and abilities derived from engaging appropriate self-regulatory strategies, may benefit students that develop these quickly where others take a different performance trajectory.

Limitations and future research directions

As with any such research the current research has strengths and limitations. Common method variance was controlled for by taking measures across a series of time points. Nevertheless, this measurement approach meant that some students contributed more than others across the study. The study participants were homogenous as they were all psychology students within a single learning setting. It may be that in different settings that characteristics associated with the setting and the students' domain of learning, such as assessment approaches, may drive some of the effects seen in the current study. These results support the idea that non-intellective factors may have greater utility, than seemingly objective indicators such as GPA, as students' progress in their educational career. However, exploring these factors associated with self-regulated performance in other HE settings would provide a richer picture. Further, the fit measures of the derived path model were not all optimal, albeit fit measure thresholds are disputed, particularly when they vary as a function of sample size (Marsh & Hocevar, 1985; J. B. Ullman & Bentler, 2012). It may be therefore that further research in other settings and domains would clarify whether, the current model can be supported. Finally, the measure of goal setting employed in the current study was a subscale of a resilience measure developed in clinical settings (Dong et al., 2013). Whilst the results demonstrate some promise in the

current study, having logical appeal, a measure aligning more closely with goal setting theory may provide greater utility (Locke & Latham, 1990a).

Conclusions

The current study provides evidence that highly valued measures such as GPA may not be well positioned as a predictor of skills valued for employability. Further, the results suggest that there may be utility in tracking positive gains in the knowledge, skill and attitudes that support effortful striving. These results indicate that factors associated with self-regulated learning, including goal setting, self-efficacy and mindset may have a greater impact on learning. These changes are a meaningful pursuit beyond the effect of GPA, which appears to be difficult to operationalise, particularly over the short to medium term. Moreover, focusing on GPA would overlook evidence which demonstrates that to make gains in knowledge, students also must be able to manage losses (Dweck, 2017b). Gains and losses are not equally valued, people are averse to losses and attracted to gains (Kahneman & Tversky, 1979, 1984; Tversky & Kahneman, 1981), thus quantifying learning gain in such a way may be too narrow, limit understanding, and have pertinacious consequences in academia (Edwards & Roy, 2017). The results reported here support the notion that using self-regulatory approaches to help students evaluate learning and make judgements about the next steps to take, with confidence, are effective pedagogical approaches that may support the development of lifelong learners (Joughin et al., 2018). Nevertheless, more research is required to establish this understanding.

CHAPTER 6 – The Development and Validation of the Feedback in Learning Scale (FLS)

Abstract

Research attention has shifted from feedback delivery mechanisms to supporting learners to receive feedback well (Winstone, Nash, Parker, et al., 2017). Recognising feedback and the action necessary to take the next steps are vital to self-regulated performance (Panadero, 2017; Zimmerman, 2000). Evaluative judgements supporting such mechanisms are vital forces that promote academic endeavour and lifelong learning (Ajjawi et al., 2018). Measuring such mechanisms is well developed in occupational settings (Boudrias et al., 2014). How these relate to incremental gains in self-regulated learning in HE is less well understood (Forsythe & Jellicoe, 2018). Here we refined a measure of feedback integration from the occupational research domain (Boudrias et al., 2014) and investigate its application to HE. Two groups of psychology undergraduates endorsed perspectives associated with feedback. The measure examines characteristics associated with feedback including message valence, source credibility, interventions that provide challenge, feedback acceptance, awareness, motivational intentions, and the desire to make behavioural changes and undertake development activities following feedback. Of these suggested characteristics, exploratory factor analysis revealed that undergraduate learners endorsed credible source challenge, acceptance of feedback, awareness from feedback, motivational intentions, and the desire to take behavioural changes and participate in development activities which formed a single factor. The structure of the instrument and hypothesised paths between derived factors was confirmed using latent variable structural equation modelling. Both models achieved mostly good, and at least acceptable fit, endorsing the robustness of the measure in HE learners. The current findings increase understanding of HE learner's relationship with feedback. Here, acceptance of feedback predicts the extent to which learners found the source of feedback credible. Credible source challenge in

turn predicts awareness resulting from feedback. Subsequently, awareness predicts motivations to act. These promising results, whilst cross-sectional, also have implications for programmes. Further research employing the instrument is necessary to understand changes in learner attitudes in developing beneficial self-regulated skills that support both programmes of study and graduates in their careers.

Introduction

Providing feedback that assesses learner performance relative to goals or objectives is proposed as a necessary process in optimising performance. Universities have spent significant resources in their attempts to improve student satisfaction in relation to assessment and feedback. For example, increasing learner assessment literacy through the use of rubrics is thought to make available the tacit knowledge that academics often carry around in their heads. However, most interventions have had very little impact on student satisfaction with National Student Survey scores in relation to assessment and feedback remaining relatively stable, and low, across the HE sector (Evans et al., 2018).

Providing feedback may not be sufficient. Developing learner's skills in integrating feedback by evaluating and making judgements about the courses of action necessary for progression appears to be a necessary additional step (Ajjawi et al., 2018; Nicol & Macfarlane-Dick, 2006). Feedback enables adjustment by informing learners where they are against a desired standard of performance. This negative feedback loop is suggested to promote self-regulation in the workplace by enabling goal confirmation or revision (Diefendorff & Lord, 2008; Locke & Latham, 1990a; Lord et al., 2010). Within the learning domain, the evaluations that learners make following performance, for example in response to feedback, is suggested to be a central mechanism in self-regulated learning (Panadero et al., 2017; Zimmerman, 2000). Once these skills are developed, researchers propose that learners can become self-directed (Van Merriënboer & Kirschner, 2017).

Theoretical background

In its broadest sense, feedback is reported to hold two fundamental roles, it acts as a mediator of 'in-flight' performance or as a moderator of subsequent performance, by upregulating or downregulating subsequent

goals (S. J. Ashford & De Stobbeleir, 2013). Here, we focus primarily on the idea of post-performance feedback and its role in changing future performance as this approach mirrors much of the HE assessment landscape. Hattie and Timperley propose for feedback to have an effect that three evaluations must be considered *"Where am I going? (What are the goals?), How am I going? (What progress is being made toward the goal?), and Where to next? (What activities need to be undertaken to make better progress?)"* (2007, p. 86). These evaluations support an ipsative self-regulatory approach, connecting previous and future learning, particularly working towards a known performance standard (Brookhart, 2018). Within this ipsative approach, there is an inherent assumption that learners possess the necessary skills and motivations to engage in feedback, in an objective and dispassionate manner (Joughin et al., 2018) that support self-regulated approaches to performance indicated by Lord and colleagues (2010).

Given the importance of feedback, the mechanisms for delivering effective feedback to HE learners has been the focus of research for some time (Nicol & Macfarlane-Dick, 2006). Whilst it seems clear that feedback can have an effect on performance, a wide range of effects have been reported, depending on the types of feedback mechanisms utilised (Hattie & Timperley, 2007). A medium to large effect of feedback on performance has been reported by some researchers (Hattie et al., 1996). However, one third of feedback interventions are reported to have a deleterious effect on performance (Kluger & DeNisi, 1996). Research attention on delivery has led some to suggest that HE learners are typecast as passive recipients in feedback discussions (Evans, 2013). Some authors report that neither party is said to understand who owns feedback, nor do they report being satisfied with it (Hughes, 2011). There are some suggestions that even if learners acknowledge the utility of feedback, managing barriers is no easy task (Forsythe & Johnson, 2017). The evidence reviewed here suggests that complexity in the feedback environment leads to lack of receptivity.

Despite the research focus on delivery mechanisms in HE, and learners understanding which of these mechanisms serve them best,

fostering greater awareness and receptivity to feedback remains problematic (Winstone, Nash, Parker, et al., 2017; Winstone et al., 2016). Learners are reported to seek feedback that increases positive feeling but pragmatically is reported to have little effect in terms of future performance (Hattie & Timperley, 2007). Recent evidence indicates that students are aware of and in many cases value useful feedback that provides challenge (Forsythe & Jellicoe, 2018; Winstone et al., 2016). However, learners often fail to engage in adaptive evaluations of feedback information. It is suggested that this failure to engage relates to learner heuristics and biases (Joughin et al., 2018), and associated barriers (Winstone, Nash, Rowntree, et al., 2017). Recent evidence supports the idea of adaptive or defensive evaluations made by learners during appraisal which has the power to undermine decision making relating to feedback (Forsythe & Johnson, 2017; Panadero et al., 2018; Van Merriënboer & Kirschner, 2017). These are typified by dual processing theories of decision making (Kahneman, 2011; Kahneman & Tversky, 1979, 1984; Stanovich & West, 2000). In the first of these dual perspectives, described as system one thinking, reactive judgements are made quickly and rely on rules of thumb. In system one thinking, Joughin and colleagues (2018) indicate that learners may opt not to engage in the deliberate and resource intensive cognitive appraisals that are necessary to optimising gains from learning. Such evaluations typify system two thinking, the second to these perspectives. In addition to stunting engagement, heuristics and biases are proposed to inflate learner evaluations of their work and the confidence they have in it (Peverly et al., 2003). Taken together this evidence suggests that developing analytical and deliberate evaluative judgement processes supports realistic levels of confidence. Learners may not be in possession of the resources necessary to engage in such deliberative appraisals, as these might be aversive and prompt anxiety. In this frame of thinking it is suggested that learners look to invalid cues that typify system one thinking (Van Merriënboer & Kirschner, 2017). To optimise gains in learning taking an objective, and deliberate approach to feedback is necessary. A number of personal and relationship barriers must be negotiated to engage with feedback in an adaptive manner (Winstone, Nash, Rowntree, et al., 2017).

Fostering an environment that encourages positive dialogue is a pillar of good feedback practice (Nicol & Macfarlane-Dick, 2006). Recent evidence suggests that student engagement in such dialogue is challenged when learners see themselves as consumers (Bunce, Baird, & Jones, 2017). Researchers have suggested, for example, that instructors modelling feedback response provide an enlightening scaffold for learners, particularly where structural barriers exist, such as learner remoteness from instructors (Carless & Boud, 2018). Characteristics of the feedback message and the context in which messages are transmitted by the sender and absorbed by the recipient have the power to enable or restrict action. Amongst others, these perspectives are reported to lead to differential patterns in perceptions of confidence, competence, motivation and effort which have downstream effects on performance (Pitt & Norton, 2017). Recent research indicates that feedback that provides challenge and strategy are highly endorsed by learners (Forsythe & Jellicoe, 2018; Forsythe & Johnson, 2017; Winstone et al., 2016).

Within the HE context, several barriers are reported. Barriers relate to lack of awareness of the feedback process; poor knowledge of associated strategies and opportunities for development; lacking agency and associated self-regulatory strategies; and low engagement and volition with addressing the issues raised in feedback. Managing these barriers is suggested to be an important step in a move towards encouraging learner receptivity to feedback (Winstone, Nash, Parker, et al., 2017). Transforming this narrative from a passive to an active process is suggested to be best considered as a partnership (Evans, 2013), and others have suggested that educators should work in co-operation with learners to co-construct goals from feedback (Farrell, Bourgeois-Law, Buydens, & Regher, 2019). The extent to which feedback is used for development, relates to a complex mix of characteristics, including those associated with the message under consideration, inter-personal relationships and intrapersonal factors (Hattie & Timperley, 2007; Stone & Heen, 2015). Although evidence is mixed, message characteristics include whether the feedback message has a

positive or negative valence, and also relate to whether the recipient believes that it has face-validity (Evans, 2013). Interpersonal relationships, between the source of the feedback and the recipient are thought to be crucial in creating a suitable environment (Winstone, Nash, Parker, et al., 2017). Boudrias and colleagues (2014) posit that where the feedback source is trustworthy, greater acceptance and awareness is promoted by feedback. Intrapersonal factors, including personality, motivations and emotions also foster a dynamic self-regulatory environment (Evans, 2013). These ideas are supported both within approaches to self-regulated learning and recent models of feedback integration.

A receiving focus in relation to feedback is supported in Winstone and colleagues (2017) recent SAGE framework. The SAGE framework promotes strategies that aim to increase the learner's '*Self-appraisal'* (S) ability, possess greater '*Assessment Literacy'* (A), employ '*Goal-setting and self-regulatory strategies'* (G), and develop '*Engagement and motivational strategies'* (E). In this way, developing learner's abilities to judge the quality of their work and to make necessary adjustments must be a key outcome for educators, and students in particular if they are to transition to be effective lifelong learners (Ajjawi et al., 2018). These abilities that support learning are also suggested to be fundamental to self-regulated performance in the workplace (Diefendorff & Lord, 2008; Lord et al., 2010). As such, academics seeking to promote incremental learning gains require appropriate diagnostic skills to make appropriate recommendations to foster change, where students require metacognitive abilities associated with self-assessment and self-management to enable them to optimise their chances of success (Evans, 2013).

However derived, engaging students in the development of adaptive knowledge, skills and attitudes that underpins hard won gains in learning is crucial, in particular, if learners are to develop the ability to manage themselves during the courses of their studies and into employment (Forsythe & Jellicoe, 2018). A recent qualitative report indicates that learners in HE, even when approaching graduation, do not possess the emotional

repertoire to manage and act upon feedback and are not enabled in doing so (O'Donovan et al., 2016; Pitt & Norton, 2017). Indications are that current assessment approaches do not enable learners to engage in development in the manner expected by employers (The Confederation of British Industry, 2016).

Within the occupational domain, Boudrias and colleagues (2014) developed a measure of feedback integration for candidates exposed to individual psychological assessment feedback following evaluation at an assessment centre. Based on earlier such measures (see for example Kudisch, 1996) a revised measure was proposed that aimed to examine whether candidates in occupational settings who were exposed to developmental feedback would be motivated towards taking developmental actions and adopt behavioural changes resulting from feedback. Boudrias and colleagues (2014) postulated a causal path where characteristics associated with feedback including valence of the message, its face validity, the credibility of the source and challenge were associated with greater acceptance of feedback and awareness of changes. In turn, acceptance and awareness were proposed to relate to greater motivational intention, which was hypothesised to lead to increased behavioural and developmental changes. Observations from 97 candidates were taken on two separate occasions, separated by a three-month interval, with 178 observations taken in total. Boudrias and colleagues (2014) describe a model that had excellent fit to the data. Findings indicate that awareness and its direct and indirect antecedents led to motivational intention, but acceptance did not. In this model, motivational intentions were more strongly associated in turn with behavioural change than taking developmental action. Authors suggest that these results are consistent with the Theory of Planned Behavior (Ajzen, 1996). For example, candidates evaluations are that they hold greater volition changing their own behaviours change, whereas engaging in developmental activities relies on external developmental opportunities becoming available. Sample size considerations, the self-report nature of the instrument and low reliability relating to valence of the message, limit these findings somewhat. The participant pool (n = 97) used in this study

may have resulted in imprecise estimates. Generally a sample size of 200 is considered optimal (Kenny, 2015). Low power meant that Boudrias and colleagues (2014) were unable to examine the latent factor structure, relying instead on Cronbach's alpha. It has been argued that such metrics do not provide adequate evidence of construct validity (Flake & Fried, 2019; Flake et al., 2017). Whilst validity also relates to theoretical consideration of measures, examining the factor structure of any such measure is recommended for reliable and valid prediction.

Despite the noted limitations in Boudrias and colleagues (2014) model, these results provide an interesting perspective suggesting that increased awareness led to greater integration of feedback and a desire to act in accordance with feedback messages received. Whilst focused in occupational settings, Boudrias and colleagues findings could contribute important understandings in relation to undergraduates' evaluations and integration of feedback. Feedback that is more specific is postulated to lead to greater levels of performance striving (S. J. Ashford & De Stobbeleir, 2013). This is because specificity leads to greater awareness and ability to interpret the feedback in terms of the learner's future progress. This follows work suggesting that integration or recipience of feedback (see for example Nicol & Macfarlane-Dick, 2006; Winstone, Nash, Parker, et al., 2017) is an under-represented area of research and will support greater understanding of how evaluations support self-regulation during learning (Panadero et al., 2017). It has been proposed that learners can develop evaluative judgements by being engaged in formative assessment that encourages self-regulated learning (Panadero et al., 2018). In this approach, learners must understand how a piece of work is related to its context, develop the expertise that is necessary to understand the qualities and standards against which it is being judged and how these relate to assessment criteria. These evaluations align with the three considerations proposed by Hattie and Timperley (2007). Measuring learner endorsement of behaviours associated with feedback and its integration would provide a useful means of indicating whether students were prepared to make the incremental gains in learning necessary for development. Domain specific refinements are necessary to

secure its applicability in terms of undergraduate learning and development. Refinements would also support the self-awareness component of the SAGE model of feedback integration (Winstone, Nash, Parker, et al., 2017). If such measurement instruments demonstrate utility in learner's self-regulated approach to learning, then it follows that employing these in diagnosis and intervention will be informative. Given the suggestion that undergraduate learners, as they move towards greater independence, often find self-regulation challenging (Zimmerman & Paulsen, 1995). Such a supportive mechanism will help to address a gap in current knowledge.

Current study

Drawing on these suggestions, the first aim of the current study is to explore the factor structure of a modified feedback integration measure that has been utilised in occupational domains (Boudrias et al., 2014) and to translate it from occupational environments into academic endeavours. There has been some limited use of a modified version of this survey instrument within academic settings (e.g. Forsythe & Jellicoe, 2018; Forsythe & Johnson, 2017), which have provided an interesting pattern of results. However, as indicated, there has been no thorough and systematic investigation of the measurement properties of the scale within student populations. Further, we have no knowledge of a similar instrument that can either be used by educators to target interventions in the manner intended by Winstone and colleagues (2017). Boudrias and colleague's (2014) measure appears to have a strong theoretical foundation. Whilst there are synergies between the experiences of those in the workplace and HE, the extent to which the suggested factors replicate and measure knowledge, skills and attitudes related to feedback in HE learners is not necessarily assured. Boudrias and colleagues' (2014) measure was confirmed with a relatively small participant pool, and as a result, before this is used further, examining the nature of the measurement tool appears to be warranted. Further, such a measure appears to have utility as part of a self-directed approach to promote understanding in learners and address deficits in relation to

feedback. As a result of the identified issues with the previous exploration of the factors, and the modifications necessary for an academic audience, a data driven analysis approach was used in the first instance as a route to providing a measurement structure that is definitive for a tertiary academic audience.

Research aims and hypotheses

Addressing the issues above, the first research aim was to determine a data driven approach to understanding feedback integration in tertiary academic audience based on a modification of a measure provided by Boudrias and colleagues (2014). The second aim of the current study is first to confirm the derived factor structure of the FLS, determined as part of exploratory analysis in aim one. Simultaneously, a tentative unidirectional path between the factors identified during exploratory analysis will be examined. Taking account of the directional model proposed by Boudrias and colleagues (2014) four paths were hypothesised, addressing the five derived factors. The first hypothesised path proposes that acceptance of feedback will predict credible source challenge. A second hypothesised path predicts that credible source challenge will predict awareness from feedback. Awareness from feedback will, in turn, predict motivational intentions, is the third hypothesised path. The final fourth path hypothesises that motivational intention will predict behavioural changes and developmental activities.

Method

Participants

Two pools of participants were recruited to examine cognitive and behavioural factors associated with integration of feedback in learning. A first convenience sample of 353 first and second-year psychology undergraduate students was recruited to participate in the current study. Two sources of opportunity recruitment were used. In the first of these a convenience sample

of 163 second year undergraduate participants were recruited. The first recruitment opportunity was time-limited and did not generate a large enough sample for exploratory analysis. As a result, a further sample of first year students (n=190) was recruited using an experimental participation scheme (EPS) in return for nominal course credit. Twelve cases were excluded from the first sample and three from the second, as they failed to respond to all survey items. Following exclusion participants were M_{age} = 19.54, SD_{age} = 2.98. Eighty six per cent of participants were female, mirroring the profile seen in samples recruited from these populations. Following inspection of these data, seventeen cases were excluded based on an inspection of Mahalanobis distance cut-off criteria (Kline, 2015). The remaining 321 complete cases were used in Exploratory Factor Analysis (EFA).

A second convenience sample of 402 second year students registered on a half year psychology module were requested to participate as part of a wider data collection process. Forty-six responses were excluded in the second sample where participants failed to respond to one or more of the items. Following exclusions participants were M_{age} = 20.31; SD_{age} = 3.64. Matching the first sample, 86% of participants were female. The remaining 356 complete cases were used in latent variable structural equation modelling (LVSEM).

Design

The current study employed a cross-sectional design and structural equation modelling (SEM) to explore two pools of responses to determine the factor structure of the FLS. A data driven approach using EFA was used to explore the first sample. The second sample was used in an LVSEM approach to simultaneously confirm the psychometric properties of the scale and to test a linear hypothetical path through the factors derived in EFA.

Measures

The Feedback in Learning Scale

A 34-item measure examined perspectives supporting integration of feedback in learning. Items were derived from an existing measure of feedback integration typically used in occupational research (Boudrias et al., 2014). Fit measures were at least adequate, although these were derived with relatively low participant pool. The original measure developed within an occupational setting suggests a nine-factor structure. The original measure referred to candidate integration of feedback following attendance at a specific assessment centre occasion, minor modifications were made to recognise the different context of the measure. To illustrate, one item *'I have changed my less-efficient behaviours discussed during the feedback session'* was modified to '… behaviours described in the feedback I received' supervisor is replaced by tutor to reflect the academic context. Further items from Boudrias and colleagues' (2014) measure relating to the workplace are modified to situate the measure in higher education, an example of this relates to assessment face validity. Of these, *message valence* relates to whether feedback received is regarded by the learner as positive or aversive; *face validity* can be interpreted as the idea that participants endorse the relatedness of the feedback to themselves and their future careers; *source credibility* relates to the person assessing the work can be relied upon to provide an accurate assessment of work; and *challenge interventions*, which speak to the idea that the assessor's feedback provides a catalyst for change. Here, due to its poor performance in a previous examination, and the challenge of meaningfully operationalising *face validity*, we decided to discard these items from the analysis (Forsythe & Jellicoe, 2018). Five remaining factors relating to integration of feedback were also considered. *Feedback acceptance* relates to the student recognising that feedback received relates to them; *awareness from feedback*, such that the learner will have a greater understanding of their strengths and limitations; and *motivational intentions*, which relate to the desire to take action, perhaps as a

result these earlier factors. The final two factors are outcome measures, these consider students estimation of *behavioural changes* and *developmental actions* they will undertake as a result of the feedback they receive. Participant ratings of the FLS were endorsed using a 6-point response format; with a value of 1 to 6 (1 = Strongly Disagree, 6 = Strongly Agree). Higher scores relate to endorsement of each factor. As a result, reverse scoring ensured that inter-item correlations remained positive.

Procedure

Participants completed the survey online via a hyperlink directing participants to the Qualtrics (2018) online surveying platform. Participants read a participant information sheet and indicated consent to participate in the study. Participants were informed of the benign nature of the study, and that there were no anticipated risks or rewards associated with participation. In the second part of the study, related to a pedagogical project, students were furnished with automated reports, which summed scores associated with the factors they had endorsed. Automated individual feedback reports were designed to debrief participants by prompting individual reflection and greater self-awareness. Interpretive support was made available for students. This study was carried out in accordance with the recommendations of the British Psychological Society. The protocol was approved by the University of Liverpool Ethics Committee. All subjects gave written informed consent in accordance with the Declaration of Helsinki.

Data analyses

All analyses were conducted in an R environment (R. Core Team, 2013) using Jupyter notebook architecture (Kluyver et al., 2016).

Analysis checks and data preparation (sample 1 and 2)

FLS items were assessed for normality. In relation to the first sample, employed in EFA, sampling adequacy was assessed using the Kaiser-Myer-Olkin (KMO) statistic. Bartlett's test of sphericity was used to assess whether inter-item correlations were sufficiently large to continue with EFA. For the second sample, data were examined for multivariate normality. As Mardia's Kurtosis test was violated (Crede & Harms, 2019; Gana & Broc, 2019) maximum likelihood estimation package with robust standard errors and Satorra-Bentler scaled test statistics (Satorra & Bentler, 2010) were obtained to correct for this violation using the MLM procedure in *lavaan* (Rosseel, 2012). As a result, 356 observations were employed in a latent variable structural equation modelling approach to assess a hybrid confirmatory factor analysis and path analytic approach.

Approach to Structural Equation Modelling

Model fit was assessed using the Normed χ^2 statistic (χ^2/df) (S. Ullman, 2001), the Tucker Lewis Index, Comparative Fit Index (TLI; CFI; Bentler, 1990; L. Hu & Bentler, 1999) the Root Mean Square Error of Approximation (RMSEA; MacCallum et al., 1996), and Standardized Root Mean Square Residual (SRMR; L. Hu & Bentler, 1999). Normed χ^2/df less than two (S. Ullman, 2001), and TLI and CFI above .90 (Bentler, 1990) are considered acceptable. RMSEA values indicate a good- ($<$ .05), fair- ($>$ .05, $<$ .08), mediocre- ($>$ .08, $<$ .10) and poor- fit ($>$ .10) respectively (MacCallum et al., 1996). SRMR less than .08 are deemed a good fit (L. Hu & Bentler, 1999).

Exploratory Factor Analysis (Sample 1)

The *psych* package (Revelle, 2016), was used for EFA purposes. Using a maximum likelihood factor extraction method, a combination of methods were used to determine the final factor solution. Initially, to determine the number of factors to extract parallel analysis (Horn, 1965) was

employed alongside a visual inspection of scree plots (Cattell, 1966). However, using these techniques, some of the factors identified at the elbow point of the scree plot were ambiguous, with a low level of variance explained. Therefore eigenvalues > .70 (Jolliffe, 1972) was selected, in the spirit of parsimony and discovery, as the Kaiser criterion (i.e. retaining eigenvalues > 1) is not always considered an optimal cut-off threshold when determining factors to retain (Costello & Osborne, 2005). As factors were expected to correlate, an oblique rotation was employed (Vogt & Johnson, 2011). At each iteration, items were removed where factor loadings were less than .40 (Costello & Osborne, 2005). The suitability of the derived model was considered in light of relevant theoretical explanations.

Internal Consistency and Descriptive Statistics (Sample 1 and 2)

Internal consistency of the FLS was assessed using the Cronbach's alpha. A lower bound estimate of $\alpha = .70$ was considered acceptable (Nunnally & Bernstein, 1994). The *psych* package (Revelle, 2016) was used to calculate mean scores and reliabilities for each of the identified factors.

Latent Variable Structural Equation Modelling (Sample 2)

The *lavaan* package (Rosseel, 2012) was used to perform LVSEM this analysis sought to confirm the factor solution identified from EFA. In addition, and simultaneously in this measurement approach, we hypothesised paths between the latent variables following a consideration of the solution derived from EFA and considering the measurement model hypothesised by Boudrias and colleagues (2014). Items were free to load onto related latent factors and no restrictions were placed on them. Following initial modelling, model fit was improved by adding covariance between error terms. These adjustments followed consideration of modification indices and theory.

Results

Analysis checks and participant characteristics

With the exception of one variable across both samples, skewness and kurtosis values were between -2 and 2. Whilst there is a lack of clarity in the literature, skewness and kurtosis values were below 'rules of thumb' indicated by Kline (2015), with skewness ≤ 3, and Kurtosis ≤ 10. In all cases, such values were well below these thresholds.

Exploratory Factor Analysis (sample 1)

The KMO statistic for the model was above the .50 threshold (KMO = .90) and Bartlett's test of sphericity was significant ($p < .001$). Participant characteristics for sample one and two are reported in Table 6.1.

Table 6.1

Characteristics of participants in each group. Values in parentheses represent the standard deviation (±SD) of the mean.

	Sample 1 ($n = 321$)	Sample 2 ($n = 356$)
Females : Males	276:45	307:49
Age(years): mean(±SD)	19.54 (± 2.85)	20.31(± 3.64)

An initial attempt at factor extraction using parallel analysis with a maximum likelihood approach indicated a seven factor solution. This was largely confirmed by visual inspection of scree plots, however, ambiguity was present in at the elbow point of the scree plot. Inspection of eigenvalues (variance explained) indicated that the final factor explained a morbidly low proportion of variance. As a result, an additional attempt was made to identify factors from the data by specifying eigenvalues > . 70. Three iterations were sufficient to derive simple factor structure. In the first iteration, EFA with an oblique (oblimin) using a maximum likelihood approach, visual inspection of the scree plot and the .70 eigenvalue criteria revealed a five-

factor solution. However, an unclear factor structure was indicated. Six items reported factor loadings less than the suggested .40 criteria. Following the removal of these items, and using the same cut-off criteria, a second iteration revealed a five-factor solution. In this iteration, however, simple structure was not achieved, with one further item failing to load on to the five derived factors. Following the removal of this single item, a third and final iteration of the same EFA procedure was undertaken. A five-factor structure converged during the final iteration with 27 individual items retained. Eigenvalues for the respective factors were 7.95, 2.03, 1.12, 0.99, and 0.71. Factor one, made up of eleven items, referencing credible source challenge, for example *'the staff who assessed me are outstanding in their capacity to gain my confidence'*, accounted for 17% of the total variance in the model. Five items loaded on the second factor accounting for 9% of the total variance. This factor represents one's desire to make behavioural changes and developmental actions resulting from feedback, for example, *'following feedback I have searched for developmental activities in line with competencies described during the feedback'*. Three items loaded on to factor three, feedback acceptance, an example item includes 'I believe the feedback I received depicts me accurately'. This factor again accounted for 9% of the total variance in the model. Four items make up the fourth factor, motivational intentions, an illustrative example suggests *'I am motivated to develop myself in the direction of the feedback I received'*. This fourth factor accounted for 8% of the variance in the model. Finally, the fifth factor, accounted for 6% of the variance in the model, addressing awareness from feedback; '*I am more aware of the strengths that I can draw on from my studies*' an indicative item supporting this factor. Item factor loadings are provided in Table 6.2. As a total, the factors cumulatively explained 49% of the variance in the model. The full 27 item FLS and scoring instructions are provided in Appendix 3. See Figure 6.1 for a diagramme depicting the fitted exploratory model. The final iteration indicated an acceptable to good fit to the data, see Figure 6.1; Normed χ^2 (χ^2/df) = 1.11, RMSEA (90% CI) = .06 (.050 - .065), CFI = .939, TLI = .904, SRMR = .03.

Table 6.2

Factors, items, and factor loadings for EFA and LVSEM analyses

Factor (no. of items)	Item	Factor Loadings	
		EFA	LVSEM
1. Credible Source Challenge (11)	CR7	.772	.732
	CR2	.765	.697
	CR4	.763	.662
	CR8	.726	.651
	CR5	.652	.509
	CR3	.640	.725
	CR9	.620	.544
	CR6	.584	.369
	CI3	.497	.481
	CR1	.462	.602
	CI2	.440	.521
2. Behaviour and Development Change (5)	DC3	.799	.761
	DC2	.714	.642
	DC1	.669	.761
	BC4	.593	.527
	BC3	.527	.564
3. Feedback Acceptance (3)	AC2	.916	.927
	AC1	.889	.807
	AC3	.725	.705
4. Motivational Intention (4)	MI3	.861	.646
	MI2	.859	.724
	MI1	.575	.804
	BC1	.411	.652
5. Awareness from Feedback (4)	AW3	.730	.664
	AW2	.644	.549
	AW1	.585	.626
	AW4	.493	.727

A key to items is contained in Appendix 3. *Credible Source Challenge* [CR1 – 9, and CI2 and C!3]; *Behaviour and Development Change* [BC3 – BC4, DC1 -3]; *Feedback Acceptance* [AC1 – AC3]; *Motivational Intention* [MI1 – 3, BC1]; and *Awareness from Feedback* [AW1 – AW4]
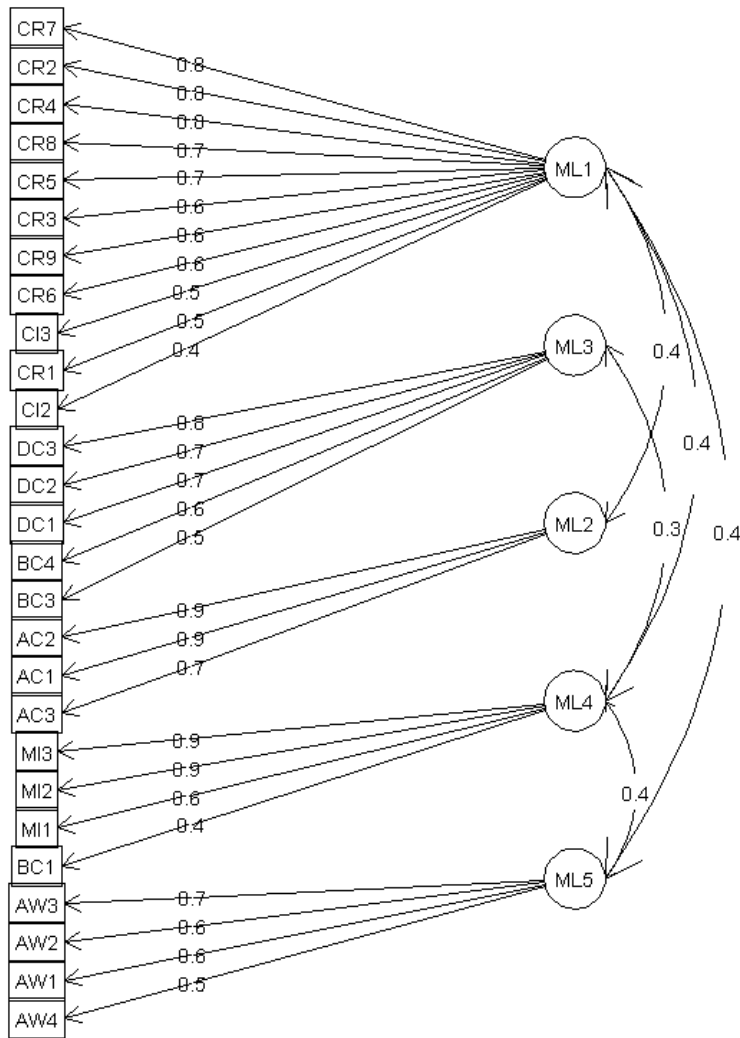
Figure 6.1 Factor model of FLS with standardized factor loadings represented on unidirectional arrows Note: Factors in Figure 6.1 are represented by the following key. ML1 = *Credible Source Challenge*; ML2 = *Feedback Acceptance*; ML3 = *Behavioural Changes and Developmental Actions*; ML4 = *Motivational Intentions*; and ML5 = *Feedback Awareness*; and; See Appendix 3 for a detailed key to items

Internal Consistency and Descriptive Statistics

Subscale scores for both samples in relation to the FLS are reported in Table 6.3 together with internal consistency, reported using Cronbach's alpha. Inter-item correlations are displayed in Figure 6.2 and Figure 6.3 for samples 1 and 2 respectively.

Table 6.3

Descriptive statistics (where values are means and standard deviation ±) and internal consistency (Cronbach's alpha) for the FLS

	Sample 1 (*n* = 321)		Sample 2 (*n* = 356)	
	Mean(±)	α	Mean(±)	α
1. Credible Source Challenge	4.2 (± .67)	.90	4.5 (± .57)	.86
2. Behaviour Development Change	3.6 (± .91)	.81	3.5 (± .90)	.81
3. Feedback Acceptance	3.9 (± .87)	.89	4.0 (± .82)	.85
4. Motivational Intention	4.6 (± .65)	.83	4.7 (± .62)	.83
5. Awareness from Feedback	4.6 (± .65)	.75	4.5 (± .73)	.78

Items endorsed using a 6 point response format (1 = Strongly Disagree, 6 = Strongly Agree).
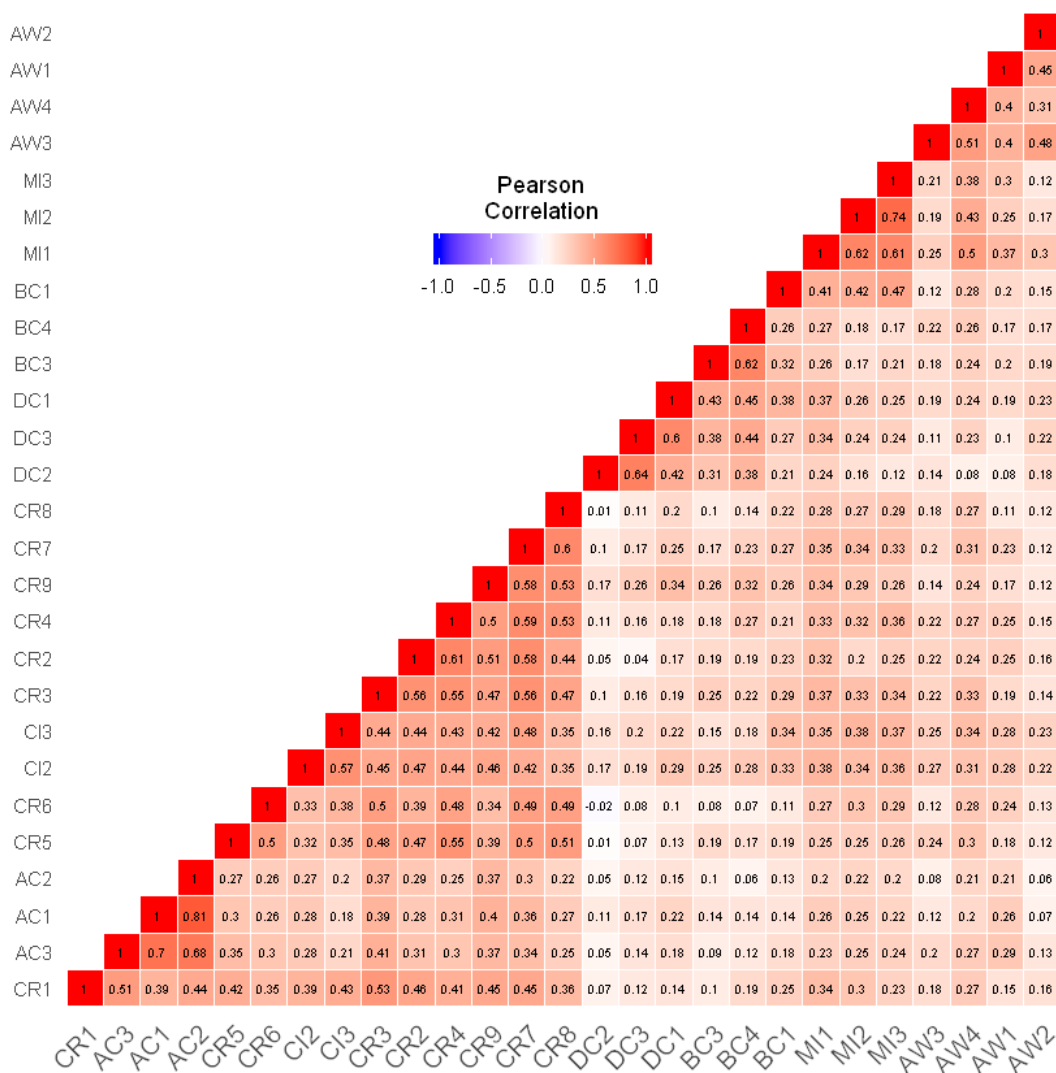
Figure 6.2 Inter-item correlations for EFA
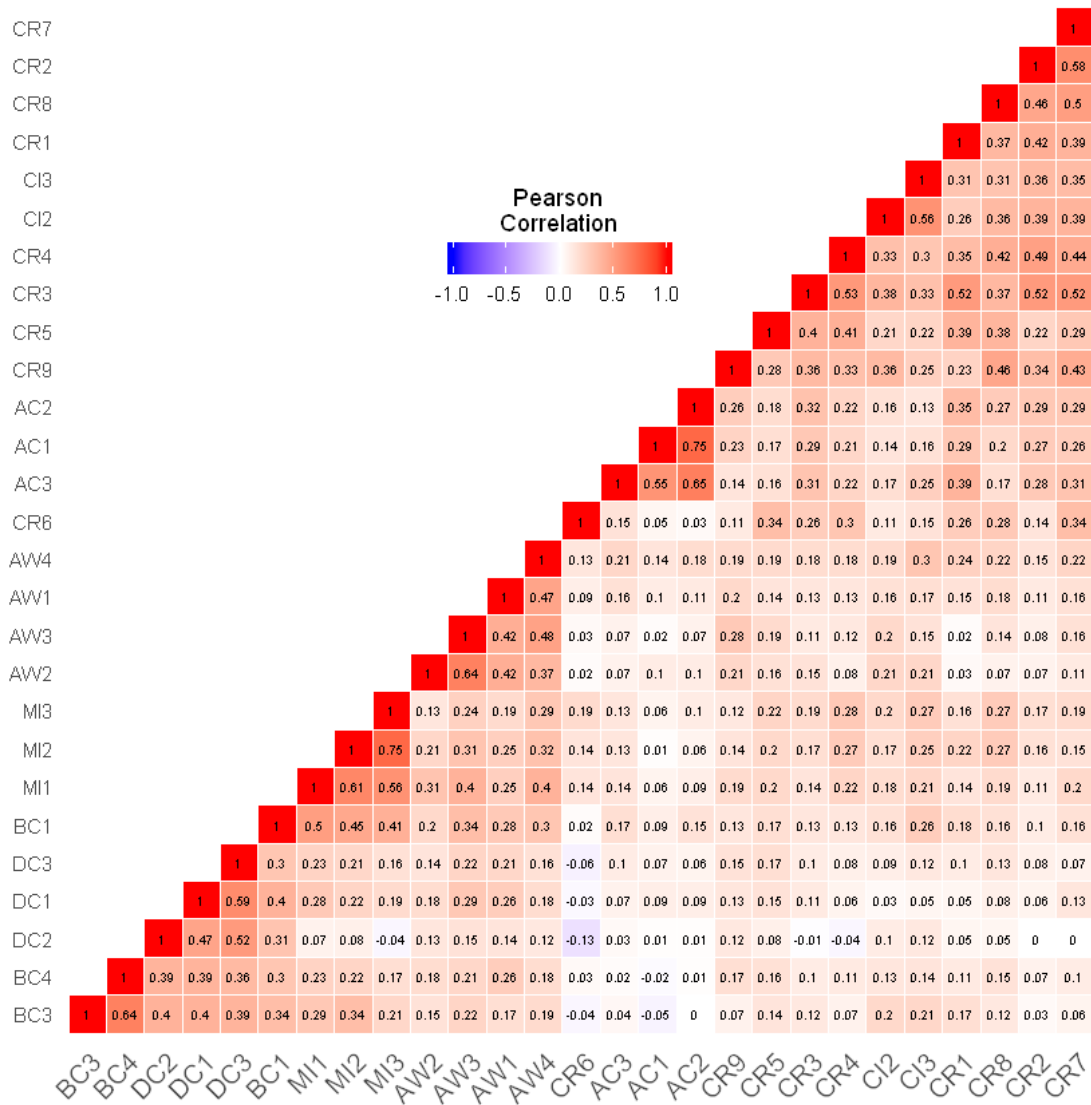
Figure 6.3 Inter-item correlations for LVSEM

Latent Variable Structural Equation Modelling (sample 2)

Model specification

A measurement model was specified that simultaneously confirmed the latent factor structure and examined a unidirectional path through identified factors. In the model specified, from twenty-seven items identified in EFA, eleven were free to load on to the latent factor Credible Source Challenge; five items were free to load on to the latent factor Behaviour and Development Change; four items each were free to load on Feedback

Acceptance and Motivational Intention respectively; and the remaining three items were free to load on latent factor Awareness from Feedback. Following consideration of the factor structure, four tentative paths were specified at the latent variable level. These were that feedback acceptance predicts credible source challenge. In turn, credible source challenge predicts greater awareness from feedback. Subsequently, it was predicted that awareness from feedback will predict motivational intentions. Our final prediction was that motivational intentions will predict the endorsement of behavioural changes and developmental actions resulting from feedback.

The initial iteration did not achieve acceptable fit to the data without modifications. Following inspection of modification indices, a number of items were allowed to covary due to conceptual congruity, see Appendix 3 for a key to items. These include MI2 with MI3, both concern motivations to develop in line with feedback ($cov = .531$, $p < .001$). BC3 with BC4, both items are concerned with seeking out developmental plans ($cov = .483$, $p < .001$); CI2 with CI3, which concern positive challenge interventions ($cov = .407$, $p < .001$). AW2 with AW3 were correlated as they relate to greater self-knowledge and reaction ($cov = .445$, $p = .001$). Standardized factor loadings are presented in Table 6.2 and indicate that items reflected the underlying latent variable ($p < .001$).

Confirming the latent factor structure

Factors and related items identified in data driven analysis were confirmed in the LVSEM model. Table 6.2 includes a summary of factors and related item loadings. Table 6.4 and Figure 6.4 indicate the associations in the LVSEM of the hypothesised paths between latent variables. In addition, summary factor scores and internal consistency coefficients are reported in Table 6.3.

Testing hypothesised paths

All the paths specified in the model were significant ($ps < .001$). In relation to the first path, feedback acceptance positively predicted credible

source challenge ($\beta = .45$) explaining 21% of the variance in the outcome; a second path found that credible source challenge positively predicted learners' awareness from feedback ($\beta = .41$) explaining 17% of the variance in the outcome; a third positive path found awareness from feedback predicted motivational intention ($\beta = .67$) explaining 45% of the variance in the outcome; and the final path explained 22% of the variance in behavioural changes and development actions when regressed on motivational intention ($\beta = .47$).

Table 6.4

Direct paths between latent factors specified in the measurement model

Path	Determinant		Outcome	Standardised estimates (β)	R^2
1.	Feedback Acceptance	→	Credible Source Challenge	.45*	.21
2.	Credible Source Challenge	→	Awareness from Feedback	.41*	.17
3.	Awareness from Feedback	→	Motivational Intention	.67*	.45
4.	Motivational Intention	→	Behaviour Development Change	.47*	.22

* $p < .001$

Following modifications, the final model achieved an acceptable to good fit to the data, see Figure 6.4. Robust fit statistics using the Satorra-Bentler (2010) adjustment with a scaling factor of 1.288 were as follows, normed χ^2 (χ^2 / df) = 1.59, RMSEA (90% CI) = .041 (.035 - .046), CFI = .934, robust TLI = .927, SRMR = .066. For comparison purposes, unscaled maximum likelihood fit measures were again acceptable or good, and are as follows, normed χ^2 (χ^2 / df) = 2.05, RMSEA (90% CI) = .054 (.048 - .060), CFI = .913, TLI = .903, SRMR = .066.
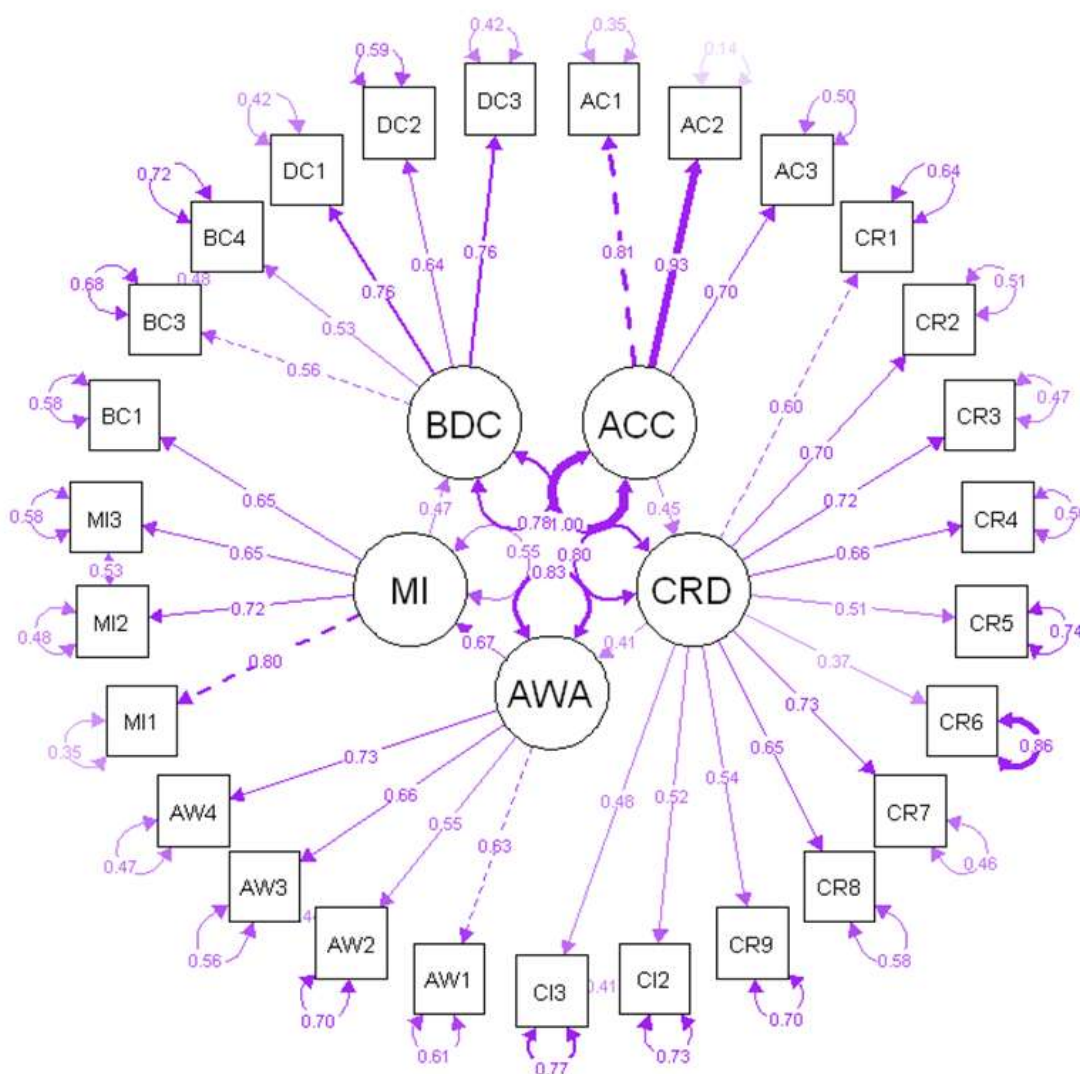
Figure 6.4 Latent Variable Structural Equation Model of FLS with standardized factor loadings (reported on unidirectional arrows), error terms (circled values), and covariances (reported on bidirectional arrows). Note: Factors in Figure 6.4 are represented by the following key: ACC = *Feedback Acceptance*; CRD = *Credible Source Challenge*; AWA = *Feedback Awareness*; MI = *Motivational Intentions* and BDC = *Behavioural Changes and Developmental Actions*; See Appendix 3 for a detailed key to items.

Consideration of Alternate Latent Variable Structural Equation Models

Three alternate models were explored. In the first such model [A1], the first specified path predicted that credible source challenge led to awareness from feedback. In turn, awareness from feedback was allowed to

predict acceptance of feedback. A subsequent path was specified from acceptance to motivational intentions. In the second model [A2], credible source challenge was allowed to predict both awareness from feedback and acceptance of feedback. Both factors, in turn, predicted motivational intentions. A third model [A3] took a similar linear approach to the hypothesised model; however, in this approach credible source challenge was allowed to predict acceptance of feedback, transposing the order in the hypothesised model. Next, acceptance led to awareness, and then in turn to motivational intentions. In each of alternative models, as with the hypothesised model, behavioural change and developmental action predicted by motivational intentions was specified as the final path.

Remaining constant in all models, modification indices suggested the specification of four covariances between item error terms. Two additional modifications were suggested to the first alternate model. The first of these modifications suggested a path between acceptance of feedback to credible source challenge. The second modification suggested a path from awareness from feedback to motivational intentions. These paths reintroduced the suggested directional paths from the hypothesised model. For comparison purposes, fit measures for each model are presented in Table 6.5. Whilst fit measures were equivalent or worse when compared to the hypothesised model, it was noted that none were superior.

Table 6.5

Comparison of robust fit measures for hypothesised and alternative models

Model	χ^2 / df	AIC	BIC	RMSEA (90% CI)	CFI	TLI	SRMR
Hyp	1.59	22613.56	22853.80	.041 (.035 - .046)	.934	.927	.066
A1	1.59	22617.21	22865.21	.041 (.035 - .046)	.934	.926	.066
A2	1.59	22615.41	22859.53	.041 (.035 - .047)	.934	.927	.066
A3	1.65	22641.92	22882.17	.049 (.041 - .056)	.927	.919	.091

'Model' refers to the hypothesised model [Hyp] as presented or the alternative model [A*n*]. Fit measures presented are, where appropriate, scaled.

Summary

The current investigation examined the factor structure of a modified measure of feedback integration. Analyses explored and confirmed five latent factors associated with feedback integration by HE learners. A hypothesis driven model reported at least marginally superior fit to alternative models explored. This indicated a directional path through each of the derived five factors. Acceptance of feedback led to credible source challenge, in turn predicting awareness from feedback. Greater awareness subsequently predicted motivational intentions. Finally, motives predicted action. Both models achieved at least acceptable fit to the data, and the paths between factors represented unique proportions of the variance in the model.

Discussion

The current study refined and validated a measure, drawn from the occupational domain, examining the nature of feedback integration in undergraduate learners. A first data driven approach derived a feedback in learning scale with a five factor structure. The first factor, credible source challenge, addresses the credibility of the source providing feedback and the challenge they provide. Behavioural change and developmental actions, the second factor, represents the learner's desire to take action following feedback. Next, acceptance from feedback considers whether the feedback received is acknowledged by the learner. The penultimate factor represents the motivational intentions in response to feedback. The final fifth factor relates to awareness from feedback, specifically whether learners were more aware of their strengths and weaknesses following feedback. Except where noted, findings largely support factors derived by Boudrias and colleagues (2014). However, a message valence factor, which refers to the learner's perception that the feedback was positive or negative, was discarded during exploratory analysis.

A latent variable structural equation modelling approach was used to address a second research aim. First, the latent factor structure identified in the first exploratory investigation was confirmed. Conjointly, four hypothesised paths were proposed between each of the five latent factors following a consideration of theory and the model indicated by Boudrias and colleagues (2014). Our hypotheses were that learner acceptance of feedback would predict the learners view that the source of feedback provided credible challenge. Subsequently, we proposed that trust in the source of feedback would predict awareness in learners. In turn, our third hypothesised path indicated that the level of awareness would predict learners' motivational intentions in respect of feedback. The final, fourth path hypothesised that behavioural changes and development actions in response to feedback would be predicted by motivational intentions. Supporting our suggestions, significant associations were seen for all hypothesised paths with medium to large effects seen across all paths.

Although one model is reported in the current study, alternate explanatory models were examined following good practice (Crede & Harms, 2019). Whilst some indication of equivalence in fit measures was observed between models, none of the models examined were superior to the hypothesised model. The hypothesised model is parsimonious and aligns well with Boudrias and colleagues' (2014) previous findings. Nevertheless, future research should consider that alternate models may be plausible. Data for the current study are open and as a result developments in theory may give rise to further testing, as recommended by Crede and Harms (2019).

Findings from the current study speak to five factors associated with feedback integration in tertiary learning. These findings are particularly noteworthy as they highlight the importance of raising learner awareness of strengths and challenges as a central role for intervention. Awareness from feedback is seen to relate directly to learners' motivational intentions, which accounted for the greatest proportion of the variance in the path model. Learner motives led to behavioural changes and developmental actions endorsed by learners following feedback. Further, these findings suggest that

learners may seek out additional feedback and action plans from credible sources of information. This understanding may come from a credible source, such as a tutor or a trusted peer. The relationships seen in the current study appear to address the three considerations highlighted by Hattie and Timperley (2007). These suggest that to integrate feedback learners need to understand where and how they are going, together with an evaluation necessary to operationalise awareness into action (Ajjawi et al., 2018). Although learners endorsed motivated intentions and actions, being motivated to carry out an action may not necessarily lead to the desired action during goal striving (Gollwitzer, 1999). However, in models of self-regulation (Zimmerman, 2000), adaptive evaluations and the resulting motivations following task performance are suggested to lead to the setting of more challenging and specific subsequent goals. Although this is untested in the current study, feedback data from a trusted, reliable source only has utility if it is acted upon. In some undergraduate learners self-regulatory skills are not well developed (Zimmerman & Paulsen, 1995), it is further suggested that the learners' ability to control the course of action may increasingly be compromised (Duckworth et al., 2019). Results indicate that tertiary learners equipped with greater awareness subsequently hold greater motivational intentions. In turn, motivations are associated with subsequent intention to take action.

Supporting recent theoretical models, factors including the increasing self-awareness, goal setting, and engagement and motivation are also established as central forces in recent models of feedback recipience (Winstone, Nash, Parker, et al., 2017; Winstone, Nash, Rowntree, et al., 2017). This addresses the idea of motivational intention in the current model. Although goal setting is not addressed directly in the current approach, HE learners appear to possess a sense of where they are going in their endorsement of behavioural changes and developmental actions resulting from feedback. Goal setting and volitional action have been endorsed as a central pillar of the SAGE model of feedback integration (Winstone, Nash, Parker, et al., 2017). Evidence to support the importance of this assertion is somewhat limited, as noted by the authors. Goal setting has previously been

highlighted as a possible intervention route, for example, to promote learner response to feedback (Evans, 2013), and as a route to bolstering agentic beliefs such as self-efficacy (Morisano, 2013; M. Richardson et al., 2012). Despite there being a prima facie case to support the role of goal setting, this remains a fruitful area for investigation; as a result, we highlight the need for further research in this area. As indicated, the findings of the current study appear to align well with models of self-regulated learning which suggest reciprocal causality between planning, action and evaluation (Panadero, 2017; Zimmerman, 2000). These results also align well with workplace models of self-regulation (Lord et al., 2010). Increasing awareness may lead to greater motivation, which in turn may lead to improved planning processes in a virtuous cycle.

Using the measure developed and validated here for diagnosis and intervention will prove useful as a cost effective route to identifying and addressing maladaptive behaviours. For example, the FLS is a tool that facilitates identification of learners with lower levels of acceptance, trust, awareness, motivational intent, and desire to act in response to feedback. Following identification, addressing suboptimal feedback behaviours using appropriate pedagogies appears to be an effective mechanism to assist learners in developing the evaluative judgements that are necessary to optimise learning (Winstone et al., 2019). The ability to be able to accept feedback, in particular how this is associated with the ability to trust the source of challenge and feedback, was endorsed in the feedback measure. These relationships have previously been discussed in terms of modelling feedback behaviours and building improved relationships, which are often perceived as distant (Carless & Boud, 2018; Evans, 2013; Pitt & Norton, 2017). The SAGE model also highlights the importance of interpersonal characteristics as a route to proactive feedback response (Winstone, Nash, Parker, et al., 2017). The emergence of five key factors in the FLS operationalise an economic model of feedback integration that appears to assist in understanding student responses to feedback.

Limitations and future research directions

Despite providing a parsimonious model of feedback integration, the current study has its limitations. The model of feedback integration reported here represents one model of feedback integration, it is possible that any number of other hypothetical models may account for the data just as well, and possibly better. Although this approach aligns well with theories of self-regulated learning (Panadero, 2017; Zimmerman, 2000), we are not aware of similar measures that can be used to measure perceptions and changes in attitudes and behaviours over time. A strength of the approach is that having modified the original measure, many of the items and similar latent factors were retained. In addition, similar paths are seen. This suggests a common approach between the domains in integrating feedback, which will benefit HE learners when they enter the graduate workforce. We increased statistical power across both samples, when compared to Boudrias and colleagues (2014) original measure. This allowed for latent variable estimation, which was not possible in the source measure, and potentially provides a more robust model in the current investigation. The current results are, however, derived from two separate samples of psychology students within the same tertiary education setting. This, and the gender imbalance, may limit the results. As a result, examining this measure in other disciplines, with other samples of students, will further establish its utility as a measure of feedback integration within HE learning. We attempted to broaden the participant base, by recruiting from undergraduate learners at different stages of their undergraduate career, albeit these were drawn from the same setting and course. Finally, findings here are based on two cross-sectional samples of data, whilst tentative causal paths were specified in the second model, only longitudinal or experimental research can support suggested regression paths seen in the path model.

Conclusion

In summary, the current investigation indicates that the FLS represents a valid and reliable measure of feedback integration behaviours in undergraduate learners. Three aligned practical implications of the FLS are suggested. Firstly, the measure may assist in identifying active components associated with feedback integration in undergraduate learners. Using the FLS for identification of behaviours and change over time, as a meaningful mechanism for capturing gains in learning also provides a useful tool to promote further research. In addition, using the FLS as part of interventions and pedagogies to raise learner self-awareness may support learners to take the steps necessary to evaluate and make necessary changes to optimise learning. Future research is necessary to validate the FLS as a reliable tool in other tertiary settings to determine if the measure has utility beyond the current setting and domain of learning. However, these ideas are consistent with theory (Panadero et al., 2017; Zimmerman, 2000), and have important implications for practice by providing an supplementary tool to encourage integration of feedback in HE learners (Evans, 2013; Nicol & Macfarlane-Dick, 2006; Winstone, Nash, Parker, et al., 2017).

CHAPTER 7 – The Development and Validation of the Goal
Setting in Learning Scale (GLS)

Abstract

Mastery and performance academic goal orientations are well documented proxies of goal setting, however, these hold weak associations with academic endeavours (M. Richardson et al., 2012). In the occupational domain, goal based cognitions, such as goal difficulty and clarity, are more prominent. This presents an opportunity to develop an established measure of goal setting used in occupational settings to determine whether it has utility in relation to academic endeavours. Two separate samples of undergraduate students (n = 380; n = 190) from the University of Liverpool completed the Goal Setting in Learning Scale (GLS). Thirty-six items derived from two goal setting questionnaires, the Revised Goal Setting Questionnaire (Kwan et al., 2013) and Student Goal Behaviour Questionnaire (White, 2002), indicate a ten factor structure. Exploratory (EFA) and Confirmatory Factor Analyses (CFA) were conducted. This was followed by a simulated Structural Equation Modelling (SEM) approach to generate 1000 random datasets to test the robustness of the confirmed model. In the current sample, EFA revealed that only two factors provided the best account of the data. Goal clarity, with five items, and goal difficulty, with four items, held good internal reliability ($\alpha s > .70$). CFA supported the exploratory model, with good fit measures, replicating those for EFA. In turn, the simulated SEM supported the robustness of the model demonstrating acceptable mean fit measures as a minimum. The GLS provides a valid, reliable tool that can be used to understand goal based cognitions associated with academic endeavours. The endorsement of goal difficulty and clarity here aligns well with the most essential cognitive substrates of goal setting theory (Locke & Latham, 1990a).

Introduction

Goals are central organising mechanisms and have been described as critical to self-regulated learning (Winne, 2013). Goal setting research from a HE learning perspective is scant and the resulting association with other variables of interest, such as self-efficacy, in the preparatory phase of self-regulated learning are not well understood (Richardson et al., 2012; Travers, Morisano, & Locke, 2015). Much research in relation to goal setting employs either achievement goal orientations (Payne et al., 2007; Wood et al., 2013) or grade goals (M. Richardson et al., 2012; Zimmerman et al., 1992) as proxies of goal setting. Where goal orientations describe the why and the how of situated orientations, in particular in relation to conceptions of ability, goal setting, focuses primarily on motivation (Kanfer et al., 2017; Seijts et al., 2004). Additional benefits of goal setting are also seen, in that difficult goals which are also specific, require a search for different strategies (Seijts & Latham, 2005). Some researchers report that goal orientations form part of the general network of constructs that surround motivated performance, however, they do not possess the specificity of set goals (Wood et al., 2013). Whilst goal orientations may have some motivating power, where these are employed in research, the utility in performance terms is known to be weak, perhaps due to the conceptual stability (Forsythe & Jellicoe, 2018; Payne et al., 2007). Although goals, developed in the occupational domain, and goal orientations, developed in the education domain, bear a close relationship and form major components in the preparatory stages of self-regulated learning (Seijts et al., 2004). In the case of grade goals, relatively few studies have investigated these understandings (M. Richardson et al., 2012), and they are proposed to have greater effect where outcomes are narrowly defined rather than global achievement outcomes such as GPA. Thorough task analysis and strategic planning and indicated in the forethought stage of Zimmerman and Moylan's (2009) phasic model of self-regulated learning may not be well accounted for by these proxies of goal setting.

Setting a goal requires the learner to make a prediction. This requires learners to understand the criteria for success and to predict the level they expect to perform at. Goal setting theory, developed inductively by Locke and Latham (1990a), continues to be one of the most compelling motivational theories in occupational research. The theory suggests that specific goals with an appropriate level of difficulty provide greater levels of motivation than no goal, or vague or easy goals. Goals are mediated by focus, effort, persistence and strategy which combine to predict performance (Wood et al., 2013). When levels of goal commitment and difficultly are high, performance is proposed to be at its highest (Klein et al., 1999). For example, Vieira and Grantham (2011) found that high levels of free will led learners to set more difficult goals when they were mediated by levels of self-efficacy and goal commitment. The measure of goal difficulty used by Vieira and Grantham was developed for the research and had no reported level of reliability and validity. Structural goal measures, such as self-efficacy and goal difficultly, appear to support motivated performance during the initial stages of task planning. Associations between goal setting and self-efficacy have been tentatively supported by Richardson and colleagues (2012) in academic endeavour, however, the evidence supporting these ideas is scant.

Setting a goal, however challenging, does not necessarily lead to action. Some authors suggest that clarity of goals, in particular, contrasting desired future reality with the reality of a given situation leads to greater levels of energisation during goal pursuit, speaking to the moderating role of focus in goal striving (Kappes & Oettingen, 2011; Oettingen, 2012; Oettingen et al., 2013). However, the authors indicate that the notion of mental contrasting has not been rigorously examined in relation to levels of task or goal difficulty. Such reflections in terms of difficulty level and clarity during goal setting therefore appear to provide facilitative mechanisms for action in the task performance phase. This proposal is supported by Wood and colleagues (2013) who propose that when specific challenging goals are present, greater strategic effort, such as developing the focus and motivated strategies, contribute positively to performance. Sitzmann and Ely (2011) also support the suggestion that strategies associated with self-regulation

have an additive effect to performance. However, self-regulatory strategies show weak or non-existent associations with goal orientations. This evidence provides additional support for the central pillars of Locke and Latham's theory and in particular in relation to clear and difficult goals (1990a).

Research on the practice of goal setting within Higher Education has received relatively little attention. However, a small number of investigations have provided tentative, but informative findings. For example, in a group of students deemed as being at risk, Morisano and colleagues (2010) found that students exposed to a goal setting intervention enjoyed higher performance, lower levels of negative emotions and were more likely to fulfil their course obligations. Here students were encouraged to set specific goals which were personally salient. Researchers proposed that the greater confidence derived from goal achievement could spread to other domains but were noted in particular in academic achievement. These findings were supported in a further study using the goal setting model used by Morisano and colleagues, set within a 15 week self-reflection paradigm (Travers et al., 2015). These subsequent authors found that the complex mix of 'growth goals' set during the programme was reported by learners to have positive and self-regulatory effects on subsequent performance. Supporting suggestions by Richardson and colleagues (2012), goals were suggested to contribute towards higher levels of self-efficacy and lower levels of negative emotionality experienced by learners. Subsequently, learners reported setting increasingly more challenging goals.   Another self-regulated learning training programme with a focus on goal setting, however, did not provide such compelling results (McCardle et al., 2017). During training, learners focused on single academic goals of short duration. Despite training in goal setting, students set vague goals that focused on behaviours, such as the intention to set a goal, rather than clearly focused actions. Despite refinements to the programme in a second study similar approaches were seen and students set goals that mirrored prescribed goals within occupational domains. Such extrinsically focused goals are suggested to be related to lower levels of motivation (Tempelaar et al., 2015; Vansteenkiste, Lens, & Deci, 2006). McCardle and colleagues (2017) considered that

students might have sacrificed specificity in their written narratives as goals were little more than placeholders for goals and that the learners in fact possessed clearer cognitive representation of goals than those recorded, perhaps suggesting that measuring unobserved goal cognitions may benefit understanding. In a final examination of goal setting approaches, Acee and colleagues (2012) asked one hundred and thirty learners to set twenty goals each. Learner goals, when classified according to their goal related mechanisms. Goal specificity was the only positive associate of GPA as an outcome. Controlled, or extrinsic, motivation was the sole negative associate in the model, somewhat mirroring McCardle and colleagues' results.

The evidence reviewed above provides tentative and useful insights from goal setting interventions. In the main findings support the role of specific, clear of goals and underlines the importance of these within self-regulated approaches and related outcomes. The reported investigations employed a mixture of methodologies, mostly being biased towards qualitative research. As a result, such investigations may limit the wider utility of the findings from these investigations, as the samples used here are heterogeneous in nature as they range from at risk undergraduate to postgraduate learners. In most cases here investigating and accurately capturing the cognitions associated with students' goals, is a resource intensive process. Therefore, using a cost-effective measurement instrument to understand learner perspectives associated with goal setting might also provide a solution. However, measures of this nature seem to be largely absent in education research, or, as noted previously, proxies are used which may lack specificity or conceptual clarity and may therefore lack utility.

Attempts have been made in the occupational domain to develop measures to understand the cognitive and behavioural factors associated with goal setting (e.g. Kwan et al., 2013; Lee et al., 1991; Locke & Latham, 1984), However, these developments may have been limited by incomplete reporting of psychometric properties of such scales and model fit (Kwan et al., 2013). The Goal Setting Questionnaire (GSQ) measures structural factors associated with goal setting including the specificity and difficulty of

goals, together with facilitating factors including supervisor support, worker participation, rationale and feedback (Lee et al., 1991). Later additions to the GSQ included dysfunctional qualities of goals, goal stress and goal conflict added (Lee et al., 1991). This followed suggestions that goals could result in negative consequences, including increased risk taking and decreased co-operation (Ordóñez et al., 2009).

Kwan and colleagues (2013) subsequently examined the ten factors of the GSQ along with a goal difficulty measure referencing a typical co-worker (Lee & Bobko, 1992). This revised measure was then subjected to confirmatory factor analysis across two samples of Chinese and American participants. Factors included supervisor support / participation, goal efficacy, goal rationale, goal clarity, use of goal setting in performance appraisal, tangible rewards, goal stress, goal conflict, organisational conflict, dysfunctional effect of goals, and goal difficulty. Acceptable fit to the data was seen in both samples, and except for goal efficacy and goal conflict in the US sample, all factors reported acceptable reliabilities. Moderate relationships were seen between the factors indicating their separability. In addition, the relationships were examined in relation to goal commitment due to associations with specificity and difficulty (Klein et al., 1999). A positive relationship was seen between goal specificity and goal commitment, as expected, however a negative relationship to goal difficulty was seen. However, the negative relationship between goal commitment and goal difficulty was not necessarily unexpected as a result of a scarcity of research investigating this relationship.

In academic settings measuring goal behaviours and cognitions has, in large part relied on the ability conceptions bound within goal orientation. This may be inappropriate as concerns conceptual clarity and measurement are a concern in relation to goal orientations (Morisano, 2013), and they may not predict self-regulated learning behaviours well, as previously indicated (Sitzmann & Ely, 2011). There has been a previous attempt by White (2002) to develop a goal setting questionnaire for a HE audience based on Locke and Latham's (1990b) iteration of the goal setting questionnaire. However,

this development was based on an earlier version of the GSQ which at that point had been subject to one revision. White modified the measure, terming it the modified goal setting questionnaire (MGSQ), for an academic audience. White's primary research aimed to employ the MGSQ to examine the convergent validity of a separate measure being developed, the student goals and behaviour questionnaire (SGBQ). The SGBQ was tested using principal component analysis, in a sample of 100 HE learners, and has limited information on psychometric properties. However, the SGBQ had a problematic factor structure. Many of the components derived represented by one or two items, and eight of the ten components held low, or morbidly low reliabilities. In addition, item response formats were also problematic, with lack of consistent response options between factors. This may be why the SGBQ has rarely been cited again in the literature. A more interesting measure, the MGSQ was consigned to an appendix of the White (2002) paper. The psychometric properties and the utility of the MGSQ remain unexplored in academic HE audiences. In addition, the GSQ itself has subsequently been subject to revision (Kwan et al., 2013). This error of commission presents an interesting problem and an opportunity, as the GSQ has some pedigree in the occupational literature and does not have the issues that appear to be present in relation to the SGBQ presented by White (2002). Further, there appears to be a place for a measure that would capture salient learner goal cognitions.

Considering the measurement issues noted and the evidence summarised above focusing on goal setting and self-regulation interventions (e.g. Acee et al., 2012; McCardle et al., 2017; Morisano, 2013; Panadero, 2017; Travers et al., 2015), it appears that there may be value in developing a cognitive and behavioural measure of factors associated with goal setting. Developing such a measure may provide utility in clarifying understanding of the factors that operate within the nomological network that surrounds self-regulated learning (Panadero et al., 2018). In particular, answering the call to develop greater understanding of the association between goal setting and self-efficacy in tertiary academic endeavour (M. Richardson et al., 2012). Considering these relationships alongside those that operate in the predictive

space that precede and support learning, such as personality factors, would appear to have utility (Ackerman et al., 2011; Panadero, 2017). A behaviourally anchored measure of goal setting may also help to advance understanding of the development of knowledge, skills and attitudes over time, indicating how self-regulated gains in learning are secured. Assuming such a behaviourally anchored measure has sound psychometric properties, using this for identification and intervention, would provide a cost-effective tool that can be used by educators at scale (Schippers et al., 2015) to assist learner development.

Method

<u>Participants</u>

Two pools of participants were recruited to examine the constructs using data driven Exploratory Factor Analysis (EFA), different methodologies were employed for both samples. The first sample of 402 second year learner registered on a half year psychology module was given the opportunity to participate within the frame of a larger research process. Incomplete responses were omitted, reducing the sample to 389 participants. In addition, 9 outlying cases were excluded using a cut off criteria determined by Mahalonbis' distance (Kline, 2015). The resulting 380 completed cases were used in EFA. Participants were typical of samples recruited from undergraduate psychology populations 86% of participants were female, M_{age} = 20.29, SD_{age} = 3.58.

The second sample, again a convenience sample, of 190 first year students were recruited using an experimental participation scheme. Female participants made up 83% of the sample and were M_{age} = 18.98, SD_{age} = 1.95. These data were employed in Confirmatory Factor Analysis (CFA). On this occasion, data were collected in exchange for nominal course credit. Both datasets were subsequently pooled to provide a base sample for a simulated CFA.

Design

The current study employed structural equation modelling (SEM) to explore two pools of responses to determine the factor structure of the GLS.

Measures

The Goal Setting in Learning Scale

A 36-item measure was employed to examined goal behaviours and cognitions associated with learning. The items employed in the measure were derived from three key sources found in the literature. The first of these, typically used in occupational research, is the Revised Goal Setting Questionnaire (r-GSQ) (Kwan et al., 2013). The second, used once previously, the Modified Goal Setting Questionnaire (MGSQ) (White, 2002) were used to derive items in the current investigation. The r-GSQ was designed for occupation settings and may not be applicable in learning contexts. As an example, one factor relates to the use of goal setting in performance appraisal; as this does not hold face validity to the HE learning environment, statements associated with this factor were not retained. As both measures hold the same origin, the GSQ (Lee et al., 1991; Locke & Latham, 1984), all three were considered in deriving a pool of domain appropriate statements for use in the current study. Appendix 4 compares the three scales described here, the final items employed in the measure used in the current study are emboldened. As a result, three broad classes of goal cognitions or behaviours, speaking to ten possible factors were explored in the current study. Broadly, these include enabling conditions, understanding, and challenges associated with goals. For *enabling conditions* that support goal setting processes, *Tutor Support*, speaks to the facilitative support provided by tutors or academic advisors in relation to goal pursuit; *Organisational Facilitation*, the extent to which the organisation

provide enabling conditions; *Goal Efficacy*, relates to a student's capabilities associated with their ability to organise the actions necessary to achieve a goal, and *Tangible Rewards*, are direct or indirect desires the individual perceives to result from goal striving. *Understanding* considers how one relates to the motivational drivers associated with goal directed behaviour. Specifically, *Goal Rationale* relates to those causal factors that drive the need for the goal, where *Goal Clarity*, ensures a clear understanding of goals as an entity. Finally, *challenge* relates to aspects of goal striving that may be deleterious to goal achievement. *Goal Stress* indicates the extent to which a student believes that pursuing goals cause them to experience anxiety; *Goal Conflict*, relates to the congruity of goals to each other and individual interests; *Dysfunctional Goals*, are those that drive risky or poor choices. *Goal Difficulty* is an individual's perception of the extent to which the goals they have set provide greater challenge, requiring the recruitment of greater level of problem solving and cognitive ability, and effort when referenced to others experiencing similar levels of challenge. Internal consistency for the scales has been reported by the authors of each scale except for the MGSQ. Across three samples, internal consistency ranged from $\alpha = .71 - .91$. Five subscales across three samples, exhibited marginally lower levels of reliability, between $\alpha = .63 - .69$, a full summary is contained within Appendix 4 for a full summary.

<u>Procedure</u>

Both samples of participants were requested to complete a version of the survey online, using the Qualtrics (2018) online surveying platform. Participants read an information sheet and indicated consent to participate in the study. The first sample was drawn from participants undertaking a related pedagogical project. As part of this project, students were furnished with automated feedback reports, designed to debrief participants on summed scores of the measures of interest, fostering individual reflection and greater self-awareness. Support to enable interpretation of feedback reports was made available for all students. The study received ethical approval from the relevant University of Liverpool ethical review board.

Data analyses

All analyses were conducted in an R environment (R. Core Team, 2013) using Jupyter (Kluyver et al., 2016) notebook architecture.

Analysis checks and data preparation

Participant ratings of the GLS, with the exception of those items related to goal difficulty, were endorsed using a 5-point response format; with a value of 1 to 5 (1 = Strongly disagree, 5 = Strongly agree). Higher scores related to endorsement of each of the item. Reverse scoring was necessary in some cases to ensure that inter-item correlations remained positive. Four goal difficulty items again employed a 5-point response format. Participants to considered 'when compared to the average student in the same level of course and experience as you, the goals that you have in relation to this students would require: (1) no challenge to (5) extreme challenge; (1) almost no effort to (5) enormous effort; (1) no thought or skill to (5) an extreme degree of thought and problem solving skill; and (1) very little persistence and tenacity to (5) an enormous amount of persistence and tenacity. GLS items were assessed for normality. Sampling adequacy was assessed using the Kaiser-Myer-Olkin (KMO) statistic. Bartlett's test of sphericity was also used to assess whether inter-item correlations were sufficiently large to continue with EFA.

Approach to Structural Equation Modelling

A variety of measures were used to determine model fit. These comprised the Normed χ^2 statistic (χ^2/df) (S. Ullman, 2001); the Tucker Lewis Index, and the Comparative Fit Index (TLI; CFI; Bentler, 1990; L. Hu & Bentler, 1999); the Root Mean Square Error of Approximation (RMSEA; MacCallum et al., 1996); and Standardized Root Mean Square Residual

(SRMR; L. Hu & Bentler, 1999). Normed χ^2/df less than two (S. Ullman, 2001), and TLI and CFI above .90 (Bentler, 1990), are considered acceptable. RMSEA values indicate a good- ($<$ .05), fair- ($>$ .05, $<$ .08), mediocre- ($>$ .08, $<$ .10) and poor- fit ($>$ .10) respectively (MacCallum et al., 1996). SRMR less than .08 are deemed a good fit (L. Hu & Bentler, 1999).

Exploratory Factor Analysis (Sample 1)

The *psych* package (Revelle, 2016), was used to conduct EFA. A combination of approaches was taken, using a maximum likelihood factor extraction method, to derive the final factor solution. Firstly, parallel analysis (Horn, 1965) was employed alongside a visual inspection of scree plots (Cattell, 1966), to determine the number of factors to extract. Low levels of variance around the elbow of the scree plot indicated ambiguity, As a result, the Jolliffe (1972) criteria was selected as the Kaiser criterion (i.e. retaining eigenvalues $>$ 1) may not always represent the most accurate cut-off threshold when determining factors to retain (Costello & Osborne, 2005). An oblique (oblimin) rotation was employed in the analysis as factors were expected to correlate (Vogt & Johnson, 2011). Where factor loadings were less than .40 at each iteration, items were removed to derive an appropriate solution (Costello & Osborne, 2005). Finally, theory was considered in determining the appropriateness of the derived model.

Internal Consistency and Descriptive Statistics (Sample 1 and 2)

Reliability of the GLS was assessed using Cronbach's alpha, here a lower bound estimate, $\alpha = .70$, is considered acceptable (Nunnally & Bernstein, 1994). The *psych* package (Revelle, 2016) was used to calculate descriptive statistics and reliability estimates for the factors identified during EFA.

Confirmatory Factor Analysis (Sample 2)

The *lavaan* package (Rosseel, 2012) was used to perform CFA on the solution with the best identified fit from EFA. Items were free to load onto related latent factors and no restrictions were placed on them. Following initial CFA, model fit was improved by adding covariance between error terms. These adjustments followed consideration of modification indices and theory.

Simulated Confirmatory Factor Analysis

Finally, the package *simsem* (Jorgensen, Pornprasertmanit, Schoemann, & Rosseel, 2018) was used to simulate CFA. To facilitate this approach, the datasets for both samples were collapsed. From the combined data, one thousand random normally distributed datasets, each containing 500 observations were generated. Randomised datasets further explored the factor structure suggested in EFA and supported by CFA. This approach was taken to secure maximum efficiency and robustness of the associated results.

Results

Analysis checks and participant characteristics

With the exception of two variables in Sample 1, and one in Sample 2, Skewness and Kurtosis values were between -2 and 2 (Lewis-Beck, Bryman, & Liao, 2003). As these values were within the tolerances indicated by Kline (2015), a decision was taken to proceed without transforming the variables in question. The KMO statistic for the model was above the .50 threshold (KMO = .74) and Bartlett's test of sphericity was significant ($p < .001$). Participant characteristics for sample one and two are reported in Table 7.1.

Table 7.1

Characteristics of participants in each group. Values in parentheses represent the standard deviation (±SD) of the mean.

	Sample 1 ($n = 380$)	Sample 2 ($n = 190$)
Females : males	325 : 55	157 : 33
Age(years): mean(±SD)	20.29 (± 3.58)	18.98 (±1.95)

Exploratory Factor Analysis (sample 1)

An initial approach when considering the factors to extract employed parallel analysis with a maximum likelihood approach. This approach indicated a four factor solution. However visual inspection of scree plots, revealed some ambiguity in the number of factors identified. As a result, reference was made to the eigenvalues (variance explained) for each of the factors, however, the eigenvalue reported for the final factor was morbidly low. A subsequent approach to extract factors used a maximum likelihood approach with an oblique (oblimin) rotation. An acceptable factor structure for the GLS converged across six iterations. In the first iteration of EFA using the eigenvalue > .70 criteria and visual inspection of the scree plot revealed a five-factor solution. However, an unclear factor structure was indicated. Sixteen items reported factor loadings less than the .40 criteria. Following the removal of these sixteen items, a second iteration of the EFA procedure was undertaken, this identified a four-factor solution. Again, this iteration failed to achieve simple structure and necessitated the removal of four further items. A third iteration suggested a three-factor solution, however, the structure remained unclear, again requiring the removal of a further five items that failed to converge successfully. The fourth iteration followed the same pattern of analysis. Two factors were suggested during analysis using the specified cut-off values. One single item failed to successfully load on to one of the two suggested factors. On removing this item, a fifth iteration of the analysis approach commenced. Again, two factors were indicated. However, simple structure was not achieved as one further item failed to load. On

removal, a sixth and final iteration of this data driven approach was undertaken. A two-factor structure converged during the final iteration with nine individual items being retained. Eigenvalues for the respective factors were 2.16 and 1.73. Factor one, made up of five items, references Goal Clarity, accounting for 24% of the variance in the model. Four items loaded on to the second factor, speaking to an individual's estimation of goal difficulty when compared to a typical student, following a course at the same academic level. This second factor accounted for 19% of the variance in the model. Together factors represent a combined 43% of the variance in the model. Factors were weakly and positively correlated ($r = .20$). Item factor loadings are reported in Table 7.2 and diagrammatically at Figure 7.1. The full 9 item GLS and scoring instructions are provided in Appendix A. The final iteration indicated a good to acceptable fit to the data; Normed χ^2 (χ^2/ df) = 1.82, RMSEA (90% CI) = .063 (.004 - .085), CFI = .967, TLI = .938, SRMR = .04.

Table 7.2

Factors, items, and factor loadings for the GLS

Factor	Item	Factor Loadings EFA	Factor Loadings CFA
Goal Clarity	GY5	.708	.793
	GY4	.629	.690
	GY3	.609	.673
	GY2	.490	.548
	GY1	.471	.546
Goal Difficulty			
	GD2	.820	.780
	GD4	.742	.783
	GD3	.704	.719
	GD1	.636	.638

A key to items detailed in Table 7.2 is outlined in Appendix 4.
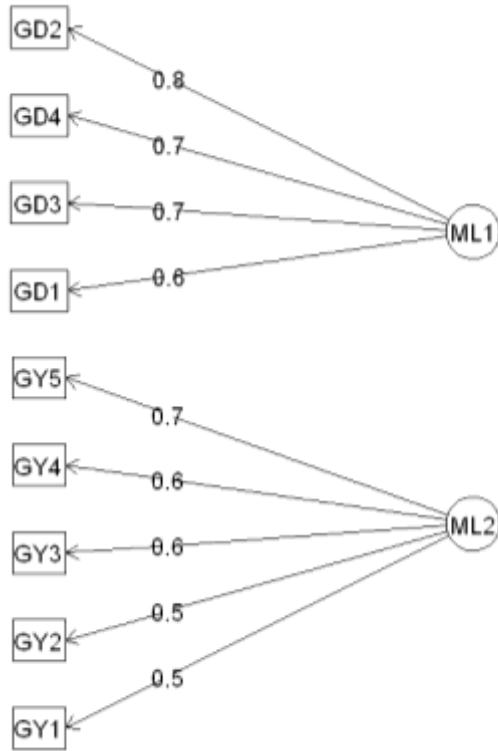
Figure 7.1 Factor model of GLS with standardized factor loadings represented on unidirectional arrows. Factors in Figure 7.1 are represented by the following key: ML1 = Goal Difficulty; ML2 = Goal Clarity. See Appendix 4 for a detailed key to items.

Internal Consistency and Descriptive Statistics

Subscale scores for both samples' endorsement of the GLS are reported in Table 7.3 together with reliability measures, reported using Cronbach's alpha. Inter-item correlations are displayed in Figure 7.2 and Figure 7.3 for samples 1 and 2 respectively.

Table 7.3

Descriptive statistics (where values are means and standard deviations ±) and internal consistency for the GLS

	Sample 1 ($n = 380$)		Sample 2 ($n = 190$)	
	Mean($\pm$)	α	Mean($\pm$)	α
Goal Clarity	3.50 (± .66)	.71	3.50 (± .78)	.79
Goal Difficulty	3.70 (± .59)	.82	3.60 (± .61)	.82
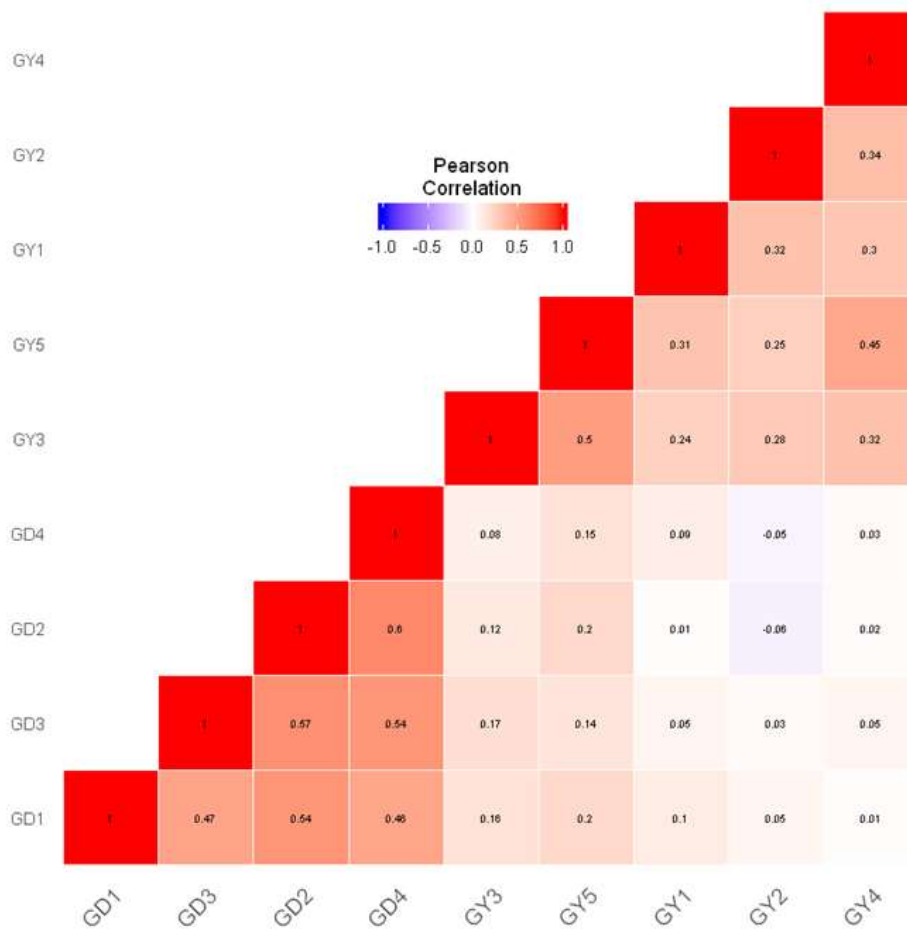
Figure 7.2 Inter-item correlations for EFA
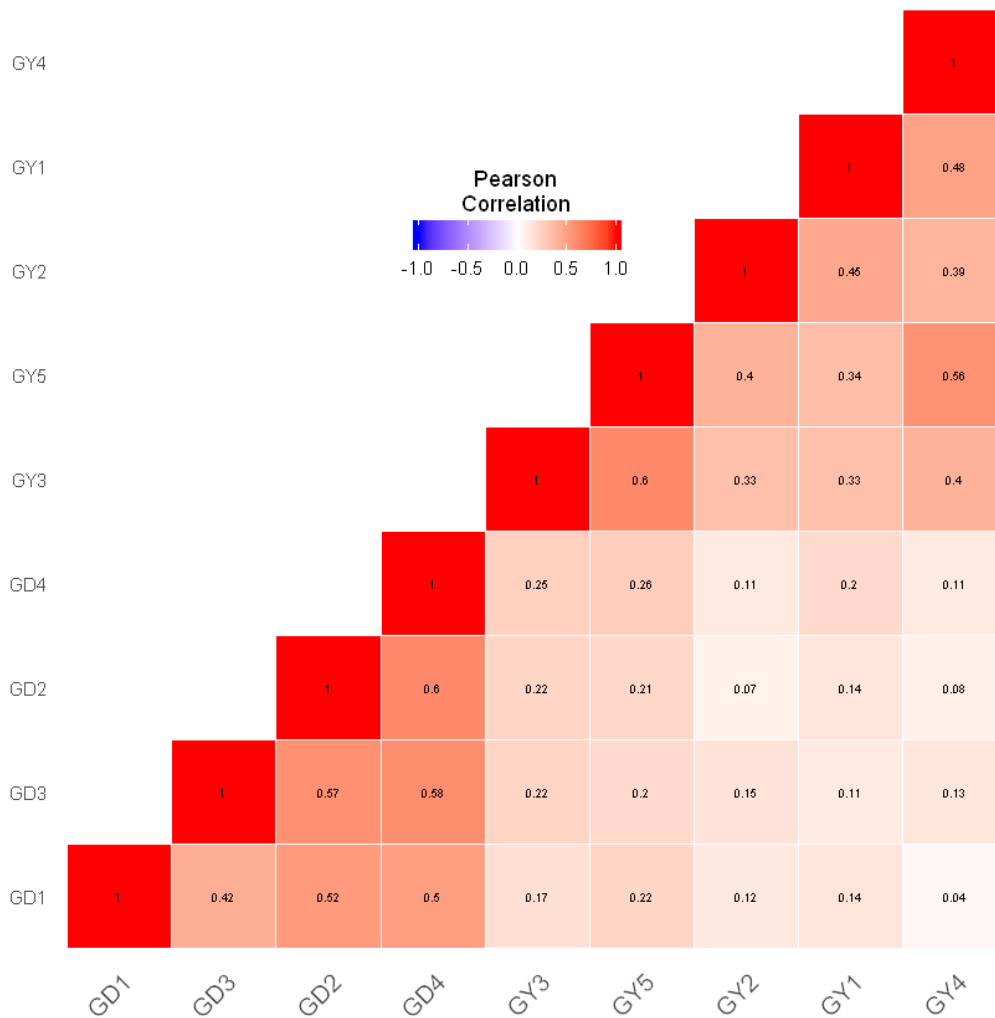
Figure 7.3 Inter-item correlations for CFA

Confirmatory Factor Analysis (sample 2)

Of the nine items identified in EFA, five items were free to load on to the latent factor Goal Clarity, with the remaining four items free to load on latent factor Goal Difficulty. The initial iteration indicated a mainly good, but at least acceptable, fit to the data using the Satorra-Bentler (2010) scaled fit statistics, and without the need for modifications, see Figure 7.4; Normed χ^2 (χ^2 / df) = 1.65, RMSEA (90% CI) = .061 (.025 - .093), CFI = .965, TLI = .951, SRMR = .050. For comparative purposes, non-scaled fit measures using a maximum likelihood approach were reported as follows; Normed χ^2 (χ^2 / df) = 1.82, RMSEA (90% CI) = .066 (.034 - .095), CFI = .960, TLI =

.945, SRMR = .050. Standardized factor loadings indicated that items reflected the underlying latent variable ($ps < .001$).
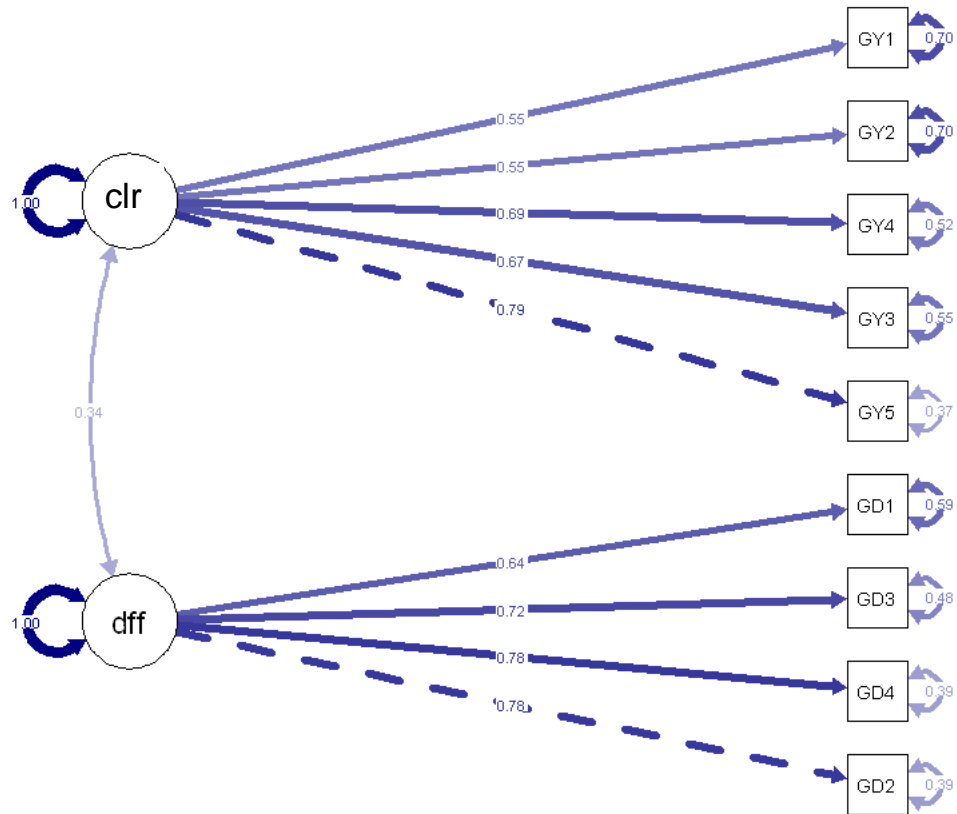
Figure 7.4 Factor model of GLS with standardized factor loadings (reported on unidirectional arrows), error terms (circled values), and covariances (reported on bidirectional arrows). Note: factors in Figure 7.4 are represented by the following key: DFF = *Goal Difficulty*; CLR = *Goal Clarity.* See Appendix 4 for a detailed key to items

Simulated Confirmatory Factor Analysis

To further examine the robustness of the model, both datasets from samples one and two were collapsed and the combined dataset was used to generate one thousand simulated datasets each containing five hundred observations. Simultaneously, these datasets were then employed to examine the fitted factor structure identified above. In Table 7.4 and Figure 7.5 below, fit statistics are presented. Mean fit indices reported were again

mostly good and are at least acceptable. Using an alpha cut-off value of .05, results indicate that in 95% of cases fit indices are largely acceptable. The TLI is marginally below, and the RMSEA being marginally above tolerances those values considered acceptable. Figure 7.5 presents histograms of the fit indices, with the .05 cut-off value indicated with vertical red lines.

Table 7.4

Simulated fit indices from 1000 datasets, mean scores and those at .05 level are highlighted, together with the standard deviation of the mean

	Fit Indices						
	χ^2	AIC	BIC	RMSEA	CFI	TLI	SRMR
0.05	122.37	10636.53	10720.82	0.09	0.923	0.890	0.062
Mean	90.40	10493.75	10578.04	0.07	0.949	0.926	0.051
SD	18.21	93.16	93.16	0.01	0.01	0.02	0.01
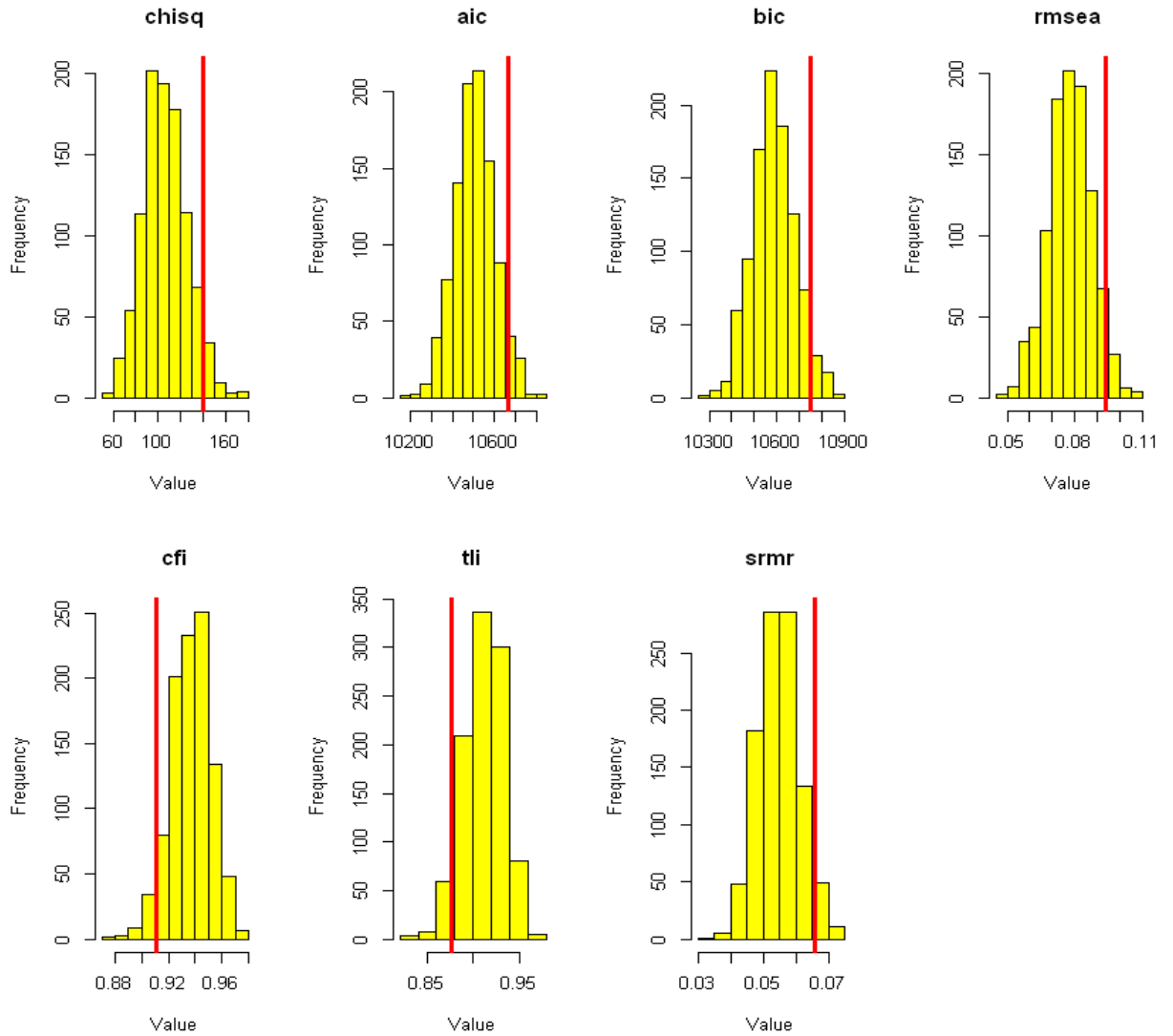
Figure 7.5 Histograms of fit indices from 1000 datasets (.05 alpha values highlighted with red vertical lines) Note: Fit measures as outlined in the design section of methods.

In summary, the results from the current study using data driven, confirmatory, and simulated approaches triangulate to provide support for the goal setting in learning scale. The analyses here, endorsed by tertiary learners, appear to indicate the fundamental role of clear goals that provide challenge.

Discussion

The current investigation sought to develop and validate a measure of goal setting in learning, focusing on tertiary learners. The approach used here was to examine a modified goal setting scale from three sources identified in extant research (Kwan et al., 2013; Lee et al., 1991; White, 2002). In two samples factor analysis was used to investigate salient characteristics associated with goal setting. In the first investigation, a data driven exploratory factor analysis approach was used. Thirty-six items were derived from the modification of three measures which spoke to ten possible factors. Following six iterations of analysis, two dimensions emerged speaking firstly to goal difficulty, and goal clarity; four and five items loaded on to the two identified factors respectively. In the exploratory analysis, fit measures were good, or at least acceptable. Once a model was derived, this model was employed in CFA endorsed by a second sample of tertiary learners. Using robust estimation methods and without the need for modifications, the structure of the GLS was confirmed. Finally, to examine the robustness of the model, the two samples of observed data were pooled. From this pooled dataset one thousand datasets were simulated, each containing five hundred randomly generated observations. The result of this examination indicated that mean fit measures were mostly good or at least acceptable. Further, 95% of the datasets reported mostly acceptable fit measures. Furthermore, both factors demonstrated acceptable internal consistency.

These results are supported by the most fundamental aspects of goal setting theory. Within the occupational domain, it has been consistently demonstrated that fundamental substrates of goal setting theory include difficult goals which are specific (Latham et al., 2016; Locke & Latham, 1990a, 1990b). Whilst early studies indicated the role of difficult goals in the education domain, these findings largely related to relatively short-term cognitive tasks, which may not be directly comparable to the tasks encountered by undergraduate learners. Whilst goals have nominally been investigated in the tertiary learning domain. These understandings relate to

constructs such as goal orientations which are weakly related to performance outcomes and suffer from not insignificant issues relating to their conceptual clarity (Morisano, 2013; Senko & Tropiano, 2016). Goals that are operationalised as grade goals and hold a moderate association with performance (M. Richardson et al., 2012). Resulting from the grade goal association, Richardson and colleagues (2012) indicate in their meta-analysis that goal setting may help promote self-efficacy, which holds the strongest relationship of over 50 non-intellective factors associated with academic performance. This finding is based on a relatively low number of studies and relates to goals that have a performance orientation, for example, "*What is the minimum (i.e., the least you would be satisfied with) percentage grade goal for the next test (on a scale of 0% to 100%)?*" (M. Richardson et al., 2012, p. 357). Whilst the literature is not always clear (Payne et al., 2007), holding such an orientation, is held to be deleterious to performance. Whilst there have been some interesting but mixed findings from goal setting interventions (Acee et al., 2012; McCardle et al., 2017; Morisano et al., 2010; Travers et al., 2015), these have largely supported the central factors found in the current study. Firstly, that specificity in goals is an important predictor of performance (Acee et al., 2012), but this may be sacrificed in the goals that students endorse in favour of an undocumented cognitive representation (McCardle et al., 2017). In two studies reported by McCardle and colleagues (2017) training resulted only in vague goals being reported. On achievement, goals which were set for growth, versus performance, led to greater levels of subsequent of goal challenge (Travers et al., 2015), consistent with goal setting theory. Similarly, such goals also supported greater persistence in those at risk of lower than expected performance (Morisano et al., 2010). Whilst such interventions are theoretically interesting, work to undertake such developmental interventions are evidently resource intensive, from the evidence discussed above. For tertiary educators considering developing self-regulated strategies, this may present a challenge, particularly where time pressure exists within curricula. Therefore, a parsimonious measure that taps into the essential components of goal setting theory such as goal clarity and goal difficulty, may have traction. Such a measure may have utility as a diagnostic litmus test of

important learner cognitions associated with the goals that they hold for themselves, particularly where skills focused on making goals observable are limited.

Despite the number of possible items and dimensions examined, it is interesting to note that neither enabling factors or those associated with challenges were endorsed as factors in the samples of learners in the current study. There may have been a variety of reasons why enabling factors including tutor support, organisational facilitation, goal efficacy, and tangible rewards did not emerge in the current investigation. Higher Education provides a different type of context for learners, with independence being promoted. In these samples, learners may not require the institutional support which the items referenced. Further, the tangible reward seen in employment settings, and which may be related to esteem needs and financial rewards may have less immediate relevance, given the learners' stage of their academic careers. In addition, in the current investigation perspectives associated with goal stress, dysfunctional aspects of goal, and goal conflict did not have salience for the current learner samples. This may because such factors are more typical of the goals seen in workplaces. In the United Kingdom, learners opt for tertiary programmes of study which are congruent with their personal desires. Perspectives such as person-environment fit and its association with levels of job satisfaction and workplace stress, seen in the occupation domain (P. Chen, Sparrow, & Cooper, 2016; Lent & Brown, 2006) may be less relevant for learners in tertiary education because learners undertake a programme of study consistent with their needs. The negative challenges associated with goals in the occupational domain may therefore have less direct relevance.

Limitations and future research directions

A parsimonious measure has resulted from the current investigation, which addresses the most essential dimensions associated with goal setting. Goal clarity and difficulty, and the underpinning items bear close relation to

theory. However, these theoretical notions have been rarely examined in the higher education literature. This omission is in part due to the dominance of the goal orientation literature (Morisano, 2013; Payne et al., 2007; Senko & Tropiano, 2016), which is known to suffer low levels of conceptual clarity. Whilst providing a parsimonious model, this measure was developed in a single tertiary setting and, within this, a single programme of learning. As a result, it may be that the current perspectives are peculiar to the institution or the programme under examination. Further, one in five of the participants across both samples were male. Although there are no grounds to suspect participants cognitions associated with goal directed performance differed by gender, it may be that in other settings with a more equal gender balance that a different picture might emerge. A strength of the current study is that a simulation study was conducted to generate randomised datasets, which were confirmed using structural equation modelling. This speaks to the robustness of the current study. The predictive and concurrent validity of the measure has been examined separately, see chapter seven. However, further research will be necessary across HE domains, to secure the place of the GLS as a measure with utility. In this way, educators may gain greater insight into HE learners cognitions when they consider their goals.

Conclusion

The focus of the current investigation was to develop a measure of goal setting in tertiary learning. Specifically, our focus was to determine whether a measure applied largely in the occupational domain (Kwan et al., 2013), could be successfully transferred to tertiary academic settings. Using exploratory and confirmatory factor analysis across two samples of undergraduate learners, a stable and parsimonious measure was derived. The final nine items of the GLS address two essential factors associated with goal setting theory; goal clarity and goal difficulty (Locke & Latham, 1990a). The GLS also align well with results from recent interventions supporting the importance of goal specificity. The measure may have utility in assisting learners in understanding essential cognitions associated with goals. To

further establish the utility of the GLS, research should examine the utility of the GLS in other domains and within interventions designed to promote gainful learning. Given the suggested importance of goal setting in models of feedback integration (Winstone, Nash, Parker, et al., 2017), and the suggested relationship between goal setting and self-efficacy (M. Richardson et al., 2012) in tertiary education, these research findings provides additional to support this work.

CHAPTER 8 – The Self-Regulatory Nomological Net Associated
with Learning Gains from Feedback

Abstract

The non-intellective factors associated with final academic
performance are well known (M. Richardson et al., 2012; Schneider &
Preckel, 2017). It is less clear how such factors are operationalised by
learners in securing incremental development, and how such factors can be
used to greatest effect by educators. The current cross-sectional study
examined self-regulatory factors associated with feedback integration. Three-
hundred and forty-three tertiary learners endorsed measures associated with
feedback integration, self-efficacy, goal cognitions, and achievement goal
theory once each across three measurement occasions. Findings indicate a
central role for raising awareness of learners strengths and weaknesses in
feedback. Underlining the recursive nature of self-regulation, learners
endorsed greater awareness from feedback when they held clearer goals.
Learners also reported heightened awareness when feedback was received
from credible source that also provided supportive challenge. Awareness
from feedback led to downstream increases in motivational intentions, both
directly and indirectly through mastery approach goal orientations. Providing
fuel for action, motivational intentions are associated with higher levels of
self-efficacy, which were also predicted by a growth mindset and
performance approach goal orientations. Subsequently, adaptive levels of
self-efficacy provide the foundations for clearer goals. Results indicate a
virtuous self-regulatory cycle. The cross-sectional nature of the research
means that tentative causal indications are made, however, results have
clear implications for educators. Providing supportive pedagogies that
promote clear goals may also support learners in both accepting feedback
and importantly harnessing the greater awareness that may optimise
learning. The current findings support models self-regulated learning
(Panadero, 2017; Zimmerman, 2000) and of feedback integration in tertiary

learning (Winstone, Nash, Parker, et al., 2017). Further, these findings lend support to Richardson and colleagues (2012) notion that goal setting, in combination with other factors, has a role in operationalising higher levels of self-efficacy, which is known to be the strongest associate of subsequent academic performance.

Introduction

From a social cognitive perspective, mastery occurs when an individual, and their behaviour, engages with their environment (Bandura, 2006). An agentic, self-regulatory approach requires opportunities to perform tasks and reflect on feedback associated with that performance. This feedback may be self-generated or come from a trusted assessor. Armed with greater awareness the agentic learner adjusts their development course toward mastery by revising or setting goals (Panadero, 2017; Zimmerman, 1989, 2000). This evolutionary perspective is suggested to provide a foundation for gainful learning (Schunk, 1990). This approach requires a multiplicity of socially mediated factors to coalesce to secure optimum performance (Bandura, 2006). Meta analyses report that successful tertiary academic performance is most strongly associated with setting goals for performance, effort regulation, and notably self-efficacy (M. Richardson et al., 2012; Schneider & Preckel, 2017). Nevertheless, moderate relationships are reported. It is proposed that moderate relationships may be as a function of non-intellective variables being pitted with distal performative outcomes, such as grade point average (GPA) (M. Richardson et al., 2012). This supports Bandura's suggestion that confident performance prediction is enhanced when the prediction is proximal to a performance event (Bandura, 2013). As a result, it is suggested that examining relevant associates with performance that is closer at hand may indicate stronger associations (M. Richardson et al., 2012).

Much research examines a narrow range of factors in learners. As a result, there has been a call for research that examines the nomological net of self-regulated learning (Panadero, 2017; Winstone, Nash, Parker, et al., 2017), proposing an approach that supports the integration of feedback. Winstone and colleagues' (2017) SAGE approach postulates that learner 'self-appraisal' (S), 'assessment literacy' (A), 'goal setting and self-regulation'(G), and 'engagement and motivation' (E) are all implicated in integrating feedback and making self-regulated gains in learning. Drawing on this evidence, the current investigation seeks to examine, factors in a

nomological net associated with phasic approaches to self-regulated learning (Panadero, 2017; Zimmerman, 2000). Speaking to the appraisal phase, learner perspectives on feedback examined, within the forethought phase, key perspectives associated with goal setting were examined, and finally in relation to the performance phase perspectives associated with achievement goal theory were considered. These appraisals address Hattie and Timperley's (2007, p. 86) questions, "*where am I going?*", "*how am I going?*", and "*where to next?*".

Feedback at its best supports learners in responding to the question "*how am I going*?" and enables corrective action during or following performance (S. J. Ashford & De Stobbeleir, 2013; Nicol & Macfarlane-Dick, 2006), thereby supporting mastery. An agentic approach requires the learner to engage with evaluative data and make appropriate decisions to maintain progress. All too often feedback interventions are reported to have deleterious effects on performance (Kluger & DeNisi, 1996). For example, two negative feedback experiences in quick succession have been reported to have a morbid impact on novice learners in a medical education setting, leading to reductions in self-efficacy (Cleary, Dong, & Artino, 2015). Having an agentic approach in the learning context requires dispassionate self-evaluation and holding levels of confidence necessary to take corrective action (Bandura, 2006; Joughin et al., 2018). However, research has for many years focused on approaches to delivering feedback, in terms of the content and the characteristics of the feedback message delivered (Evans, 2013). Whilst a transmission approach forms part of the agentic picture in the task environment described by Bandura (2006), this approach largely ignores the individual's agency. During undergraduate programmes, it has been reported that learners hold defensive evaluations in response to feedback (Forsythe & Johnson, 2017). Research suggests that even on graduating that tertiary learners are lacking in the broad base of emotions required to accommodate feedback in a way that secures continuing graduate development (O'Donovan et al., 2016; Pitt & Norton, 2017). Perhaps resulting from this, approaches have recently been proposed that take a holistic approach to managing the self-regulatory feedback journey.

Winstone and colleagues' (2017) SAGE model considers the conditions necessary to support learners to receive feedback well. These conditions address barriers associated with less adaptive approaches to feedback (Winstone, Nash, Rowntree, et al., 2017), and include approaches associated with developing tertiary learners' self-assessment, assessment literacy, goal setting and self-regulation, and engagement and motivation abilities. Further research continues to suggest the importance of the instructor in tertiary setting in fostering meaningful engagement with feedback (Carless & Boud, 2018; Nicol & Macfarlane-Dick, 2006). Recent research has investigated aspects of these integrative approaches, finding that challenging feedback interventions, together with learner motivational intentions and mastery approach goal approaches predict behavioural changes and developmental actions endorsed by learners in response to feedback (Forsythe & Jellicoe, 2018). However, these results relied on preliminary analysis, and broader investigation was called for, to include the role of other factors such as goal setting in managing feedback. A further refinement saw the development and validation of the feedback in learning scale, for tertiary learners. In chapter six, factor analyses using exploratory and confirmatory processes found five inter-related feedback factors. Findings indicated that learners reporting higher levels of feedback acceptance were more likely to trust the source of feedback and the challenge provided, supporting Carless and Boud's (2018) suggestion. Trust was positively associated with greater awareness, and in turn to increased motivational intentions when faced with feedback information. Finally, motives predicted behavioural changes and developmental actions learners reported that they would take in response to feedback. This evidence supports the notion that when well framed, the greater awareness that results from feedback increases learner adaptive motivations to accommodate the changes necessary for incremental development.

Having evaluated feedback, exploring and clearly defining next steps when responding to the question "*where am I going?*", is fundamental to development of agentic mastery. Setting, or revising, a goal provides the fuel for this developmental journey. Within tertiary settings the role of goals has

largely been measured using motivated goal orientations as a proxy for goal setting (Morisano, 2013; Payne et al., 2007). Investigations employing goal orientations have largely yielded mixed results, possibly due to lack of conceptual clarity. Nevertheless, goal orientations have been suggested as an important, but missing, personality level influence in Locke and Latham's (1990b) model of high performance (Latham et al., 2016). Goal setting theory (Locke & Latham, 1990a) is the most influential theory of task based motivation in occupational settings, however, this has rarely been investigated in academic settings, perhaps largely due to the predominance of goal orientations. Researchers have postulated that goal setting has the power to facilitate agentic approaches (M. Richardson et al., 2012), such as self-efficacy, which is known to be slow to change, and where intervening is challenging. The central premise of goal setting theory indicates that setting a specific, challenging goal creates conditions for optimal task performance rather than when a vague, less challenging, or no goal is set (Latham et al., 2016). Investigations of the power of goals in tertiary academic settings have provided interesting but mixed results. Recent investigations examining goal setting interventions suggest that goals have an impact in increasing persistence, performance (Morisano et al., 2010), self-reported confidence and agentic approaches, with increasingly higher goals being set (Travers et al., 2015). However, some interventions have not found such promising results, despite training, two groups of learners continued to set vague goals (McCardle et al., 2017). In this latter study, researchers postulated that the vague goals learners set were merely a placeholder for an unwritten goal held cognitively. It may be that understanding core goal components such as the clarity of learners' goals and the level of challenge they provide may prove informative in understanding the self-regulated approaches used by tertiary learners in a manner that may not be accessible through written representations. In a final investigation, Acee and colleagues (2012) asked learners to set goals and classified the twenty goals according to their specificity, alongside measures of motivation and value. Only the specificity of goals predicted end of semester GPA performance, this suggests the importance of clear goals in determining performance. On the face of it, however, such time-consuming interventions may not be practical, or

possible, in time pressured tertiary programmes. In chapter seven, a measure of goal setting was developed, modifying Kwan and colleagues (2013) revised goal setting questionnaire, tailoring it for use with tertiary academic settings. The goal setting in learning scale (GLS) provides a parsimonious two factor structure measuring learner endorsement of goal difficulty and goal clarity. Understanding how goal setting factors operate following an evaluation of prior performance and work together to support evaluations that contribute to motivation within a self-regulatory network that underpins agentic approaches is an appropriate next step.

Supporting the response to "*where am I going?*", self-efficacy is an agentic perspective which speaks to an individual's confidence in operationalising the resources necessary to perform in a task (Bandura, 1997, 2006). Self-efficacy acts as a foundational influence in self-regulated approaches to learning. Models of self-regulation, such as that suggested by Zimmerman (2000) and Locke and Latham's goal setting theory (Latham et al., 2016; Locke & Latham, 1990a), situate self-efficacy in the forethought or planning stage of performance. Whilst self-efficacy is a fundamental fuel for performance, it is also proposed to be associated with persistence during task performance (Bandura, 1997; Valentine, DuBois, & Cooper, 2004). Further, self-efficacy is dynamically affected by performance. Much research has examined how self-efficacy predicts performance. For example, meta analytic evidence in terms of tertiary performance consistently indicates self-efficacy as the strongest non-intellective associate of academic performance (M. Richardson et al., 2012; Schneider & Preckel, 2017). A recent systematic review of self-efficacy in terms of academic performance, however, found that there was significant heterogeneity in self-efficacy measurement, with low levels of convergence between measures (Honicke & Broadbent, 2016). Further it was found that timing of measurement affected the strength of association, however, this is not unexpected as confidence ought to be at its greatest when it is proximal to performance (Bandura, 2013). Whilst this may indicate challenges with the operationalisation of the self-efficacy construct, largely it performs well over time (Honicke & Broadbent, 2016). Recently, Talsma and colleagues (2018) have proposed that the effect of prior

performance, and presumably learner evaluations of that performance, on levels of self-efficacy as a more fruitful, and underexplored, avenue of enquiry. For example, in adults, these researchers found stronger associations between prior performance and levels of self-efficacy, than the reverse direction of causality which is more often researched and understood. This evidence supports the suggestion that efficacy levels during self-reflective evaluation facilitates future levels of challenge that learners set for themselves, albeit this association is underexplored. Where evaluation promotes efficacy, and confidence, greater challenge and clarity may guide increasing levels of mastery. However, as indicated earlier (Cleary et al., 2015), evaluations following performance may also be deleterious to performance and may predict lower levels of challenge and goals that are more vague in nature, if feedback is not provided within supportive pedagogies. As a result, understanding how self-efficacy mediates the relationship from learner feedback evaluations in terms of goal clarity and goal difficulty would appear to be a sensible line of enquiry. Investigations of this nature may then support clearer next steps for learners and provide an understanding that could lead to meaningful intervention.

Alongside self-efficacy, as a motivating force, it has been postulated that factors associated with achievement goal theory, such as mindsets and goal orientations, bear important relationships to goal directed performance. For example, goal orientations, which largely speak to a mastery or performance orientation, have been postulated to be important during the forethought phase of self-regulatory models (Latham et al., 2016; Zimmerman & Campillo, 2003; Zimmerman & Moylan, 2009). Although goal orientations have also been criticised due their lack of conceptual clarity (Morisano, 2013; Payne et al., 2007; Senko & Tropiano, 2016) and weak level of relationships in terms of performance (M. Richardson et al., 2012). Recent research postulates that goal orientations are less compelling than self-regulatory factors such as self-efficacy, and that more nuanced and complex orientations may provide more compelling explanatory power (Senko & Tropiano, 2016). With such reservations taken in to account, it is understood that high levels of mastery approach, and low levels of

performance avoidance, goal orientations are associated with better outcomes (Payne et al., 2007), with relationships to other goal orientations less clear. Mindset is a similar belief system, held at an implicit level, and is suggested to precede goal orientations (Dweck & Leggett, 1988). Mindset theory proposes an adaptive – maladaptive dichotomy with associated mastery and performance orientations at opposite poles of a continuum of belief (Dweck, 2017b). The two orientations are termed growth mindset, denoting an orientation towards mastery, and a fixed mindset relates to a performance orientation. Early evidence appeared to indicate improved performance in learners endorsing a trait growth mindset, and also where learners were experimentally induced into holding a growth mindset following a short intervention (Blackwell et al., 2007). Recent meta analytic evidence indicates that the direct association between mindset and performance is weak (Burnette et al., 2013; Sisk et al., 2018). However, as an implicit belief it may be that mindset exerts a distal influence in the self-regulatory network explaining why it does not have a strong, or direct relationship to performance. This has been suggested in the occupational domain (Heslin & Keating, 2017; Heslin et al., 2018). Whilst there have been some suggestions that growth mindsets may be a protective factor and hold predictive power over and above self-efficacy, other evidence suggests that self-efficacy fully mediates the effect of mindset in terms of performance. The precise role of mindset requires clarification, in particular, how the construct contributes to self-regulated learning.

Taking these factors into account, a pragmatic, exploratory approach was taken in the current study to data analysis. The current study used a path analytic approach to extend the understanding developed during the confirmation of the Feedback in Learning Scale (FLS). Specifically, the aim was to understand how these factors operated in conjunction with a wider self-regulatory network of factors. These factors include feedback behaviours and cognitions; self-efficacy; those associated with achievement goal theory, specifically, goal orientations and mindset; and finally, factors associated with goal setting, for example, goal clarity and goal difficulty. Based on a previous analysis see chapter six, four initial paths were hypothesised. Path

one predicted that learner willingness to accept feedback would be positively associated with credible source challenge. A second path predicted that credible source challenge would be positively associated with greater awareness from feedback. Third, that awareness from feedback would be positively associated with motivational intentions. Fourth, that in turn motivational intentions would be positively associated with behavioural changes and development actions taken as a result of feedback. Additional hypothetical paths were developed by examining inter-item correlations, see Figure 8.2, alongside consideration of theory. Where a factor, or sub-factor, contributed beyond its own theoretical domain, i.e. achievement goal theory, self-efficacy, and goal setting, the inclusion of additional paths was considered. Several exploratory paths were specified in an initial model balancing an inclusive, holistic approach with parsimony. As a result, a fifth hypothetical path proposed an association between motivational intentions and self-efficacy. A sixth path proposed an association between mindset and self-efficacy. A seventh path was postulated that mastery approach would predict motivational intentions. Given the association of self-efficacy with goal setting, two paths predicting associations between self-efficacy and goal clarity were specified, eight (a); and between self-efficacy and goal difficulty, eight (b). A ninth path proposed a covariance between goal clarity and goal difficulty, given their relationship in goal setting theory. A tenth path indicated a positive association between a performance approach goal orientations and self-efficacy. A final, eleventh path indicated a positive association between mastery approach goal orientations and behaviour and development changes. The hypothetical model is outlined in Figure 8.1.
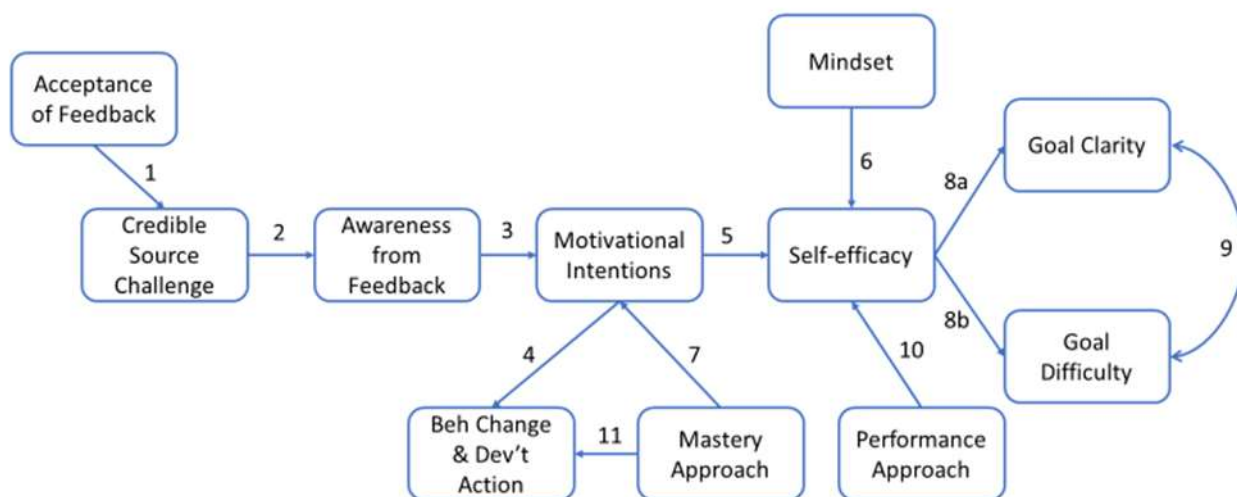
Figure 8.1 Initial hypothetical model describing the nomological net of feedback integration

Method

Participants

A pool of 402 second year learners registered on a half year psychology module were requested to participate as part of a wider data collection process. Incomplete responses were omitted, reducing the sample to 343 participants. The remaining participants were typical of samples recruited from undergraduate psychology populations 86% of participants were female, M_{age} = 20.27, SD_{age} = 3.63.

Design

A structural equation modelling (SEM) approach was used to examine the nomological self-regulatory network associated with integration of feedback messages. In the first stages of analysis, descriptive statistics and distribution were examined. Deviation from multivariate normality was noted (Kline, 2015). Following this, in an exploratory data analytic approach, bivariate correlations were examined to determine factors employed in the

analysis. The resulting factors included in the analysis include self-efficacy; mindset; goal clarity and goal difficulty from the goal setting in learning scale (GLS), mastery approach from the 2 x 2 Goal Orientation scale; and five factors from the FLS, including feedback acceptance, credible source challenge, awareness from feedback, motivational intentions, and behavioural change and development actions taken in response to feedback. Deviation from multivariate normality was addressed by employing the Satorra-Bentler (2010) scaling adjustment in the SEM approach taken. This was implemented by using the MLM estimator in the *lavaan* package (Rosseel, 2012).

Materials

The Feedback in Learning Scale

The FLS was developed and validated, see chapter six, in two undergraduate samples from a selective university in the North West of England. A five-factor structure was derived, with the measure reporting solid fit to the data. Further, the measure reports acceptable internal consistency. The factors include Credible Source Challenge, Feedback Acceptance, Awareness from Feedback, Motivational Intentions, and Behaviour and Development Change, for sample items see Appendix 3. A six-point response format is employed in the measure, with high scores representing greater propensity towards the factor.

Academic Self-Efficacy Scale

A ten-item measure of academic self-efficacy is employed here (McIlroy, 2000). Internal consistency across three samples demonstrates the acceptable reliability of the instrument (Cronbach's $\alpha s \geq .80$) (Forsythe & Jellicoe, 2018). A seven-point response format indicating endorsement from 'strongly agree' (1) to 'strongly disagree' (7). Seven items were reverse

scored. A sample item 'I am convinced that I will eventually master those items on my academic course which I do not currently understand'.

Mindset

An eight-item measure of mindset was used in the current study (Levy & Dweck, 1998). Despite possible issues in the validity of measurement, the measure reports solid reliabilities (Forsythe & Jellicoe, 2018). Half of the items in the measure address a fixed mindset; the remainder relating to growth mindset orientations. A six-point response format is employed in the measure from strongly disagree (1) to strongly agree (6). A single factor is derived by reverse scoring growth mindset items; therefore, a high score indicates fixed mindset endorsement. A sample fixed mindset item is "Your intelligence is something about you that you can't change very much"; where a sample growth mindset item is "You can always substantially change how intelligent you are".

2 x 2 Goal Orientations

A 2 × 2 measure of goal orientations was used in the current study (Elliot & McGregor, 2001). The measure examines participants endorsement of four factors associated with development or demonstration of competence. These include mastery-approach, performance-approach, mastery-avoidance and performance-avoidance. In a mastery-approach orientation, emphasis is placed on developing competence by acquiring skills or knowledge during performance. Performance-approach orientations speak to demonstrating competence; mastery-avoidant orientations speak to achieving no more than a minimal level of competence, where those who have a performance-avoidant focus, seek to avoid performing worse when compared to their peers. Elliot and Murayama (2008) revised the measure to improve its precision. Internal consistency is reported to be solid, however, in a previous examination here, one dimension, mastery approach exhibited sub-optimal levels of consistency (Forsythe & Jellicoe, 2018). A five-point

response format is used in the current scale. Responses range from strongly disagree (1) to strongly agree (5), with high scores indicating endorsement of the orientation. 'My goal is to learn as much as possible.' is a sample mastery approach goal item.

The Goal Setting in Learning Scale

The measure employed here was developed from three associated measures of goal setting, two from occupational research (Kwan et al., 2013; Lee & Bobko, 1992) and a third from educational research (White, 2002). The development of the scale is described in chapter seven. A parsimonious two factor structure, from ten possible dimensions, was derived, with nine items loading on to the two factors. The two factors address essential components of goal setting theory, goal clarity and goal difficulty (Locke & Latham, 1990a). Five items address goal clarity, with a further four items speak to goal difficulty. Items are described in Appendix 4. Measured using five-point response formats, high scores indicate the strength with which each factor is endorsed.

Procedure

A sample of learners in Higher Education was surveyed across three separate occasions, at one-week intervals. Participants were drawn from a pool of second year undergraduate psychology students registered on a one semester long core module. Learners registered on the module were invited to participate in a pedagogical activity which had an associated research component. Phased emails were delivered to learners with individual hyperlinks which directed participants to the Qualtrics (2018) online surveying platform. Firstly, participants read a participant information sheet and indicated consent to participate in the study. On the first measurement occasion, learners were surveyed, using the FLS, on attitudes towards feedback. On the second occasion, attitudes towards goal setting, using the GLS, and self-efficacy. On the third and final measurement instance,

attitudes associated with achievement goal theory, namely mindset and achievement goal orientations, were considered. Each measurement interval preceded an associated lecture offering critical perspectives associated with the factors under consideration. This pedagogic approach ensured, as far as possible, that learners were naïve to the perspectives under consideration. Whilst no risks or rewards were associated with participation, as part of the approach, learners were furnished with automated feedback reports, providing summary scores associated with each of the notional factors. These reports were designed as participant debrief, and a mechanism to promote individual reflection and self-awareness. Support to enable interpretation was made available for all learners, via online resources or optional face to face clinics. Further, in the unlikely event that learners experienced anxieties associated with self-reflections, referral information to the institution's counselling service was made available. In addition, learners were informed of their ability to withdraw from the associated research component of the project, without compromising the pedagogical aspect of the activity. The study received approval from the relevant University of Liverpool ethical review board.

Analysis

Data were analysed using Jupyter Notebooks (Kluyver et al., 2016), using an R software kernel (R. Core Team, 2013). The *lavaan* (Rosseel, 2012) package was used to conduct structural equation modelling. Associated packages were called upon as necessary. To account for a minor deviation from multivariate normality, a robust MLM estimator was used in the analysis to scale the fit statistics with a Satorra-Bentler (2010) adjustment. The path model identified in Figure 8.1 was specified and subject to initial testing. Following this, modification indices were examined to determine whether adjustments, when considered alongside theory, would improve the fit of the model to the data.

Results

Analysis checks and participant characteristics

Skewness and kurtosis values were between -2 and 2, except for one variable. Whilst there is lack of clarity in the literature on appropriate levels of skewness and kurtosis, values were below 'rules of thumb' indicated by Kline (2015), skewness $\leq$ 3, and Kurtosis $\leq$ 10. In all cases, such values were considerably below these thresholds.

Table 8.1

Characteristics of participants in each group. Values in parentheses represent the standard deviation (±SD) of the mean.

	Participants (n = 343)
Females : Males	294:49
Age(years) : Mean (±SD)	20.27(± 3.63)

Table 8.2

Descriptive statistics of factors associated with the nomological net associated with self-regulatory approaches to feedback integration; values are Mean, Standard Deviation and Cronbach's alphas (α)

Factor	Mean (±)	α
Credible Source Challenge (CRm)	4.48 (±.56)	.85
Behaviour and Development Change (BDm)	3.53 (±.89)	.80
Feedback Acceptance (ACm)	4.05 (±.81)	.85
Motivational Intention (MIm)	4.80 (±.65)	.82
Awareness from Feedback (AWm)	4.52 (±.73)	.77
Goal Clarity (GCm)	3.49 (±.65)	.69
Goal Difficulty (GDm)	3.70 (±.59)	.81
Academic Self-efficacy (SEm)	4.84 (±.80)	.81
Mindset (MSm)	2.85 (±.88)	.94
Mastery approach (Map)	4.38 (±.53)	.67
Performance approach (Pap)	4.07 (±.80)	.83
Mastery avoidance (Mav)	3.91 (±.80)	.71
Performance avoidance (Pav)	4.12 (±.85)	.82
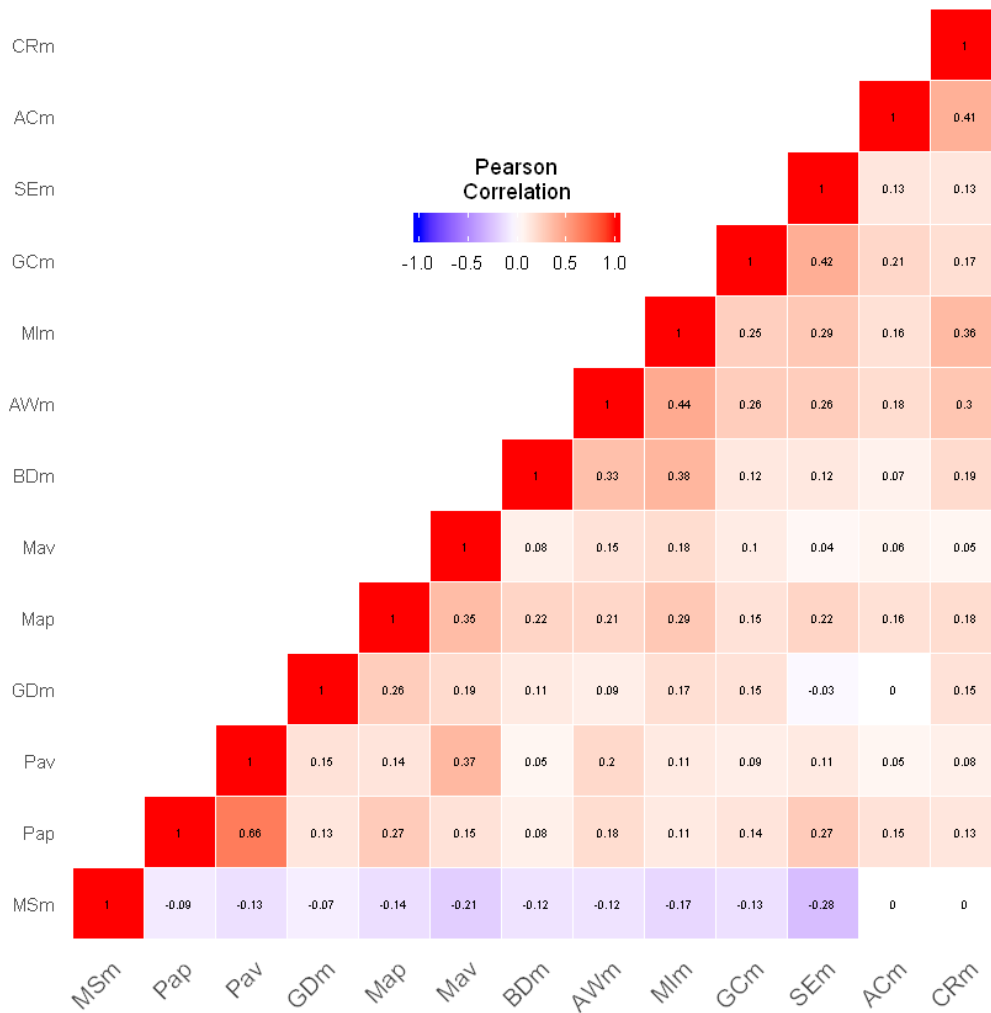
Figure 8.2 Bivariate (Pearson) correlations between factors associated with the nomological net associated with self-regulatory approaches to feedback integration

In these results, and demonstrating a large effect (Gignac & Szodorai, 2016), the extent to which learners accept the content of feedback, together with motivational intentions, predict higher levels of credibility associated with the source of feedback and the challenge that the assessor provides. In terms of this set of associates, feedback acceptance reports the largest association in terms of credible source challenge. A large effect was also seen when motivational intentions were regressed on awareness from feedback and mastery approach orientations. Both predictors were positively associated with motivations, however, awareness from feedback reported a larger association to feedback motives. Demonstrating a medium effect, academic self-efficacy, and to a lesser extent the degree to which learners accepted

feedback related to them, predicted goal clarity. Next, and again demonstrating a medium effect, awareness from feedback was positively predicted by three factors. These included behavioural changes and development actions, goal clarity, and credible source challenge. The association between goal clarity and awareness from feedback indicates the recursive nature of feedback integration. Subsequently, and with a medium effect, performance approach goal orientations, motivational intention resulting from feedback and mindset predicted academic self-efficacy. The strength of predictors was similar in nature with performance approach and growth mindset being marginally stronger. Motivational intentions, and to a lesser extent, mastery approach goal orientations independently held significant associations with behavioural changes and development actions, again demonstrating a medium effect. Goal difficulty was predicted with a small effect by mastery approach orientation. However, goal difficulty was not associated with academic self-efficacy. In addition, goal difficulty and goal clarity reported small but significant levels of covariance ($cov = .17, p = .005$), supporting the hypothesised covariance path. Relationships, and their associated significance levels, indicated here are reported in Table 8.3. These associations are further represented graphically in Figure 8.3. Direct paths are indicated by unidirectional arrows, with covariances indicated by bidirectional arrows. In Figure 8.3 standardised paths lower than or equal to .10 were suppressed with the result that only significant paths are shown.

Table 8.3

Direct paths between factors specified in the measurement model

Path	Determinant		Outcome	Standardised estimates (β)	R^2
1	Feedback Acceptance	→	Credible Source Challenge	.37***	.24
13	Motivational Intention	→	Credible Source Challenge	.26***	-
3	Awareness from Feedback	→	Motivational Intention	.30***	.21
7	Mastery Approach	→	Motivational Intention	.23***	-
8a	Academic Self-Efficacy	→	Goal Clarity	.39***	.19
16	Feedback Acceptance	→	Goal Clarity	.17**	-
14	Beh and Dev't Change	→	Awareness from Feedback	.21**	.18
15	Goal Clarity	→	Awareness from Feedback	.19**	-
2	Credible Source Challenge	→	Awareness from Feedback	.16*	-
10	Performance Approach	→	Academic Self-Efficacy	.23***	.17
6	Mindset	→	Academic Self-Efficacy	-.23***	-
5	Motivational Intention	→	Academic Self-Efficacy	.21***	-
4	Motivational Intention	→	Beh and Dev't Change	.28***	.15
11	Mastery approach	→	Beh and Dev't Change	.14*	-
12	Mastery Approach	→	Goal Difficulty	.27***	.07
8b	Academic Self-Efficacy	→	Goal Difficulty	-.09 n.s.	-

* $p < .05$, ** $p < .01$, *** $p < .001$; R^2 values are reported alongside the strongest associate, presented in order of variance explained of the response variable. Paths 1 to 11 indicate those included in the initial model, see Figure 8.1. Paths 12 to 16 indicate modifications to the initial model.
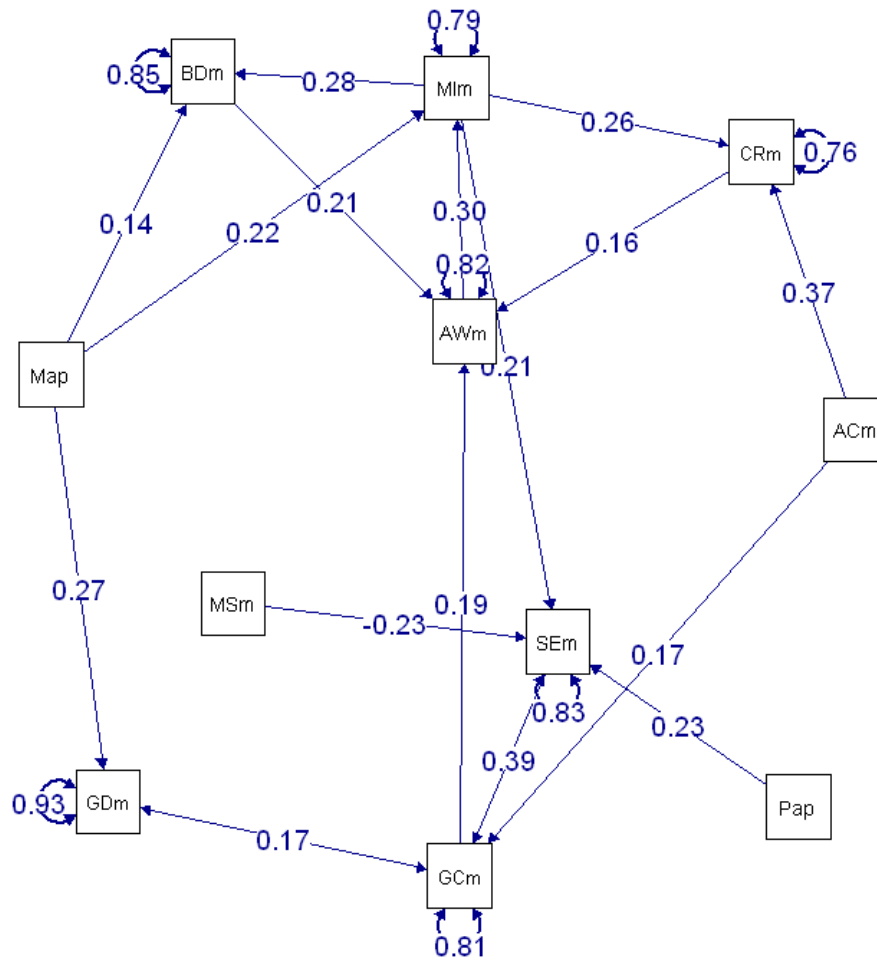
Figure 8.3 Path model of the nomological network of factors associated with feedback integration. Unidirectional arrows indicate direct paths, with bidirectional arrows indicating covariances Note: factors in Figure 8.3 are represented by the following key: ACm = *Acceptance of Feedback*; CRm = *Credible Source Challenge*; AWm = *Awareness from Feedback*; MIm = *Motivational Intentions*; BDm = *Behaviour Change and Development Actions*; SEm = Academic s*elf-efficacy*; Map = *Mastery Approach*; Pap = *Performance Approach*; MSm = *Mindset*; GDm = *Goal Difficulty*; GCm = *Goal Clarity.* Paths with a standardised coefficient value less than .10 (non-significant) are suppressed.

The measurement model reported here, using the Satorra-Bentler (2010) adjustment to derive robust fit statistics revealed a mostly good, or at least an acceptable, fit to the data. Robust fit indices, with a scaling factor of 1.11, were as follows; normed χ^2 (χ^2 / df) = 1.28, RMSEA (90% CI) = .03 (.000 - .066), CFI = .978, robust TLI = .966, SRMR = .056. For comparison

purposes, unscaled maximum likelihood fit measures were again acceptable or good, and are as follows, normed χ^2 (χ^2 / df) = 1.47, RMSEA (90% CI) = .037 (.007 - .058), CFI = .969, TLI = .952, SRMR = .056.

Discussion

Findings from the current investigation indicate the interdependent nature of factors associated with integrating messages received from feedback. Notably, the findings of the current study indicate a suite of virtuous, reciprocal associations. The most crucial of these is that between greater learner awareness of strengths and weaknesses resulting from feedback and the clarity of goals that learners set. Critically, this reciprocity appears to be mediated by learners motivational intentions and self-efficacy, with contributions from other factors associated with self-regulated learning. Specifically, and supporting the first hypothesised path, learner acceptance of feedback predicted the extent to which they felt the source of feedback was trustworthy and provided appropriate challenge. The second path indicating a positive association between credible source challenge and greater learner awareness from feedback was also supported. In turn, awareness predicted learners' motivational intentions, supporting hypothesis three. Supporting hypothesis four, enhanced motivational intentions were associated with behavioural changes and development actions learner reported that they were willing to take as a result of feedback. Next, the fifth hypothesis, a positive association between enhanced motives and academic self-efficacy, was also supported. Hypothesis six indicated a relationship between mindset, specifically growth mindset, and academic self-efficacy, supporting this association. Support for a seventh hypothesis, that there would be a positive association between mastery approach and motivational intention, was also supported. Next, academic self-efficacy was positively associated with goal clarity, supporting hypothesis eight (a), but academic self-efficacy was not associated with goal difficulty, as a result, hypothesis eight (b) was rejected. Goal difficulty and goal clarity reported small but significant levels of covariance, supporting the ninth hypothesised covariance

path. A tenth hypothesised path between performance approach goal orientations and academic self-efficacy was also supported. Finally, from the initial model outlined in Figure 8.1, an eleventh hypothesised path between mastery approach goal orientations and behavioural changes and development actions was also supported. Following inspections of fit statistics, and modification indices, five iterations of the path model were specified. Modifications resulted in five additional significant paths. Path twelve supported a positive association between mastery approach goal orientations and goal difficulty. Path thirteen also identified a positive association between motivational intentions and credible source challenge. Paths fourteen and fifteen indicated the recursive nature of the nomological net. Path fourteen highlighted a positive association between behavioural changes and development actions and greater awareness. Greater awareness from feedback was also positively supported by goal clarity, through path fifteen. A final fitted path, path sixteen, supported a positive association between feedback acceptance and goal clarity. The final model derived during analysis reported good fit to the data, using both robust and unscaled fit measures.

These findings appear to shed light on, and clarify, theoretical assumptions about the incremental nature of self-regulated tertiary learning. The findings reported in this study suggest that learner awareness derived from feedback leads consequentially to increased motivations. Increased engagement leads to greater confidence and on to support learners in developing clearer goals. In turn, goal clarity leads learners towards accessing greater awareness from future feedback. These findings support central ideas in the SAGE model of feedback integration (Winstone, Nash, Parker, et al., 2017). This SAGE model proposes that learners with the ability to self-appraise; possess greater assessment literacy; can set goals and self-regulate; and demonstrate engagement and motivation; are more likely to integrate messages from feedback. The findings of the current study support these suggestions through clear goals. Clarity of goals supports learners towards in accessing greater awareness from feedback, presumably because the information contained in feedback enables corrective action

which facilitates the goals learners wish to achieve. The idea of supplementing feedback with a goal focussed action plan has previously been suggested (Carol Evans, 2013). An important aspect in learner self-regulated learning environment is the interaction with the learning sphere. Results from the current study support this in greater awareness through a credible source of feedback, that provides supportive challenge. The validity of the instructor's role in providing this support is emphasised in these current results (Carless & Boud, 2018; Forsythe & Jellicoe, 2018; Winstone, Nash, Parker, et al., 2017). When learners accepted feedback they reported greater trust in the instructor providing supportive challenge through feedback. Higher levels of motivational intention also led to endorsement of greater credibility associated with the source of the feedback. Acceptance of feedback also assisted learners directly in developing clear goals. These findings suggest that whist acceptance is a necessary condition for integration of feedback that it may not be sufficient, and that a holistic, agentic approach may be necessary.

This agentic approach relies on the important fuel that self-efficacy provides. Illustrating this idea, the results of the current study support the well reported association of self-efficacy to academic performance (Honicke & Broadbent, 2016). These results are particularly noteworthy as they lend support to Richardson and colleagues (2012) suggestion that goal setting may provide an access route to increase learners levels of learner self-efficacy, which is reported to provide a challenging intervention route. Much research in tertiary settings has investigated the causal association from self-efficacy to performance (Honicke & Broadbent, 2016; M. Richardson et al., 2012). Recent research indicates associations in the opposite causal direction, that is from performance to self-efficacy may hold stronger associations. These researchers call for more investigations that explore post task appraisals of performance in terms of their effects on levels of self-efficacy (Talsma, Schüz, Schwarzer, et al., 2018). In the current study, a medium effect of motivational intention following feedback appraisal on levels of self-efficacy was found, when taken together with a performance approach goal orientation and a growth mindset. These findings in relation to self-

efficacy tentatively support the suggestions made by Talsma and colleagues (2018). The results also support the importance of engagement and motivation in feedback integration, as suggested by Winstone and colleagues (2017). Furthermore, Richardson and colleagues (2012) report that non-intellective constructs may report stronger associations with narrowly defined performance outcomes than global indexes of performance, such as GPA. As a result, focussing on performances that are proximal in the minds of learners, providing them with feedback to support greater awareness may contribute towards, and possibly harness, a virtuous circle of performance, which stems from being in possession of clear goals. A suggestion of misalignment between theory and research practice, may to some extent be addressed by the current findings. These findings provide tentative support for the role of such non-intellective factors, in developing incremental gains in learning that are necessary to secure mastery on the path to higher, and more distal, performance outcomes.

Providing additional support for the engagement and motivational perspectives, and partially supporting previous findings (Forsythe & Jellicoe, 2018), both mastery approach goal orientations and motivational intentions arising from feedback were independently related to learner reports that they were likely to change their behaviours and seek out development actions as a result of feedback. In this set of results, behavioural changes and developmental actions also led to greater awareness, which may be as a result of taking those incremental steps that support gainful learning and broadening thought-action repertoires. The idea of such marginal gains in integrating feedback and securing development is supported in recent work by Winstone and Carless (2019a, 2019b). In addition, awareness from feedback was also indirectly related to motivational intentions through mastery approach goal orientations. Mastery approach goal orientations also contributed to levels of goal difficulty reported by learners. This association supports the suggestion that those who have a desire to master tasks do not shy away from challenge, rather they embrace it (Bandura, 2013). Locke and Latham (1990a) pit goal difficulty as a fundamental precursor to high performance, however, in the current results goal difficulty did not contribute,

in a clear way to the self-regulated approach investigated. Nevertheless, goal difficulty covaried with goal clarity, albeit weakly. It may be that clear goals of themselves provide sufficient challenge required by learners when refining their journey towards agentic mastery. Taken together, findings support the importance of an agentic, self-regulatory approach which relies on an interaction between the learner, their enacted behaviour and the environment (Bandura, 2006; Zimmerman, 2000).

Limitations and future research directions

The results of the current study draw strength from their examination of the range and number of constructs associated with self-regulated integration of feedback messages. In addition, by employing novel measures, it is possible to examine learner attitudes towards feedback in a holistic manner. Although the model identified here makes causal inferences, data collected for the current study is nevertheless cross-sectional. As a result, it is recommended that longitudinal and experimental work may assist in developing understanding. This additional research may indicate whether the tentative causal associations identified in the current study replicate across time and situations. Novel measures have been developed and employed in the current study. The generalisability of these measures may be limited by sample demographics; the sample of undergraduate psychology learners were predominantly young females. Further, participants were drawn from a single programme within a highly selective UK university, as a result, the research to replicate these findings in a range of settings and domains of learning is warranted to add to the scientific knowledge in this area. These results may also be limited as the goal clarity measure employed here demonstrated a marginally sub-threshold level of reliability, in the current study. Whilst one further examination has yielded higher levels of reliability, further examinations of this measure will be beneficial to demonstrate the performance of the measure over time. Finally, whilst mastery approach goal orientation made a positive contribution to tertiary learners' approaches, again sub-threshold reliability is seen in the current

study, this mirrors previous similar work (Forsythe & Jellicoe, 2018), and should be taken in to account when interpreting the results of the current study.

Conclusion

The current study examined a range of non-intellective factors thought to be implicated in self-regulated approaches to learner integration of feedback in tertiary settings. Amongst a range of findings, these results highlight the central importance of raising awareness from feedback. Clear goals support learners in realising higher levels of awareness from feedback messages. Awareness, in turn, is related to greater motivations towards feedback, and on to higher levels of academic self-efficacy. Self-efficacy, in turn, leads to increased goal clarity. Greater acceptance of feedback also leads to greater trust in the assessor providing feedback, supporting awareness. These results support the notion of agentic self-regulated approaches to learning and emphasise the interdependent nature of the learner, and their enacted behaviours operating within a supportive sphere of learning (Bandura, 2006; Zimmerman, 1989). As a result, these findings have important practical implications. The results support the role of the instructor in developing pedagogical approaches which foster clear goals, and raising awareness of the role of feedback and its benefits for learning and development (Carless & Boud, 2018). Such approaches have been outlined effectively by Winstone and colleagues (2017), and others specifically in relation to goal setting in tertiary academic settings (Morisano et al., 2010; Travers et al., 2015). These results are novel as they provide evidential support for the nature of goals and associated relationships, which are often assumed (M. Richardson et al., 2012). Whilst some tertiary learners will have developed effective approaches others may not; the measures employed in the current study may assist in identifying learners in need of intervention to optimise learning outcomes, with instructor support. These results would benefit from replication, including from different settings

and domains, to determine if these results can be generalised beyond the current setting and domains.

CHAPTER 9 – General Discussion and Contribution

Major contribution to knowledge

This research programme contributes to and clarifies understanding of self-regulation in integrating feedback. Knowledge, skills and attitudes that support and are associated with evaluative judgement in tertiary learning are proposed. Major outcomes include the development and confirmation of two separate behavioural measures of self-regulation, including goal setting and feedback integration. Using these measures to promote pedagogies, interventions, and learner self-awareness is discussed. Findings further the understanding of the crucial role of self-efficacy in post task appraisal, supporting Richardson and colleagues' (M. Richardson et al., 2012) proposed relationship between self-efficacy and goal setting. These results indicate that self-efficacy promotes setting clearer goals following feedback. This finding lends further support to encourage dialogue between tertiary learners and educators which focus on clarity of purpose. The results also indicate the contribution of achievement goal theory constructs, including mindsets and goal orientations, when set within a nomological network of factors support self-regulated learning. Finally, results contribute to knowledge by increasing understanding in relation to the role of non-intellective factors, including mindsets, self-efficacy, and goal setting, and how these factors support learners' perceptions of employability, as a measure of confidence developed from tertiary learning.

Background – problem statement

Knowledge, skills and attitudes beyond grade

Objective measures of achievement, such as grades, provide an entry point to employment and are highly prized (Forsythe & Jellicoe, 2018). A narrowed ability range in undergraduates may mean that non-intellective

factors hold greater predictive utility in terms of subsequent performance beyond previous grades (Ackerman et al., 2011). Graduate employers appear to echo these findings, holding greater store in recruits with the ability to self-direct and manage their performance trajectory (The Confederation of British Industry, 2016). The current programme of research aimed to develop insight into the nature of gainful tertiary learning and how this understanding relates to perceptions of preparedness to enter the employment domain. The current research programme considered incremental learning gains central to developing mastery within a self-regulated learning approach. Gainful learning here is defined as the "*self-reported behaviours that suggest the productive acquisition of beneficial skills, knowledge and attitudes through study and experience*" (Forsythe & Jellicoe, 2018, p. 86). If learners demonstrate success in developing such behaviours within the tertiary learning environment, then these should readily translate to the employment sphere.

Self-regulation and evaluative judgement as learning gain

Within tertiary settings, the learner's ability to develop confident judgments and direct the course of their learning and development is thought to be fostered by self-regulated learning processes (Van Merriënboer & Kirschner, 2017). Self-directed learners possess the ability to make confident and reliable (self-) evaluations of their current and performance, take account of feedback, and make informed judgements about the next steps in their development (Ajjawi et al., 2018). Such self-directed processes help learners to respond to three fundamental questions "*where am I going? … how am I going? … and where to next?*" (Hattie & Timperley, 2007, p. 86). Amongst other things, this appraisal requires students being able to accommodate feedback in a way that facilitates learning. Factors such as remoteness from tutors (Carless & Boud, 2018), lack of awareness of feedback and its meaning, and lack of strategies to support feedback integration may act as barriers to development (Winstone, Nash, Parker, et al., 2017; Winstone, Nash, Rowntree, et al., 2017). Self-directed feedback integration is thought

to rely on a developmental transition in thought processes. For example relation to feedback integration, Carless (2019) describes a move from accommodating feedback that is task focused, to one that focuses on understanding associated with principles which support longer term understanding. Such transitions require development of evaluative judgements that take account of the interactions experienced by the learner, and their enacted behaviour within the learning or task environment to ensure that they take the actions necessary for development (Panadero & Broadbent, 2018; Zimmerman, 2000), and assist them in moving on to the next stage in development. Self-regulated learning concerns the decisions made by a learner in regulating their approach. Information from a credible assessor, or tutor, is proposed to be fundamental in the developmental process (Carless & Boud, 2018). These are complex foundational networks at the heart of self-regulated learning.

Non-intellective factors that promote self-regulation

Despite nuanced theoretical complexity, much educational research employs designs with a limited number of non-intellective factors in terms of their predictive relationship to academic performance (M. Richardson et al., 2012). Such relationships are described as being well understood in tertiary learning (Schneider & Preckel, 2017), and a prima facia case indicating that x predicts y, has appeal. Intervening using non-intellective factors to secure objective changes in measures of performance, such as GPA, however, may be hindered by a lack of specificity or clarity in theory (Senko & Tropiano, 2016) and timing of measurement (Honicke & Broadbent, 2016). As an example, self-efficacy is consistently the strongest associate of GPA, however, intervention to secure changes in self-efficacy is thought to be challenging (M. Richardson et al., 2012). Richardson and colleagues (2012) postulate that goal setting may provide an access route to secure changes in self-efficacy, due to its theoretical proximity (Zimmerman, 2000; Zimmerman & Moylan, 2009) in many models of task based performance (Locke & Latham, 1990b). However, Richardson and colleagues' proposal is based on

a moderate association between grade goals and performance, despite relatively few studies underpinning this association. Caution has also been proposed in relation to similar proxy measures of goal setting, as measures employed, such as goal orientations, lack the specificity of goals. The nature of goal orientations also requires clarification if the construct is to have utility (Morisano, 2013; Payne et al., 2007). Clarity in measurement of goal setting, and how this relates to other theoretical associates of self-regulated learning, such as self-efficacy, appears to be warranted.

Building on this, although seemingly compelling (Forsythe & Jellicoe, 2018) the direct relationships between factors associated with achievement goal theory, such as mindsets and goal orientations, and their relationships to performance are reported to be weak (Burnette et al., 2013; M. Richardson et al., 2012; Senko & Tropiano, 2016; Sisk et al., 2018). An abundance of theory exists relating to academic endeavour (Dweck, 2017a) and it may be that a lack of coherence contributes to misspecification. In turn, logic indicates that lack of stable measurement may impact knowledge (Pickering, 2015). The result of this may be that compelling factors which have utility in terms of self-regulated approaches are overlooked because their relationship with performance operates at a more distal, or indirect level of specification in the self-regulated learning (M. Richardson et al., 2012). Bandura (2013) further proposes that too many self-regulatory barriers exist on the path to distal performance outcomes, such as GPA. Therefore, the resulting predictive qualities associated with self-efficacy may be sacrificed as a function of methodological issues, such as the timing of measurement.

In addition, it has been noted that the mechanisms of goal setting and goal orientations are related but fundamentally different (Seijts et al., 2004). This distinction is also recognised by researchers who refer to factors including goal setting and self-efficacy as structural theories of self-regulation, where those associated with achievement goal theory, such as mindsets and goal orientation, are content theories (Diefendorff & Lord, 2008). Further research has called for to investigate the associations between the two types of self-regulatory mechanisms (Cellar et al., 2011).

However, these calls appear to have passed largely unheeded in the academic literature. Self-regulated learning postulates that the what, i.e. structural theories, together with the why and how, i.e. content theories, of academic motivation are fundamental forces in driving human agency. An opportunity exists to clarify how such factors operate within a self-regulatory framework.

Much evidence indicates a causal relationship from self-efficacy to performance (Honicke & Broadbent, 2016; M. Richardson et al., 2012). Talsma and colleagues (2018) recently report stronger associations in the opposite direction, indicating that post task performance appraisals inform levels of self-efficacy. These findings align with theoretical frameworks, which also provide support for goal setting and future action. The broad scope of self-regulated learning theory means that it is often not practical to consider more than a handful of variables in a single research design. Thus, the number of factors considered in unison in such research may limit understanding.

As indicated, interactions between such non intellective factors are nuanced. The relative complexity of such interactions are rarely investigated, perhaps in favour of simple designs that may be 'answering an easier question' (Kahneman, 2011, p. 97). Aiming to address this gap in knowledge, at least in part, the primary aim of the current programme focused on post task appraisal and how such appraisals support preparatory phases of self-regulated learning. A secondary aim considered how selected non-intellective factors are associated with longer term considerations, for example, employability perceptions which might act a barometer of confidence in preparation for graduate life and may show a transition in self-reported behaviours.

Answering the call of several researchers (Evans, 2013; Nicol & Macfarlane-Dick, 2006; Winstone, Nash, Parker, et al., 2017) the current research programme aimed to bolster understanding in relation to the role of incremental gains that may result from greater insight in to the role of goal

setting factors and how these relate to integration of feedback. Drawing on the above, the first aim of the current research programme sought to clarify how learner cognitions and behaviours could be effectively measured in two key areas, goal setting and feedback integration. These being fundamental self-regulatory steps underpinning the learning journey in terms of appraisal of current or prior performance and planning the next steps in the learning journey (Panadero, 2017).

Research aim 1a – Development of the Goal Setting in Learning Scale

Two separate investigations aimed to elucidate the factors endorsed by learners in responding to this first aim. A first investigation addressed the primary research aim and saw the development of a measure of goal setting; the Goal Setting in Learning Scale (GLS). Given the criticism of proxy measures of goal setting (Morisano, 2013; Payne et al., 2007) and their low level of predictive utility (M. Richardson et al., 2012; Senko & Tropiano, 2016), and the alignment of these factors with goal setting theory (Locke & Latham, 1990a), a learner endorsed measure of cognitions and behaviours associated with goal setting theory was developed. Initially, ten factors were specified after identifying three associated measures of goal setting, two from occupational and one from the educational domains (Kwan et al., 2013; Lee et al., 1991; White, 2002). Two stages of structural equation modelling derived a two-factor solution. Fit measures demonstrated either good or acceptable fit to the data. Learners endorsed two factors related to essential components of goal setting theory; goal clarity and goal difficulty. These goal setting factors reported a low-level covariance, as expected. See chapter seven for a full discussion of findings.

Research aim 1b – Development of the Feedback in Learning Scale

Secondly, and based on a refinement of a feedback integration measure from occupational research (Boudrias et al., 2014), the Feedback in Learning Scale (FLS) was developed. Exploratory factor analysis and a later

confirmatory latent variable structural equation model identified a parsimonious five factor structure, see chapter six for a comprehensive analysis of results. Fit measures revealed either a good or acceptable fit to the data, and each of the five factors demonstrated acceptable reliability. Findings further indicated support for a specified causal path through each of five factors. When learners endorsed acceptance of feedback, they were more likely to endorse that feedback provided by the source contained credible challenge. In turn, challenge from a credible source was positively associated with greater learner awareness from feedback, signifying that learners had a clearer understanding of their strengths and weaknesses. Awareness was then positively associated with greater motivational intentions in responding to feedback. Finally, behavioural changes and developmental actions were positively predicted by greater motivational intentions. These five factors starting with acceptance in turn to led to greater motivations, which aligns well with Ajzen's (1991) Theory of Planned Behaviour, and willingness to engage in development which support the notions outlined in models of feedback integration (Evans, 2013; Winstone, Nash, Parker, et al., 2017). This model of feedback integration supports the adaptive, evaluative judgements that are proposed facilitate learners in self-managing beyond their academic career (Ajjawi et al., 2018; The Confederation of British Industry, 2016).

Two behaviourally anchored rating scales were developed and validated as part of the first research aim. Three uses of these two measures are possible in both research and pedagogical practice. Firstly, it is proposed that the FLS and GLS may be used as pedagogical aids to broaden and build learners' evaluative judgement. Goal setting interventions appear to have potential in academic endeavour (Morisano et al., 2010; Travers et al., 2015), however, even with training, goals set by learners despite training may remain vague with learners using observed goals as cognitive place holders for goals that are mentally represented with a greater degree of specificity (McCardle et al., 2017). For learners, increasing understanding of goal clarity and difficulty levels could be particularly beneficial during appraisal of task-based performance and may further support learners in

planning and preparatory phases of self-regulation. Additionally, measures such as the FLS and GLS could be employed by educators as part of a toolkit (Evans, 2013; Winstone, Nash, Parker, et al., 2017) or within a discrete intervention framework (Morisano et al., 2010; Travers et al., 2015) as part of a suite of apparatus designed to optimise learning. These enhanced understandings may be particularly useful to those learners that lack motivation, engagement or strategies thought to be crucial to self-regulated engagement. Whilst the findings reported in the current programme show promise, the utility of measures should be explored in research, either cross-sectionally or experimentally. This represents a third recommended use for these measures.

Research aim 2 and 3 – Use of Behaviourally Anchored Measures of Goal Setting and Feedback within a self-regulatory nomological net

Drawing on this call for additional research, a second research aim examined how selected non-intellective variables were associated with feedback integration; two studies investigated this second research aim. A first preliminary investigation investigated factors associated with achievement goal theory, including mindsets and goal orientations, and how these factors related to learner integration of feedback, using a measure of feedback integration modified for the study. A combination of factors including mastery approach orientations, from achievement goal theory, together with motivational intentions, and challenge interventions predicted behavioural changes and development actions taken in relation to feedback, see chapter six for a full summary of results.

Following this preliminary investigation, a measure of feedback integration, the FLS was refined and validated. The FLS was subsequently employed alongside a network of factors associated with the appraisal and preparation phases of self-regulation to further understand how factors operate in concert to promote gainful learning. The investigation considered how post task evaluations of performance using the FLS were related to

subsequent levels of self-efficacy following Talsma and colleagues (2018) proposal, alongside other constructs from achievement goal theory. In doing so, this investigation married structural and content theories (Cellar et al., 2011; Seijts et al., 2004) within a holistic self-regulated learning approach (Panadero, 2017; Zimmerman, 2000). The research also explored the proposed association in tertiary settings between self-efficacy and goal setting, operationalised using the GLS (M. Richardson et al., 2012). Drawing on the results from the first research aim, a network of related paths investigated the idea of a structure of self-regulated of feedback integration in tertiary learners. When learners endorsed acceptance of feedback, they were more likely to believe that that feedback was generated by a credible source that provided appropriate levels of challenge. Trust in the source and their message informed increased learner awareness of their strengths and weaknesses. In turn, this greater awareness increased learners' motivated intentions. From motivated intentions, two diverging paths were observed, the first to behavioural changes and development actions taken in response to feedback, aligning with previous work in this area (Forsythe & Jellicoe, 2018). A second path from motivational intentions reports a positive association with subsequent levels of self-efficacy, supporting the association between post task appraisal and this most essential component of self-regulation (Talsma, Schüz, Schwarzer, et al., 2018). An association with goal setting was observed such that higher levels of academic self-efficacy were associated with higher levels of goal clarity. Although goal clarity and goal difficulty covaried, academic self-efficacy was not significantly related to levels of goal difficulty reported by learners. Research proposes that specific goals are not necessarily difficult (Trudeau & Boudrias, 2019). Results tentatively support meta-analytic findings and experimental work which indicates an association between self-efficacy and goal setting (M. Richardson et al., 2012; Travers et al., 2015). In turn, results also provide support for the reciprocal nature of self-regulation (Panadero, 2017; Zimmerman, 2000), such that goals that are clearer in the minds of learners are associated with greater learner awareness following feedback. Several other ancillary associations were noted which contributed to the network of factors that combine within self-regulated learning approaches.

For example, growth mindset and performance approach goal orientations positively predicted levels of academic self-efficacy. A mastery approach goal orientation also contributed positively to behavioural changes and developmental actions taken following feedback, goal difficulty, and motivated intentions. These contributions largely support the role of factors from achievement goal theory. However, results indicate that both performance and mastery orientations are implicated in adaptive self-regulatory processes that underpin learning. Those learners that possess a mastery orientation are thought to be more likely to be ready to take on challenge and will persist where that challenge is difficult, where the evidence in relation to performance orientations is mixed (Payne et al., 2007). These results may indicate nuance in the endorsement of such factors (Senko & Tropiano, 2016) and which have also been seen in interventions (Travers et al., 2015), where setting performance goals that are growth oriented are proposed to be adaptive (Bandura, 2013). These results add to understanding by providing support for the reciprocal nature of self-regulated learning (Panadero, 2017; Zimmerman, 2000) suggesting a compelling model of feedback integration that aligns well with proposed theoretical models (Evans, 2013; Nicol & Macfarlane-Dick, 2006; Winstone, Nash, Parker, et al., 2017). This extends previous work as it provides evidence within a tertiary learning framework supporting the link between self-efficacy and aspects of goal setting, of which evidence is theoretically compelling but nevertheless scant (M. Richardson et al., 2012; Winstone, Nash, Parker, et al., 2017).

Research aim 3 and 4 – Self-regulatory predictors of medium and long-term learner outcomes

A fourth research aim in the current programme examined how selected factors associated with self-regulated learning predict students' proximal and distal outcomes. Proximal outcomes included grades, with distal outcomes associated with work readiness, operationalised by decision making abilities, and perceptions of employability and teamworking abilities.

The contribution of grade to other work-readiness outcomes was also considered. A longitudinal data collection process was used to examine learner attitudes at various points in their tertiary academic career. Path analysis reported a complex pattern of results. When measured separately fixed and growth mindsets were negatively and positively related respectively, as expected, to academic self-efficacy and goal setting. Conversely, both fixed and growth mindsets were positively associated with perceptions of teamwork competence. These findings indicate greater nuance within mindset theory (Dweck, 2017b). Rather than the two mindsets operating as opposing poles on a spectrum, holding both beliefs in combination may be adaptive. Goal setting was directly related to perceptions of teamworking competence, which drew strength from a strong relationship from academic self-efficacy. There was no direct relationship from academic self-efficacy to teamwork perceptions, with goal setting fully mediating this relationship. Representing complexity in the path model, employability perceptions were predicted by two paths of similar strength. Perceptions of teamwork competence predicted perceptions of employability most strongly, with academic self-efficacy making a comparable but marginally lower contribution to the model. Despite being fully mediated by goal setting in relation to perceptions of teamwork competence, academic self-efficacy independently predicted perceived employability, where goal setting did not as its strength was fully mediated by teamwork competency perceptions. This pattern of results provides insight into the nature of non-intellective factors associated with self-regulation in tertiary academic endeavour. Results show that implicitly held beliefs contribute as expected to structural self-regulatory factors such as goal setting and academic self-efficacy. Greater complexity is seen in relation to perceptions of teamwork competence where implicit, growth and fixed, mindset beliefs that are generally held to have positive and negative consequences for performance respectively. Here a more nuanced perspective is observed. In addition, both goal setting and academic self-efficacy make unique contributions to perceptions of work-readiness. The current results indicate that academic self-efficacy makes an indirect contribution to one measure of work-readiness and a direct contribution to overall perceptions of employability.

The current set of results propose that non-intellective factors may provide a useful gauge of learner perceptions of confidence to enter the workforce. These self-report measures of employability perceptions may not readily translate to provide a concrete barometer of graduate employment readiness. Nevertheless, they may reveal the value added by tertiary settings, in allowing learners to feel confident to progress to graduate careers.

Implications for research and practice

The current set of findings has wide-ranging implications for research and pedagogic practice. HE has a fundamental role in helping learners to develop the knowledge, skills, and attitudes associated with self-direction on completing undergraduate studies (Ajjawi et al., 2018; Van Merriënboer & Kirschner, 2017). This is a clear expectation of employers, however, these expectations are not always met. In particular soft-skills, such as problem-solving, self-management and resilience are reported to be inadequate (The Confederation of British Industry, 2017). If HE institutions are to add value in a manner that indicates a positive contribution to the economy in the twenty-first century, addressing this gap is crucially important. Understanding how these skills develop through well-designed research, set within an appropriate theoretical approach will help to inform supportive pedagogies that can be used in HE. Researchers have suggested that instruction in learning programmes, scaffolding learners in the mechanisms associated with self-regulated learning and integration of feedback is necessary (Molloy, 2019; Winstone & Carless, 2019b). The findings of the current research programme indicate some clear directions in support of this effort.

The findings reported from the current research underscore the importance of a dialogue between learners and educators in a spirit of raising awareness of feedback and self-regulation practices, such as goal setting (Winstone et al., 2019; Winstone, Nash, Parker, et al., 2017). Such an approach appears to hold face validity, however, increasingly in HE

programmes, there is distance in the learner : educator relationship (Carless & Boud, 2018). Findings reported in the current work indicate that an understanding of the behaviours and cognitions associated with feedback integration are drivers that have a positive impact on learner confidence in ability or levels of self-efficacy. These findings indicate that ability beliefs lead learners to develop goals that have clarity. As there is a role for educators in supporting learners to access feedback, these results also indicate a similar supporting role for educators in assisting learners to develop and set clear goals. For a detailed discussion of these findings please refer to chapters six, seven and eight. In addition to the distance between learners and educators, anonymised feedback within modules and modular systems themselves may act as barriers to development. Careful course design, supported by educators acting as facilitators, is at the core of scaffolding learners' development in a way that enables them to take charge of their learning (Van Merriënboer & Kirschner, 2017). Such an approach should support learners to exhibit proactive, self-management that enables learners to absorb salient messages from feedback and integrate them within their future approaches. Such an approach will also support learners to understand what high-quality work is and how to evaluate this in their own work and that of others. This is a skill that graduates need upon entering the workplace (Ajjawi et al., 2018).

Whilst these approaches have direct application in HE settings, the evidence reported here also indicates that self-regulatory factors may be associated with increases learner perceptions of, and confidence in relation to, career preparations. Findings from the current programme indicate that goal setting and the task-based competence beliefs associated with self-efficacy are fundamental drivers of self-regulation and performance in the workplace. As a result, these skills will have the power to drive the self-management approaches that employers report they expect from new entrants to the workforce. Therefore, interventions focusing on the holistic nature of self-regulated learning have logical appeal, although evidence supporting such interventions in HE is scant. The FLS and GLS measures developed as part of the current research programme have a direct practical application within such interventions. For example, pedagogic interventions

that encourage learners to reflect on the development of self-regulatory skills and attitudes using the FLS and GLS is one possible use of the measures developed as part of this work. A second use relates to the identification of learners at risk of sub-optimal performance. Using such measures to track learners' developmental gains may assist in streaming learners into interventions that level up the field in the development of supportive knowledge, skills, and attitudes. These skills associated with self-regulated learning are the bedrock of self-direction. If delivered effectively, such knowledge, skills, and associated attitudes should enable the HE sector to demonstrate the value it is adding to learners and the wider economy. A final such use related to the evaluation of modular programmes in HE. Often within HE, modules are evaluated using satisfaction surveys. Evidence consistently indicates that satisfaction is a poor proxy measure of learning and development, nevertheless, such measures are used by institutions to indicate something about learning (Hornstein, 2017; Poropat, 2014). It may be that using behaviourally anchored rating scales such as the FLS and the GLS, to track the distance travelled by learners alongside student satisfaction data may provide a holistic picture of student development and interest. Such an approach has recently been mooted by Kandiko-Howson (2019) in a final evaluation report of the learning gains project in the UK. This recommends that a survey measuring the development of soft-skills is employed alongside the National Student Survey to provide a clearer understanding of the distance travelled by students in HE. However, more research is required to secure this understanding.

In addition, a number of different areas of research enquiry arise from the current programme of work. The FLS and GLS measures developed as part of this programme of research appear to show promise in furthering understanding of the self-regulated learning process that tertiary learners are engaged in. However, these measures may be limited as they were developed in a single setting and within a single domain of learning. As a result, this creates a clear opportunity to investigate whether the understanding developed here, in particular in terms of the utility of the FLS and GLS, generalises beyond the domain and setting of measurement.

Therefore, further work to investigate the robustness of the two measures is strongly recommended. A crucial area of research enquiry will be to examine how these support self-regulation over time. Examining these measures, alongside other important self-regulatory factors such as self-efficacy, within a longitudinal design is recommended as a vital next step in the development of the measures and the related understanding in terms of the knowledge, skills, and attitudes associated with self-regulated learning. In particular, such investigations may contribute knowledge to the learning gain debate by securing a greater depth of understanding of the distance travelled by learners engaged in tertiary education, and the mechanisms that support this. Such an understanding will, in turn, contribute valuable knowledge that can be used to inform effective pedagogies to support learners in tertiary education settings. This activity should both assist in optimising success within tertiary programmes and beyond in to graduate careers.

CHAPTER 10 – Conclusion

Findings from the current research programme make important contributions to knowledge. In relation to the first and second research aims, the development of two measurement scales, the FLS and the GLS, support a nuanced but parsimonious, learner endorsed, understanding of feedback integration and goal setting. These two measures, when embedded within a network of associated factors, identify an approach that can be used to promote understanding at different levels of abstraction. At the first level, measures could be used by learners to understand their learning approaches, during the appraisal and planning stages of self-regulated learning, and subsequently tailor and optimise their approach. Next, within a pedagogical framework, measures could be used to supplement self-understanding. Such pedagogical approaches could either be focused on engaging learners in developmental dialogues with trusted tutors. Alternatively, such measures could be used to identify learners who may benefit from tailored interventions designed to promote optimisation of learning (see for example Morisano et al., 2010; Travers et al., 2015). Findings in relation to the third aim support the notion that developing knowledge, skills and attributes that foster learner perceptions of work readiness. Results also indicate factors associated with self-regulated learning which promote learner's perceptions in confidence to move on to the next developmental stage. Factors associated with self-regulated learning, promote the self-directed approaches that graduate employers report that they seek. These findings support the notion that measuring factors associated with gainful learning, and the understanding that results from these, may facilitate the development of evaluative judgements and knowledge, skills and attributes that readily transfer to the graduate employment domain (Ajjawi et al., 2018). The final contribution to understanding relates to the extant literature. As such, findings have clear implications for learners, those who support them, and those with an interest in the science of learning in tertiary settings. The findings from the current

programme of study require further validation, in different settings, with different learner cohorts and would benefit from longitudinal and / or experimental examination.

These findings add to knowledge in other ways. The findings support understanding in relation to self-regulated learning and partially clarify other aspects. For example, the current programme has examined both structural and content theories associated with self-regulation and provides a model which suggests how factors work hand in hand to foster self-regulation. Further, findings also clarify the role of self-efficacy beyond its relationship with objective measures of performance which is proposed to be well understood. In these results, the association between self-efficacy and goal setting, notably in relation to goal clarity is supported. This evidence endorses the proposal made by both Richardson and colleagues (2012), and more recently, the importance of academic self-efficacy in post task appraisal (Talsma, Schüz, Schwarzer, et al., 2018). In relation to recent models of feedback integration (see for example Evans, 2013; Winstone, Nash, Parker, et al., 2017), goals are held to be fundamental aspects of developing the towards the next stage. Whilst this proposal has face validity, evidence from the HE domain remains scant. The current programme of research provides evidence to support this notion, specifically in relation to the clarity with which goals are held. These results also support the suggestion that selected factors associated with achievement goal theory, make nuanced contributions to both proximal and distal outcomes associated with self-regulated development.

APPENDIX 1 – Abbreviations

AGQ	Achievement Goal Questionnaire	LVSEM	Latent Variable Structural Equation Modelling
AIC	Akaike Information Criterion	MGSQ	Modified Goal Setting Questionnaire
BARS	Behaviourally Anchored Rating Scales	MLM	Maximum Likelihood Estimator with robust standard errors and a Satorra-Bentler scaled test statistic
BIC	Bayesian Information Criterion	PALS	Patterns of Adaptive Learning Scale
CFA	Confirmatory Factor Analysis	r-GSQ	Revised Goal Setting Questionnaire
CFI	Comparative Fit Index	RMSEA	Root Mean Square Error of Approximation
COV	Covariance	SAGE	Self-appraisal (S), Assessment Literacy (A), Goal Setting and Self-Regulation (G), and Engagement and Motivation (E)
DAT	Decision Analysis Test	SCCT	Social Cognitive Career Theory
DOTS	Decision making, Opportunity awareness, Transition learning and Self-awareness	SEM	Structural Equation Modelling
EFA	Exploratory Factor Analysis	SGBQ	Student Goals and Behaviour Questionnaire
EPS	Experimental Participation Scheme	SMART	Specific, Measurable, Achievable, Realistic and Timebound Goals
FLS	Feedback in Learning Scale	SOMA	Goal -Setting, -Operating, -Monitoring, and -Achievement
GLS	Goals in Learning Scale	SPSS	Statistical Package for the Social Sciences
GPA	Grade Point Average	SRMR	Standardized Root Mean Square Residual
GSQ	Goal Setting Questionnaire	STEM	Science, Technology Engineering and Mathematics
HE	Higher Education	TLI	Tucker Lewis Index

HEFCE	Higher Education Funding Council for England		
HPC	High Performance Cycle		
ITIS	Implicit Theories of Intelligence Scale		
KMO	Kaiser-Myer-Olkin Statistic		

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Chapter 1 – Figure credits

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Figure 1.3 'Performance Phase'. Reproduced from Panadero and Alonso-Tapia (2014) under license from UM Journals.

Chapter 2 – Figure credits

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Contribution statement

This publication in a peer-reviewed journal was an article the first author was invited to contribute. Dr. Forsythe therefore is noted as the primary author. In terms of contribution, all analyses and much of the writing was undertaken by Mark Jellicoe. Dr. Forsythe contributed by providing advice and guidance on all stages of design, analysis and writing.

Advisory team and co-author declaration

I declare that:

- the information above is accurate
- the advisory committee has agreed to the inclusion of this publication in the student's thesis
- all co-authors of the publication have reviewed the above information and have agreed to its veracity

_____   _____

Dr. Alexandra M. Forsythe   Professor Luke J. Dawson
Primary Supervisor and   Second Supervisor
Co-author

Chapter 5 – Publication permissions and contribution statement

'The acquisition of productive knowledge and attitudes through learning' is currently submitted to the journal 'Higher Education' for consideration, and undergoing peer review.

Contribution statement

Mark Jellicoe is recorded as the primary author in the manuscript submission. In terms of contribution, all analyses, design and the writing was undertaken by Mark Jellicoe. Dr. Forsythe contributed by providing advice and guidance on all stages of design, analysis and writing. Professor Dawson provided valuable comments on the draft paper prior to submission and is recorded as a co-author.
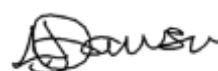
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I declare that:

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- all of the co-authors of the publication have reviewed the above information and have agreed to its veracity

Dr. Alexandra M. Forsythe Primary Supervisor and Co-author	Professor Luke J. Dawson Second Supervisor and Co-author

Chapter 6 – Publication permissions and contribution statement

'The Development and Validation of the Feedback in Learning Scale (FLS)' is currently provisionally accepted by Frontiers in Education, following

Contribution statement

Mark Jellicoe is recorded as the primary author. In terms of contribution, all analyses, design and writing work was undertaken by Mark Jellicoe. Dr Forsythe contributed by providing advice and guidance on all stages of design, analysis and writing.

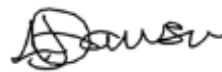*Advisory team and co-author declaration*

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- all of the co-authors of the publication have reviewed the above information and have agreed to its veracity

Dr. Alexandra M. Forsythe
Primary Supervisor and
Co-author

Professor Luke J. Dawson
Second Supervisor

APPENDIX 3 – Summary of modified measure and scoring methodology (FLS)

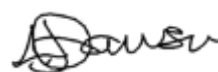| Item	Item text	New factor
MV1	"A large proportion of the feedback I received last year was negative"	*
MV2	"A major part of the feedback I received targeted my weaknesses"	*
MV3	"A large part of the feedback I received was positive"	*
FV1	"I believe the assessments I have taken part in give the opportunity to measure elements clearly related to my education"	°
	"The following examples are good tools to assess my potential":	°
FV2	- Examinations	°
FV3	- Essays	°
FV4	- Blogs	°
FV5	- Discussion / debates	°
FV6	- Presentations	°
	"I see the connection between tests and assessment methods used and what is required in my future":	°
		°
FV7	- Examinations	°
FV8	- Essays	°
FV9	- Blogs	°
FV10	- Discussion/ Debates	°
FV11	- Presentations	°
	"I believe this assessment process can correctly identify individual characteristics related to my performance on":	°
FV12	- Examinations	°
FV13	- Essays	°
FV14	- Blogs	°
FV15	- Discussion/ Debates	°
FV16	- Presentations	°
AC1	"I believe the feedback I received adequately reflects the person I am"	Acceptance
AC2	"I believe the feedback I received depicts me accurately"	Acceptance
AC3	"I recognise myself in the description my assessor has made of me"	Acceptance
	"The staff who assessed me are outstanding in their":	
CR1	- "Ability to assess my competencies"	Credible
CR2	- "Ability to make me feel comfortable"	Credible
CR3	- "Expertise in assessing people's competencies and potential"	Credible
CR4	- "Quality of listening"	Credible
CR5	- "Mastery of assessment tests and tools"	Credible

Item	Item text	New factor
CR6	- "Understanding of the context for which I am assessed"	Credible
CR7	- "Capacity to gain my confidence"	Credible
CR8	- "Tact and Diplomacy"	Credible
CR9	- "Ability to rapidly size people and their personality"	Credible
	"The assessor was outstanding in their":	
CI1	- "Ability to draw me out of my comfort zone"	*
CI2	- "Ability to destabilise me in a positive manner"	Credible
CI3	- "Capacity to confront my way of perceiving things"	Credible
CI4	- "Capacity to question how I perceive myself"	*
AW1	"I have a better idea of the type of work environment in which I perform well"	Awareness
AW2	"I understand better why some things or people make me react"	Awareness
AW3	"I know myself better"	Awareness
AW4	"I am more aware of the strengths that I can draw on from my studies"	Awareness
MI1	"I am motivated to engage in developmental activities in line with the feedback I received"	Motivational
MI2	"I am determined to work on the development areas identified"	Motivational
MI3	"I am motivated to develop myself in the direction of the feedback I received"	Motivational
	"Following feedback I":	
BC1	"have changed my less-efficient behaviours described in the feedback I have received"	Motivational
BC2	"make more use of my strengths identified during the feedback session when I encounter a problem in my studies"	*
BC3	"have sought more feedback from others to develop competencies discussed during the feedback"	BD Change
BC4	"asked others for suggestions on how I could improve competencies described in the feedback"	BD Change
BC5	"have changed my study behaviour in a way consistent with the feedback I received"	*
DC1	"have voluntarily participated in developmental activities in line with the feedback I received"	BD Change
DC2	"have asked my tutor for a development plan in line with the feedback I received"	BD Change
DC3	"have searched for developmental activities in line with competencies described during the feedback"	BD Change

° = Discarded prior to analyses
* = Discarded during exploratory analyses
All retained items scored on a [1] Strongly Disagree to [6] Strongly Agree

APPENDIX 4 – Scale development summary and key to GLS Items

Ref	GSQ (Lee et al., 1991)	SGBQ (White, 2002)	r-GSQ (Kwan et al., 2013)
1. Supervisor support/participation [4]			
TS1	9. "My boss is supportive with respect to encouraging me to reach my goals"	**9. "Lecturers and/or tutors are supportive with respect to encouraging me to reach my goals"**	1. "My boss is supportive of my goals"
TS2	NA	NA	**2. "My boss encourages me to reach my goals"**
TS3	10. "My boss lets me participate in the setting of my goals"	**10. "Lecturers and/or tutors let me participate in the setting of my goals"**	3. "My boss lets me participate in the setting of my goals"
TS4	11. "My boss lets me have some say in deciding how I will go about implementing my goals"	**11. "Lecturers and/or tutors let me have a say in deciding how I will go about implementing my goals"**	4. "My boss lets me have some say in deciding how I will go about implementing my goals"
2. Goal stress [4]			
GS1	37. "I find working toward my goals to be very stressful"	**27. "I find working toward my academic goals very stressful"**	5. "I find working toward my goals to be very stressful"
NA	38. "My goals are much too difficult"	28. "My academic goals are much too difficult"	NA
GS2	39. "I often fail to attain my goals"	**29. "In the past I have not succeeded in attaining my academic goals"**	6. "I often fail to attain my goals"
GS3	NA	NA	**7. "I feel that I must accomplish my goals"**
GS4	NA	NA	**8. "My supervisor always emphasizes that I need to accomplish my goals"**
3. Goal efficacy [3]			
GE1	NA	NA	**9. "My colleagues respect me when I reach my goals"**
NA	14. "Trying for goals makes my job more fun than it would be without goals"	14. "Trying for academic goals makes studying more fun than it would be without goals"	NA

Ref	GSQ (Lee et al., 1991)	SGBQ (White, 2002)	r-GSQ (Kwan et al., 2013)
NA	15. "I feel proud when I get feedback indicating that I have reached my goals"	15. "I feel proud when I get feedback (in the form of grades) indicating that I have achieved my academic goals"	NA
GE2	21. "I usually feel that I have a suitable or effective action plan or plans for reaching my goals"	**21. "I usually feel that I have a suitable or effective action plan(s) for reaching my academic goals"**	10. "I usually feel that I have a suitable or effective action plan or plans for reaching my goals"
GE3	23. "I feel that my job training was good enough so that I am capable of reaching my job goals"	**23. "I feel that my course was good enough so that I am capable of reaching my academic goals"**	11. "I feel that my job training was good enough so that I am capable of reaching my job goals"
	4. Goal rationale [5]		
GR1	NA	NA	**12. "My boss informs me how the goals are set"**
GY1	4. "I understand how my performance is measured on this job"	**4. "I understand how my academic performance is measured"**	33. "I understand how my performance is measured on this job *[now on goal clarity]"*
GY2	7. "My boss clearly explains to me what my goals are"	**7. "Lecturers and/or tutors clearly explain to me what my goals should be"**	34. "My boss clearly explains to me what my goals are [*now on goal clarity*]"
GR2	8. "My boss tells me the reasons for giving me the goals I have"	**8. "Lecturers and/or tutors tell me the reasons for the goals I should have"**	13. "My boss tells me the reasons for giving me the goals I have"
GR3	22. "I get regular feedback indicating how I am performing in relation to my goal"	**22. "I get regular feedback from my lecturers and/or tutors indicating how I am performing in relation to my academic goals"**	14. "I get regular feedback indicating how I am performing in relation to my goal"
	5. Use of goal setting in performance appraisal [0]		
NA	27. "In performance appraisal sessions with my boss, he stresses problem-solving rather than criticism"	NA	NA
NA	28. "During performance appraisal interviews, my boss":	NA	NA

Ref	GSQ (Lee et al., 1991)	SGBQ (White, 2002)	r-GSQ (Kwan et al., 2013)
NA	a. "explains the purpose of the meeting to me"	NA	NA
NA	b. "asks me to tell him/her what I have done that deserves recognition"	NA	NA
NA	c. "asks me if there are any areas of the job on which he or she can assist me"	NA	NA
NA	d. "tells me what he or she thinks I have done that deserves recognition"	NA	NA
NA	e. "if there are problems with my performance, never brings up more than two of them at once"	NA	NA
NA	f. "listens openly to my explanations and concerns regarding any performance problems"	NA	NA
NA	g. "comes to agreement with me on steps to be taken by each of us to solve any performance problems"	NA	15. "During performance appraisal interviews, my boss comes to agreement with me on steps to be taken by each of us to solve any performance problems"
NA	h. "makes sure that at the end of the interview I have a specific goal or goals in mind that I am to achieve in the future"	NA	16. "My boss makes sure that at the end of the interview I have a specific goal or goals in mind that I am to achieve in the future"
6. Tangible rewards [3]			
NA	17. "I sometimes compete with my co-workers to see who can do the best job in reaching their goals"	17. "I sometimes compete with other students to see who can do the best in reaching their academic goals"	NA
TR1	18. "If I reach my goals, I feel that this will enhance my job security"	**18. "If I reach my academic goals, I feel that this will increase my academic opportunities"**	17. "If I reach my goals, I feel that my job security will be enhanced"

Ref	GSQ (Lee et al., 1991)	SGBQ (White, 2002)	r-GSQ (Kwan et al., 2013)
TR2	19. "If I reach my goals, it increases my chances for a pay raise"	**19. "If I reach my academic goals, it increases my chances of a pay rise"**	18. "If I reach my goals, it increases my chances for a pay raise"
TR3	20. "If I reach my goals, it increases my chances for a promotion"	**20. "If I reach my academic goals, it increases my chances of getting into a higher degree"**	19. "If I reach my goals, it increases my chances for a promotion"
7. Goal conflict [7]			
GC1	41. "I have too many goals on this job (I am too overloaded)"	**31. "I have too many academic goals"**	20. "I have too many goals on this job (I am too overloaded)"
GC2	42. "Some of my goals conflict with my personal values"	**32. "Some of my academic goals conflict with my personal values"**	21. "Some of my goals conflict with my personal values"
GC3	43. "I am given incompatible or conflicting goals by different people (or even by the same person)"	**33. "I am given incompatible or conflicting goals by different people (or even by the same person)"**	22. "I am given incompatible or conflicting goals by different people (or even by the same person)"
GY3	44. "I have unclear goals on this job"	**34. "I have unclear academic goals"**	35. "I have unclear goals on this job [*reversed – now on goal clarity*]"
DG1	45. "My job goals lead me to take excessive risks"	**35. "My academic goals lead me to take excessive risk"**	26. "My job goals lead me to take excessive risks [now on dysfunctional effects]"
DG2	46. "My job goals serve to limit rather than raise my performance"	**36. "My academic goals serve to limit, rather than raise my academic performance"**	27. "My job goals serve to limit rather than raise my performance [now on dysfunctional effects]"
DG3	47. "The goals I have on this job lead me to ignore other important aspects of my job"	**37. "The academic goals that I have lead me to ignore other important aspects of university life"**	28. "The goals I have on this job lead me to ignore other important aspects of my job [now on dysfunctional effects]"
	48. "The goals I have on this job focus only on short-range accomplishment and ignore important long-range consequences"	38. "The academic goals that I have focus only on short-range accomplishment and ignore important long-range consequences"	NA
8. Organization facilitation of goal achievement [3]			

Ref	GSQ (Lee et al., 1991)	SGBQ (White, 2002)	r-GSQ (Kwan et al., 2013)
NA	3. "The goals I have on this job are challenging but reasonable (neither too hard nor too easy)"	3. "The academic goals I have are challenging, but reasonable (neither too hard or too easy)"	NA
OF1	24. "Company policies here help rather than hurt goal attainment"	**24. "Departmental policies help, rather than hurt academic goal attainment"**	23. "Company policies here help rather than hurt goal attainment"
OF2	25. "Work teams in this company work together to attain goals"	**25. "Students work together to attain academic goals"**	24. "Work teams in this company work together to attain goals"
OF3	26. "This company provides sufficient resources (e.g. time, money, equipment, coworkers) to make goal setting work"	**26. "This department provides sufficient resources (equipment, etc.) to make goal setting work"**	25. "This company provides sufficient resources (e.g. time, money, equipment, coworkers) to make goal setting work"
NA	28. "During performance appraisal interviews, my boss: i. schedules a follow-up meeting so that we can discuss progress in relation to the goals"	NA	NA
9. Dysfunctional effects of goals [0]			
NA	12. "If I reach my goals, I know by boss will be pleased"	12. "If I reach my goals I know my lecturers and/or tutors will be pleased"	NA
NA	40. "My supervisor acts nonsupportively when I fail to reach my goals"	30. "My lecturers and/or tutors acts non-supportively when I fail to reach my academic goals"	NA
NA	49. "The pressure to achieve goals here leads to considerable dishonesty and cheating"	NA	29. "The pressure to achieve goals here leads to considerable dishonesty and cheating"
NA	50. "The top people here do not set a very good example for the employees since they are dishonest themselves"	NA	NA

Ref	GSQ (Lee et al., 1991)	SGBQ (White, 2002)	r-GSQ (Kwan et al., 2013)
NA	51. "Goals in this organization are used more to punish you than to help you do your job well"	NA	30. "Goals in this organization are used more to punish you than to help you do your job well"
NA	52. "My boss wants me to avoid mentioning negative information or problems regarding my goals or action plans"	NA	31. "My boss wants me to avoid mentioning negative information or problems regarding my goals or action plans"
NA	53. "If my boss makes a mistake that affects my ability to attain my goals, he or she refuses to admit it or discuss it"	NA	32. "If my boss makes a mistake that affects my ability to attain my goals, he or she refuses to admit it or discuss it"
10. Goal clarity [3]			
GY4	1. "I understand exactly what I am supposed to do on my job"	**1. "I understand exactly what I am supposed to do as a student"**	36. "I understand exactly what I am supposed to do on my job"
GY5	2. "I have specific, clear goals to aim for on my job"	**2. "I have specific, clear goals to aim for as a student"**	37. "I have specific, clear goals to aim for on my job"
GY6	6. "If I have more than one goal to accomplish, I know which ones are most important and which are least important"	**6. "If I have more than one goal to accomplish, I know which ones are most important and which are least important"**	38. "If I have more than one goal to accomplish, I know which ones are most important and which are least important"
NA	16. "The other people I work with encourage me to attain my goals"	16. "The other students I work with encourage me to attain my academic goals"	NA
11. Goal difficulty [4]			
GD*	NA	NA	**"For the average employee in the same level of job and who has a similar level of education and experience as you, the goals that you have in relation to this employee's would require":**
GD1	NA	NA	**"No challenge at all" to "extreme challenge"**

Ref	GSQ (Lee et al., 1991)	SGBQ (White, 2002)	r-GSQ (Kwan et al., 2013)
GD2	NA	NA	**"almost no effort" to "enormous effort"**
GD3	NA	NA	**"No thought or skill" to "an extreme degree of thought and problem solving skill"**
GD4	NA	NA	**"Very little persistence and tenacity" to "an enormous amount of persistence and tenacity"**
		Orphan statements	
NA	NA	5. "I have deadlines for meeting my study goals"	NA
NA	NA	13. "I get credit and recognition when I attain my academic goals"	NA

Key to ref. abbreviation stems:

TS = Tutor support   GS = Goal Stress
GE = Goal Efficacy   GR = Goal Rationale
TR = Tangible Rewards   GC = Goal Conflict
OF = Organisational Facilitation   DG = Dysfunctional Goals
GY = Goal Clarity   GD = Goal Difficulty

Shaded items are those that were identified in SEM   Unshaded cells do not form part of the final GLS

	Cronbach's alpha reported by authors			
	r-GSQ		MGSQ	GSQ
Factor	US sample	CHN sample	-	-
TS	.91	.88	-	.82
GS	.65	.86	-	.75
GE	.63	.83	-	.68
GR	.77	.90	-	.91
TR	.92	.73	-	.74
GC	.78	.79	-	.85
OF	.84	.85	-	.63
DG	.90	.84	-	.85
GC	.88	.79	-	.67
GD	.78	.76	-	.91

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