

‘Non-Cognitive’ Constructs and Measures for the Young Lives School Surveys

Angela W. Little



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About Young Lives

Young Lives is an international study of childhood poverty, following the lives of 12,000 children in four countries (Ethiopia, India, Peru and Vietnam) over 15 years. www.younglives.org.uk

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1. Introduction

In their studies of academic achievement, the Young Lives school survey research teams wish to include a range of psychosocial measures. This working paper prepares the ground for this work. It reviews international literature on psychosocial constructs and measures, often referred to as 'non-cognitive' factors, in the determination of academic achievement and longer term outcomes. The review focuses on five recent meta reviews, and also describes a number of studies in low- and middle-income countries not included in these meta reviews, but which have relevance for Young Lives research. It emphasises the importance of linking constructs to theory as well as to measures, and raises a number of measurement and procedural issues. Based on evidence to date, the paper proposes a model of the role of non-cognitive factors and learning outcomes. Finally, it provides guidance on the pre-pilot work.

2. The non-cognitive terrain

The term 'non-cognitive' embraces a vast terrain of skills, strategies, attitudes and behaviours which act both as determinants and outcomes of behaviour. The term is placed in inverted commas since it is clear that the boundary between the non-cognitive and cognitive psychological domain is blurred, and that many attitudes and psychosocial factors often described as belonging to the non-cognitive domain of functioning involve cognitive processing (e.g. self-beliefs, expectancy of future performance, self-concept). This section describes the scope of five recent and extensive literature reviews and the non-cognitive constructs addressed. Section 3 then presents the main findings from each review.

2.1 Literature review 1 – Gutman and Schoon (2013)

In their review for the UK Cabinet Office, Gutman and Schoon (2013) define non-cognitive skills as the: 'the attitudes, behaviours and strategies that are thought to underpin success in school and in work'. From the research studies reviewed, they identify eight foci:

- Self-perceptions (self-concept of ability, self-efficacy)
- Motivation (achievement goal theory, intrinsic motivation, expectancy value theory)
- Perseverance (engagement, grit)
- Self-control
- Meta cognition
- Social competencies (leadership skills, social skills)
- Resilience and coping
- Creativity

2.2 Literature review 2 – Farrington et al. (2014)

Reviewing evidence on non-cognitive factors in shaping school performance in the United States, Farrington et al. (2014) underline the conceptual difficulty in trying to forge clear-cut separations between cognitive and non-cognitive factors, emphasising both that 'learning is an interplay between cognitive and non-cognitive factors' and that 'intelligence is embedded in both the environment and in socio-cultural processes'. They identify non-cognitive factors similar to those listed by Gutman and Schoon (2013), but go further and order them hierarchically in terms of their direct and indirect impact on school performance. The five broad categories and sub-categories are:

- Academic behaviours (going to class, doing homework, organising materials, participating, studying). Academic behaviours are proximal to performance and virtually all other factors (below) work through them.
- Academic perseverance (grit, tenacity, delayed gratification, self-discipline, self-control). These act on academic behaviours and, through them, on performance.
- Academic mindsets (e.g. 'I belong to this academic community'; 'my ability and competence grow with my effort'; 'I can succeed at this'; 'this work has value for me'). Academic mindsets act on academic perseverance and then on academic behaviours and performance.
- Learning strategies (processes and tactics one employs to aid cognition, e.g. mnemonics, self-correction). Learning strategies impact on performance directly and indirectly via perseverance and behaviours.
- Social skills (interpersonal skills, empathy, cooperation, assertion and responsibility). These act on academic behaviours and, through them, on performance.

The non-cognitive terrain comprises many fields of specialised literature, some of which sits comfortably in the above categories and some not.

2.3 Literature review 3 – Rosen et al. (2010)

Rosen et al. (2010) present an extensive review of research on 'non-cognitive attributes' and academic outcomes based on research from kindergarten to Grade 12 on more than 200 studies, the majority of which from the United States. The seven non-cognitive 'skill' domains reviewed were:

- Motivation
- Effort
- Self-regulated learning
- Self-efficacy
- Academic self-concept
- Anti-social and pro-social behaviour
- Coping and resilience

2.4 Literature review 4 – Duckworth et al. (2009)

Duckworth et al. (2009) explore the literature on 'self-regulation'. As the authors explain, while their intention had been to develop a typology of 'non-cognitive' skills and their relationship with learning and attainment, they concluded that the term 'non-cognitive' failed to delineate a

discrete class of skills or related attributes (Duckworth et al. 2009: 54-63). While much of the current interest in the 'non-cognitive' domain is due to the work of the economist Heckman and others (Heckman and Rubinstein 2001) and their embrace of research from sociology and psychology, economists typically fail to define 'non-cognitive' and its boundaries. Some treat 'social skills' and 'non-cognitive' skills interchangeably (e.g. Carneiro et al. 2007), while others equate non-cognitive skills with traits, characteristics, soft skills, non-cognitive personality traits, behavioural traits and social and emotional aspects of learning. Skills defined within the non-cognitive umbrella range from attitude, communication skills, motivation and personality to self-esteem, attentiveness, extraversion, teamwork, and an understanding of self.

Duckworth et al. (2009) chose to restrict their review to 'self-regulation', which refers to a rather less nebulous set of attributes within the 'non-cognitive' terrain. Self-regulation refers to: 'self-generated thoughts, feelings and actions that are planned and cyclically adapted to the attainment of personal goals' (Zimmerman 2000).

Self-regulation appears in three phases of a learning cycle. First is the *forethought* phase which precedes engagement in learning and involves task analysis (goal setting and strategic planning) and self-motivation beliefs (self-efficacy, outcome expectations, task interest/value and goal orientation). The *performance* phase involves processes of self-control (self-instruction, imagery, attention focusing and task strategies) and self-observation (metacognitive monitoring, self-recording). The third phase is the *self-reflective* phase and occurs when learners make self-judgments (self-evaluation, causal attribution) and self-reaction (self-satisfaction/affect, adaptive-defensive reactions). The process is cyclical: self-regulated learners adjust their goals and choice of strategies continuously. Self-regulation improves with practice: successful self-regulators can draw on previous learning and build a repertoire of beliefs and strategies that enhance learning (Duckworth et al. 2009: 4).

Hence, several of the constructs employed in Young Lives household surveys to date (e.g. self-efficacy, self-satisfaction (esteem/pride), self-concept, locus of control, task strategies/homework)) are captured within the above model of self-regulation. Conversely, several others (e.g. trust and agreeableness in the Young Lives Round 2 survey) are not.

2.5 Literature review 5 – Rankin et al. (2015)

Rankin et al. (2015) explore transferable skills in relation to outcome measures of employment, health and personal well-being in school and beyond. The authors focus on studies in low- and middle-income countries. Transferable skills, which they equate with soft skills and life skills, 'provide youth with the tools and confidence to succeed in terms of employment, health and personal well-being' (Rankin et al. 2015, Executive Summary). Their review comprised studies that employed 15 outcome measures, organised into three broad groups and 24 interventions, organised into seven broad types. The three broad outcome groups are:

- *Learning and behaviour* – individual knowledge; individual beliefs and attitudes; observed transferable skills (though these are not defined); social participation and interaction; health and safety behaviours; livelihoods and employment behaviours; criminality.
- *Academic, employment, livelihoods and demography* – demography and health, academic and schooling outcomes, employment; wages, income and assets; other livelihood measures.
- *Institutional outcomes* – educational institutions, private sector, societal and political.

The most common outcomes measured in the studies reviewed related to individual learning and behaviour, and individual knowledge. Most of these outcomes are self-reported. There was only one study that measured outcomes at the institutional level.

The seven types of intervention are:

- *Formal education* – teacher training programmes and curriculum reform; teacher networking and support; teacher incentives; skills courses at school; institutional management and capacity building.
- *Extra-curricular activities* – student clubs, groups and associations; career counselling and job fairs.
- *Pedagogy* - learner-centred teaching; experiential and participatory learning.
- *Skills training* – transferable skills training; TVET and transferable skills combined training; foundational and transferable skills combined training.
- *Work placement* – job matching, apprenticeship and internship programmes; public and community services programmes; military-style programmes.
- *Alternative learning pathways* – media and edutainment; community centres and civil society groups; distance learning; mentoring, tutoring and coaching; peer-to peer learning or peer encouragement; parent or family involvement; therapy and transferable skills.
- *Financial support* – education-related financial support and services; job-related financial support and services.

3. Findings from the literature reviews

The literature reviews identify consistent and inconsistent findings and considerable gaps in evidence.

3.1 Review 1 – Gutman and Schoon (2013)

Gutman and Schoon (2013) identify evidence for strong *associations* between non-cognitive factors (e.g. self-control and school engagement) and positive outcomes in the future (e.g. academic attainment, improved finances in adulthood, and reduced crime). However, evidence of robust, causal relationships is more limited. Experimental studies have focused on single factors over short time frames:

that said, there are significant signs of promise. When developed in combination, skills such as self-efficacy, motivation, and meta-cognitive strategies appear to be influential in improving academic learning and success in children and young people (Gutman and Schoon 2013: 43).

The review recognises the complex and contested nature of the extant literature in which there appears to be little agreement on the definition of terms. Terms such as 'character skills', 'competencies', 'personality traits', 'soft skills' and 'life skills' are widely used and used interchangeably with 'non-cognitive' skills. Even within a single construct, such as motivation

and resilience, both of which have long histories and a copious literature, there are competing meanings and different approaches to measurement.

Notwithstanding the complexity of the literature, current debate:

sometimes implies that there is one key factor – whether, grit, self-control or resilience – that is the “key to success” for young people, and that it is this crucial ingredient that enables them to succeed over and above cognitive ability or test scores, to overcome disadvantage and flourish even in the face of serious adversity. ... our review finds that there does not seem to be one non-cognitive skill that is the crucial “silver bullet” that predicts positive outcomes for young people. Rather, there are many skills that are inter-linked and the enhancement of one of these skills without improvement of the others is unlikely to lead to lasting changes (Gutman and Schoon 2013: 43).

In their conclusion, Gutman and Schoon (2013) call for a broad view of the non-cognitive terrain and a consideration of non-cognitive skills in combination. While acknowledging significant gaps in the evidence, they are optimistic that further studies have the potential to make the case for investing in the development of non-cognitive skills of young people. In particular they identify the need for long-term studies that explore the sustainability of non-cognitive factors and their causal relationship with long-term outcomes.

3.2 Review 2 – Farrington et al. (2012)

Farrington et al. (2012) organise their extensive about the evidence on each of the five categories (2.2) around five broad questions:

1. What is the relationship of each factor to student academic performance?
2. Is the factor malleable?
3. What is the role of classroom context in shaping the factor?
4. Are there clear, actionable strategies for developing the factor as part of classroom practice?
5. Is there evidence that attention to the non-cognitive factor would address racial/ethnic or gender gaps in student achievement?

Their conclusions are extensive, and detailed below.

3.2.1 *Relationship to academic performance*

Academic behaviours

All aspects of academic performance, cognitive and non-cognitive, are expressed through academic behaviours. Academic behaviours have both a strong direct and indirect effect on academic grades.

Academic perseverance

Research often conflates students' innate tendency to be perseverant with the actual behaviour of doing work. While academic perseverance shows moderate relationships to student performance in cross-sectional designs, longitudinal studies find more modest relationships, making it difficult to establish evidence of a causal relationship between perseverance and performance.

Academic mindsets

The effects of various school-based interventions suggest not only that mindsets are important, but also that changing students' mindsets can result in improvements in academic performance.

Learning strategies

Despite limitations, research shows that knowing how and when to use learning strategies is associated with higher overall learning and better academic success.

Social skills

Social skills show the weakest evidence of direct relationship to grades. Much of the work done in the area of social skills training programmes focuses on younger children, and there is only an indirect link between social skills and academic performance. A serious limitation of the studies showing a link between social skills and academic achievement is that almost all are correlational rather than causal. Studies tend to confound social skills with other variables, making it difficult to isolate the effect of social skills on academic performance.

3.2.2 Malleability

Academic behaviours

All types of human behaviour are considered to be malleable.

Academic perseverance

The malleability of academic perseverance depends on how one defines perseverance. The evidence suggests that perseverance expressed as 'grit' is fairly stable as an individual trait. However, students are more likely to display academic perseverance when they have positive academic mindsets or strategies to successfully manage tasks.

Academic mindsets

The apparent success of many of the mindsets interventions suggests that mindsets are malleable and can be changed intentionally.

Learning strategies

Research strongly supports the idea that learning strategies are malleable and can be directly taught. But many of the studies reviewed measured strategy use and performance concurrently. While these studies showed strong relationships between the two, they left open the question of whether learning strategies can be effectively taught, and if so, if teaching such strategies would result in improved performance.

Social skills

Research on social skills training programmes has found that they are generally effective, although the methodological strengths of these studies vary.

3.2.3 *The role of classroom context*

Academic behaviours

There is clear evidence that classroom context matters. Context shapes academic behaviours indirectly through its effect on other non-cognitive factors, as well as directly through behavioural expectations and strategies.

Academic perseverance

Classroom contexts that are structured to support students' success at assigned tasks and that provide students with strategies to make the tasks easier, make it more likely for students to persevere at those tasks.

Academic mindsets

There is a theoretical and empirical basis for the importance of context in shaping mindsets. The effect of classrooms on student mindsets is particularly salient for ethnic minority students.

Learning strategies

Classrooms are important both as sites for the explicit teaching of subject-specific learning strategies and as contexts that set motivational conditions for learning strategy use.

Social skills

Schools and classrooms play an important role in shaping students' social behaviours. Student behaviours are responsive to interpersonal, instructional, and environmental factors in the classroom.

3.2.4 *Clear classroom strategies*

Academic behaviours

While there is a wide range of classroom-based and school-wide strategies, few strategies have been evaluated on large-scale basis. Academic behaviours such as attendance and assignment completion can be affected by close monitoring and support. Whole school reform shows some effects, but it is unclear what is responsible for changing behaviour.

Academic perseverance

There are numerous instructional practices which have been shown to improve students' perseverance in their coursework by changing students' mindsets. There is little research on whether and how teachers might structure classes to develop students' perseverance in the long run.

Academic mindsets

There are a variety of short-term interventions that have evidence of success – from programmes focused on envisioning 'future possible selves' to 'developing a sense of belonging'. But while each individual study points to a relationship between mindsets and school performance, educational attainment, or other life-course outcomes, the broad array of findings across studies is confusing, and the directions for practice are unclear. There are few resources available currently that would translate social-psychological theory into classroom-based instructional practices that could be readily employed by teachers in a variety of school settings.

Learning strategies

There are numerous short-term studies that provide evidence for the effectiveness of teaching specific strategies. Teacher feedback can provide ongoing formal and informal assessments so students can understand which strategies worked for them and where they need to improve. Student self-assessments can also provide opportunity for students to critique their strategies. Students can talk about their thinking with their teachers when planning out an academic task.

Social skills

There is little direction for classroom teachers wanting to support the positive development of social skills in their students outside of a formal programme.

3.2.5 Would changing this factor narrow the achievement gap?

Academic behaviours

There is evidence that academic behaviours explain part, but not all, of the gender gap in grades. There is little consistent evidence that academic behaviours explain differences in grades by race/ethnicity, particularly when controlling for prior test scores and economic status.

Academic perseverance

Despite the fact that differences in perseverance by race or gender have been suggested as an explanation for race/ethnicity or gender differences in student academic performance, there is no research that has examined this directly.

Academic mindsets

A number of interventions targeting mindsets have been shown to reduce gender and racial/ethnic achievement gaps. Ultimately, whether a focus on mindsets can narrow current gaps in performance and degree attainment depends on how much of the gap is caused by stereotype threat or other forces that differentially harm minority students in the first place.

Learning strategies

There is little evidence across studies about measured differences in learning strategies by race/ethnicity or gender.

Social skills

Research gives little indication as to whether changes in students' social skills would narrow racial/ethnic and/or gender achievement gaps.

Overall, Farrington et al. (2014) conclude that while much of the recent work on non-cognitive factors focuses on the development of 'grit' or perseverance in learning, there is little evidence that working directly on changing the level of grit raises levels of performance. It seems that the mechanisms through which teachers can help students to exhibit greater perseverance and better academic behaviours are 'through attention to academic mindsets and development of students' metacognitive and self-regulatory skills rather than trying to changing the innate tendency to persevere' (Farrington et al. 2014).

3.3 Review 3 – Rosen et al. (2010)

Rosen et al. (2010) maintain that their review of research on motivation provides ample support for the impact of motivation on academic achievement. Intrinsic motivation, high expectations of success, and high task value and mastery goal orientations were related positively to academic achievement, education attainment, effort and engagement. However, because the research draws on diverse theoretical perspectives and measures it is not possible to estimate the relative size of the influence of each.

The review of research on effort distinguished the degree of effort (i.e. the extent to which students take an active role in learning) from the degree of specificity of effort (whether the behaviour is geared toward completing a specific task (e.g. a science assignment) or more general achievement (e.g. trying hard in science classes). Most of the research reviewed treated effort as an outcome rather than a predictor variable. Three measurement issues were identified: the choice between general achievement and task-oriented behaviour; differentiating procedural from substantive behaviours; and the relative value of subjective indicators and performance-based indicators.

The review of self-regulated learning underlined a range of definitions drawn from different theoretical orientations. Self-regulated learning refers to the way 'students evaluate tasks, review the strategies available to them for accomplishing the tasks, apply themselves to completing the tasks, monitor the effectiveness of their strategies; and, depending on outcomes, revise their model for approaching similar tasks in the future (Lennon 2010: 69). Research suggests that self-regulation is influenced by global motivation and by self-efficacy beliefs.

The review of academic self-efficacy identifies more concurrence over its definition; the student's belief that he or she can complete the task at hand. Self-efficacy is subject-specific; an individual's level of self-efficacy can vary across and within domains: reading, algebra, writing, long division.

Academic self-concept differs from self-efficacy and refers to a student's belief about his or her overall ability in school (global self-concept) or in particular subjects (domain-specific self-concept). While there appears to be a positive relationship between self-concept and academic achievement, the causal ordering and strength of the relationship remain unclear.

The review of anti-social (including physical and verbal aggression, dismissive or exclusionary behaviour) and pro-social behaviours (including cooperation, sharing and encouragement) suggested that a majority of studies found a negative and positive relationship between academic outcomes and anti-social and pro-social behaviours, respectively.

In relation to coping (which embraces a range of attitudes, behaviours and relational skills) and resilience (success in spite of demographic, academic or psychological factors), results were mixed. The authors attribute this to possible differences in the measurement of skills, the definitions of risks, and the specification of the models. In their overall conclusion the authors caution:

It is in the area of measurement where we see the most need for improvement and future research. Overwhelmingly, researchers across all constructs make use of student reports. Motivation, self-concept, anti- and prosocial behaviours, and coping, for example, are all dominated by questionnaires and this is likely to remain unchallenged. For some attributes, like self-concept, a self-report is sensible since self-concept is

fundamentally a perception. But for many other constructs, researchers should consider approaches that tap actual behaviours, which as any researcher knows often do not correlate perfectly to self-reports ... in the *effort* chapter ... the authors reported on a study that empirically showed divergence between self-reports and performance-based measures. Across the attributes we did notice that direct behavioural observations were used infrequently (Rosen et al. 2010: 199).

3.4 Review 4 – Duckworth et al. (2009)

In their review of self-regulation and its impact on learning and attainment, Duckworth et al. (2009) conclude that self-regulation has an impact on academic achievement. While its effect size is 'considerably smaller' than that associated with prior attainment, 'it exists independently of prior attainment and can be supported through appropriate policy and practice' (Duckworth et al. 2009: iii). However, students vary in the development of their self-regulation skills. Some struggle to know whether a strategy is likely to be successful and cannot assess whether an investment of effort is likely to be worthwhile. Others become defensive, procrastinate, choose easy tasks or find ways of avoiding learning tasks altogether.

The early years are important for the development of attention, inhibition and working memory which provide the foundation for positive classroom behaviour and subsequent achievement. Children who are engaged, interested and pay attention spend more time on task and higher quality time on task.

During middle childhood and adolescence, self-regulated learners develop learning strategies and achieve more than those who do not develop learning strategies. Students who develop, modify and reflect on their learning methods and understand the strategies used by peers, achieve more. Levels of self-efficacy are high and this influences goal setting and commitment to fulfil learning challenges.

Among adults, the evidence suggests that motivation, self-competence and sense of control over their own lives and circumstances, as well as difficulties regulating emotional behaviour in adolescence, have predictive power for adult wages.

3.5 Review 5 – Rankin et al. (2015)

The Rankin et al. (2015) review offers no findings. Rather it maps the many gaps in research evidence in low- and middle-income countries and suggests promising questions for research synthesis and priority questions for future impact evaluation investments.

Promising questions include skills courses at school and transferable skills training combined with technical vocational education and training outside of the classroom. Priority questions for future impact evaluation investments include other kinds of transferable skills programming connected to the formal education system as well as testing of learner- centred interventions targeted to transferable skills.

We conclude that there are multiple gaps of evidence in categories important to stakeholders. While ongoing studies are beginning to focus on transferable skills more directly, ultimately more evidence is needed on this topic in low- and middle-income countries (Rankin et al. 2015: ii).

4. Other studies of relevance to Young Lives

A number of cross-cultural and single country studies not included in the above reviews offer findings and ideas of relevance for Young Lives research.

4.1 Program for International Student Assessment (PISA)

Since the early 1990s the OECD's Program for International Student Assessment (PISA) has explored the determinants of academic success. From the late 1990s measures of student approaches to learning were developed in order to assess the broader outcomes of schooling and their impact on academic achievement. A preliminary pilot instrument consisting of 112 items was designed to measure 29 constructs considered to be important for the way that students address and handle learning tasks in schools, and the extent to which they are able to achieve their learning goals by applying strategies, motivating themselves, and by controlling their own learning processes (Baumert et al. 1998 quoted in Marsh et al. 2006). These included strategies for self-regulated learning, self-belief cognitions and preferences for different types of learning situation and approaches. The instrument was administered to samples in 22 countries. As a result of analysis of scale reliability and relationships with criterion variables of academic achievement (reading and maths), socio-economic status and gender, and input from statistical and substantive expert panels, a total of 52 items designed to measure 14 constructs were selected for a final version of an instrument designed to assess student approaches to learning (SAL).

The final 14 SAL constructs include many that have been of interest to Young Lives researchers. They are:

- Instrumental motivation
- Interest in reading
- Interest in mathematics
- Control strategies
- Memorisation
- Elaboration
- Effort-persistence
- Cooperative learning
- Competitive learning
- Verbal self-concept
- Maths self-concept
- Academic self-concept
- Self-efficacy
- Control expectation

Verbal achievement was positively correlated with all the above, especially with verbal and self-belief factors (verbal self-concept, academic self-concept, self-efficacy and control expectations) and interest in reading. Verbal achievement was also substantially related to learning strategies (control strategies and elaboration, but not memorization), effort/persistence, and, to lesser extents, instrumental motivation and both cooperative and competitive learning preferences. 'Overall 33% of the variance in reading achievement is accounted for by the 14 SAL factors'.

Maths achievement was positively correlated with all the above, except memorization. The strongest correlations were for self-beliefs factors (maths self-concept, academic self-concept, self-efficacy and control expectations) and interest in mathematics. The strongest correlations were for maths and general self-belief factors (maths self-concept, academic self-concept, self-efficacy and control expectations) and interest in mathematics. However, maths achievement was also substantially related to learning strategies (control strategies and elaboration, but not, perhaps, memorization), effort/persistence, and, to a lesser extent, instrumental motivation. 'Overall 26% of the variance in achievement in Mathematics is accounted for by the 14 SAL factors'.

Some of these constructs appear to have been used in successive waves of the triennial PISA surveys, though some constructs and some of the items used to indicate the construct have changed over time. In 2000 four broad constructs were explored – motivation, self-related beliefs, learning strategies, and preference for cooperative and competitive learning situations. In 2003 the four broad areas were motivational factors and general attitudes, self-related beliefs, emotional factors (e.g. anxiety), and learning strategies. In 2009 the areas were student engagement, student strategies and practices; and in 2012 they were perseverance, openness to problem solving, locus of control and motivation.

Also, within constructs with very similar labels, items have changed over survey rounds. For example, the items employed to indicate *effort and perseverance* (2000) and *perseverance* (2012) have changed. The 2012 items draw from Duckworth's work on perseverance and 'grit' (Duckworth et al. 2007).

In 2000:

- When studying I work as hard as possible.
- When studying I keep working even if the material is difficult.
- When studying I try to do my best to acquire the knowledge and skills taught.
- When studying I put forth my best effort.

In 2012:

- When confronted with a problem I give up easily.
- I put off difficult problems.
- I remain interested in the tasks that I start.
- I continue working on tasks until everything is perfect.

Items indicating motivation to learn maths were measured differently in 2000 and 2003.

In 2000:

- When I do mathematics, I sometimes get totally absorbed.
- Because doing maths is fun, I wouldn't want to give it up.
- Mathematics is important to me personally.

In 2003:

- I enjoy reading about maths.
- I look forward to maths lessons.
- I do maths because I enjoy it.
- I am interested in the things I learn in maths.

In 2012 these same items were used but the construct was relabelled 'intrinsic motivation to learn mathematics'.

The most recent publically available analysis of PISA data derives from the 2012 survey conducted in 64 countries. The relationship between 'students' drive and motivation' was explored using four constructs and indices:

- *Perseverance* – constructed index based on students' responses about their willingness to work on problems that are difficult, even when they encounter problems.
- *Openness to problem solving* – constructed index based on students' responses about their willingness to engage with problems.
- *Locus of control* – constructed index based on students' responses about whether they attribute failure in mathematics tests to themselves or to others; and students' responses about whether they strongly agree that success in mathematics and school depends on whether they put in enough effort.
- *Motivation to learn mathematics* – constructed indices based on students' responses about whether they enjoy mathematics and work hard in mathematics because they enjoy the subject; and whether they believe mathematics is important for their future studies and careers. The index of intrinsic motivation to learn mathematics was named the index of interest and enjoyment in mathematics in PISA 2003, but the items were the same as those used in 2012.

The findings for each construct are below.

Perseverance

Six per cent of the variation in student performance in maths is explained by differences in whether a student perceives himself/herself as someone who gives up easily when confronted with a problem, who puts off difficult problems, who remains interested in the tasks that he or she starts, who continues to work on a task until everything is perfect, and who does more than is expected when confronted with a problem.

The percentage of variation explained varies by country. In Norway, Finland, Iceland, Sweden and Denmark it is more than 10 per cent, while it is less than 5 per cent in 43 other countries. In most countries the association is positive and relatively strong. A difference of one unit in the index of perseverance is associated with a difference in performance of at

least 20 score points. In Finland, Korea, Norway, New Zealand, Chinese Taipei and Iceland it is 30 score points.

The positive relationship between perseverance and mathematics performance is stronger among higher achieving students than among lower achieving students in all countries except Liechtenstein, where perseverance is not associated with performance among the highest-achieving students and strongly associated among the lowest-achieving students.

Openness to problem solving

Twelve per cent of the variation in performance can be explained by differences in whether a student perceives himself/herself as someone who can handle a lot of information, who is quick to understand things, who seeks explanations, can easily link together facts, and who likes to solve complex problems.

The proportion of variation explained varies by country. In Finland, Norway, Australia, Canada, Korea, the UK, Sweden, New Zealand, Denmark and Ireland it is more than 15 per cent, while in 45 other countries it is less than 10 per cent.

The positive relationship between openness to problem-solving and mathematics performance is stronger among higher achieving students than among lower achieving students in all countries. In all countries bar Shanghai-China, Albania, Macao-China, Kazakhstan, Liechtenstein, Belgium and Japan, the difference is more than 10 score points. In Vietnam the performance gap among the highest-achieving students is 28 score points, while there is no relationship among the lowest-achieving students. In 10 countries openness to problem solving is not associated with performance among the low achieving students, while among high achieving students it is strongly associated positively.

Locus of control

Locus of control was measured in two ways: first, a measure of *perceived self-responsibility* for failing in mathematics; second, a measure of *perceived control* of success.

Self-responsibility

Students were asked to imagine: 'Each week your mathematics teacher gives a short quiz. Recently you have done badly on these quizzes. Today you are trying to figure out why'. Students were asked to report that they were 'very likely', 'likely', 'slightly likely' or 'not at all likely' to think or feel that they are not very good at solving maths problems; that their teacher did not explain the concepts well this week; that this week they made bad guesses on the quiz; that sometimes the course material is too hard; that the teacher did not get the students interested in the material; and that sometimes they are just unlucky. The index of self-responsibility was intended to reflect students' perceptions of their personal responsibility for failure in mathematics.

Overall, 58 per cent of students thought they were not very good at solving maths problems, 48 per cent thought that the teacher did not explain the concepts well, 46 per cent felt they made bad guesses on the quiz, 71 per cent that the course material was too hard, 53 per cent that the teacher did not get students interested in the material, and 49 per cent felt that sometimes they were just unlucky. Students in Vietnam were among those students in eight countries who were 'particularly likely to feel responsible for their failure in maths'.

The authors of the OECD report do not report systematically any association between self-responsibility and performance, except to say that 'overall the groups of students who tend to perform more poorly on mathematics – girls and socio-economically disadvantaged students – feel more responsible for failing maths tests than students who generally perform at higher levels'. The omission of any information about the association of the index and performance suggests that the index did not work well as a scale, though no scale or index statistics are presented.

This may be because some of the items were ambiguous. First, the problem is stated in terms of 'in recent weeks you have not been doing well'. Yet some of the attributions for failure refer to 'this week'. Second, the 'non-self' attributions are rather different – teacher, luck and materials – but are presumably regarded as equivalent for scaling purposes. Notably, an attribution to effort (central to a sense of self-responsibility) is missing. While much of the attribution theory literature reduced attributions to an internal-external 'locus of control' dimension, subsequent refinements classified attributions along at least three dimensions – internal-external, stable-unstable, and controllable-uncontrollable.

Perceived control of success

The second measure of locus of control focuses on the sense of control or lack of control over factors influencing academic achievement. 'Control' was explored in the PISA studies through five items and the creation of an index of perceived control.

- If I put enough effort, I can succeed in mathematics.
- Whether or not I do well in mathematics is completely up to me.
- Family demands or other problems prevent me from putting a lot of time into my mathematics work.
- If I had different teachers, I would try harder in mathematics.
- If I wanted to, I could do well in mathematics.

On average across all countries, students who reported that they strongly agree that they can succeed in mathematics and in school if they put in enough effort perform at higher levels than other students. The difference in maths performance associated with students who say that they strongly agree that they can succeed in maths with effort is 32 score points. While there is no relationship among students in Albania, Belgium, Argentina, Costa Rica and Liechtenstein, the score-point difference in Korea, Chinese, Taipei, Iceland and Norway is 50 points or larger.

In general, the positive relationship is stronger among the highest-performing students than the lowest. However, as with the locus of control index above, PISA does not report findings on the correlation between an overall index (of perceived control of success) and performance.

Motivation to learn mathematics

Drawing on the work of Ryan and Deci (2009) and self-determination theory, PISA distinguishes between two types of motivation to learn mathematics: (i) intrinsic, i.e. enjoyment and interest in mathematics, and (ii) extrinsic, i.e. usefulness for future studies and careers.

Intrinsic motivation to learn

- I do mathematics because I enjoy it.
- I look forward to my mathematics lessons.
- I enjoy reading about mathematics.
- I am interested in the things I learn in mathematics.

In general students who report low levels of interest in and enjoyment of mathematics, who do not look forward to mathematics lessons, and who report not being interested in the things they learn in mathematics do not score as highly as those who report high levels. Across all countries self-reported intrinsic motivation explains 5 per cent of the variation in mathematics performance. On average, a change in one unit in the index of intrinsic motivation to learn mathematics translates yields a 19 score-point difference in performance. But the strength of this relationship varies across countries, with a more than 40 point difference in Korea and Chinese Taipei, a more than 20 point difference in a further 21 countries, and negative relationship in six countries – Peru, Romania, Brazil, Bulgaria, Argentina and Colombia. The positive relationship is stronger among higher than among lower achieving students.

Extrinsic motivation to learn

- Making an effort in mathematics is worth it because it will help me in the work that I want to do later on.
- Learning mathematics is worthwhile for me because it will improve my career prospects and chances.
- Mathematics is an important subject for me because I need it for what I want to study later on.
- I will learn many things in mathematics that will help me to get a job.

In general, students who report low levels of instrumental motivation do not score as highly as those who report high levels. Across all countries self-reported instrumental motivation explains 4 per cent of the variation in mathematics performance. On average a change in one unit in the index of extrinsic motivation to learn mathematics translates yields a 17 score-point difference in performance. But the strength of this relationship varies across countries with a more than 30 point difference in Korea, Chinese Taipei and Norway, a more than 20 point difference in a further 16 countries, and negative relationship in four countries – Romania, Brazil, Colombia and Uruguay. The positive relationship is stronger among high than among low achieving students.

4.2 The Student Learning Orientations Group (SLOG) study

An early study of student beliefs about motives for learning was conducted by an international six-country Student Learning Orientations Group (SLOG) during the 1980s (SLOG 1987), coordinated from the Institute of Development Studies at Sussex University. The study surveyed students aged 15-16 years and 17-18 years in India, Nigeria, Malaysia, Sri Lanka, Japan and England. That work was informed by studies in the UK of, among other things, motivation (Parlett 1973), intrinsic motivation (Elton 1973) and study habits (Hewitt 1973), and from the United States on attributions for success and failure (Weiner 1979) and achievement motivation (McClelland 1976; Maehr and Nicholls 1980). Scales were developed around three main constructs.

Interest and personal development orientation

This is similar to PISA intrinsic motivation above, but expressed more generally. For example:

- I do extra reading in the subjects I like.
- I will continue to study the subjects I like even after the examinations are finished.
- I spend a lot of time working on topics I am interested in.
- Learning is an important personal experience.

Assessment (examination) orientation

This is similar to instrumental motivation above, but with the instrumentality focused on assessments and examinations. Item examples included:

- I am working very hard in class to pass the examination.
- I like to do well in examinations because it will help me to get better job qualifications.
- I do not care very much about doing well in my studies.
- I am disappointed when I do not perform well in examinations.

Significant others orientation

This orientation/motivation is absent from the OECD/PISA studies and was not identified in meta reviews as having been studied or as having generated consistent results. However, the Malaysian and Japanese researchers in SLOG considered social motivation – specifically a motivation to fulfil the expectations of parents – to be highly salient for students in those countries. Hence a significant others orientation was explored in all six countries. Item examples included:

- I work hard to please my parents.
- My mother expects me to do well in school examinations.
- My mother becomes very anxious before my examinations.
- My father becomes very worried before my examinations.

The measures for the above scales were developed through several methodological steps.

- i free response to open interview questions
- ii semi-structured questions
- iii item content validity exercise in which students were asked to explain the reasons why they responded to multiple choice questions in the way they did
- iv pilot scale survey (4-point Likert responses)
- v item and factor analysis (item-scale correlations and Guttman split half scale reliabilities were employed).

Two types of scale were generated: (i) scales common across six countries; and (ii) scales specific to each country. The development of (i) followed, rather than preceded, the development of (ii).

Many items were common to both the cross-country and country-specific scales, but the latter included additional items and generated different factor loadings. So, for example, in India, where the study (in Tamil Nadu) was conducted with Standard 9 and 11 students, seven orientation scales were identified and measured – personal development, assessment domination, intrinsic orientation in job getting and learning, learning apathy, involvement in learning, extrinsic orientation in learning, and significant others orientation. The pattern of relationship between assessment, interest/personal development and significant others orientation varied across countries. While the correlations between assessment orientation and interest/personal development orientations were high in Nigeria, India, England and Sri Lanka, they were very weak among Japanese and Malaysian students. Conversely, the link between interest/personal development and significant others was almost zero in Japan, while it was positive in all other countries.

Unlike the PISA study, this research was not designed to explore the relationship between learning orientations and student performance. Rather, the study was designed to explore premises embedded within the 'Diploma Disease' (Dore 1997) thesis. These included that: (i) students are motivated to learn by a range of orientations; (ii) workers are motivated to work by a range of orientations; and that (iii) inter-student variation in assessment orientation in school within a society will be associated negatively with inter-worker variation in innovation and creativity in the workplace. Controversially, the thesis suggested that the economic growth of societies might be dependent on a workforce (or a segment of it) that is motivated more by an intrinsic interest in the job and the opportunities it offers for creativity, originality and the development of skills, than by the extrinsic incentives or pay and promotion that the job offers (for further elaboration, see Dore 1997; Little 1997; Little 2003).

Having described key learning and working orientations and developed measures of them, the final proposition of the thesis was explored through two separate but linked designs: (i) a *prospective* study of work orientations among school-attending students; and (ii) a *retrospective* study of school orientations among workers (WOB 1990).

Given the complexity of the design and funding constraints this final proposition was explored in only two countries, England and Malaysia (Little and Singh 1992). The study involved students describing their learning motivations in the present and expressing their work motivations prospectively; and workers describing their work motivations in the present and reflecting on their learning motivations retrospectively.

In both societies a range of motivational goals among students and workers was identified. Contemporary student learning motivations were described as *assessment orientation* (examination success is what I have aimed for throughout my school learning); *interest orientation* (e.g. I will continue to study the subjects I like even after the examinations are finished), and an *inter-personal orientation* (e.g. I work hard to please my parents). Students expressed their aspirations about a range of job characteristics for the future, including whether they wanted a job that would give them opportunities for creativity and originality.

Contemporary worker motivations were described initially as: (i) *material rewards* (working for pay, promotion, security or the 'perks that go with the job'); (ii) *social rewards* (status, acknowledgement, prestige and respect from others); and (iii) *self-fulfilment* (challenge, a sense of purpose, personal growth and skill utilisation). Dimensions (ii) and (iii), stressing inter-personal processes and self-fulfilment, were strongly correlated and combined for further analysis.

At the risk of over-simplifying a complex body of evidence, our conclusion was that there was an extremely weak correlation among students between assessment orientation at school and an expressed desire for work that provided scope for innovation and creativity. Much stronger and positive was the correlation between assessment orientation and a desire for financial benefits. Of greater interest perhaps was a positive correlation between an expressed interest orientation at school and prospective work orientation. Those students who said they would 'like to continue learning subjects one likes even after the exams are finished' also said that they wanted a job where one could demonstrate and develop one's abilities and skills at work, to seek opportunities for creativity and originality and to develop one's interests. By contrast, the relationship between interest orientation and the desire for financial benefits was almost zero for the English students and negative for the Malaysian students.

The data from the workplace were even more revealing. There was a slightly negative relationship between an assessment orientation at school (recalled retrospectively) and a 'fulfilment' orientation at work (i.e. a motivation to work based on challenge, a sense of purpose, an opportunity for personal growth and skill utilisation). But there was a strong positive relationship between this work orientation and an interest orientation (recalled retrospectively) at school. Of course, positive and negative correlations do not indicate causality. Aware of this, Singh and I offered *post hoc* interpretations of possible causal explanations for our findings on interest orientation at school and at work.

The first was that schools and teachers are succeeding in creating environments from which students derive interest and satisfaction and some excitement from the learning tasks they encounter. The interest orientation formed by the school experience endures and transfers to the workplace. This interpretation would, we argued, be consistent with the formation of human capital. A second interpretation was that the relationship may be a function of a disposition to perceive most situations as interesting and challenging, a disposition that is developed in early childhood and which transfers from the family/household to the classroom, to the workplace, to leisure, and to parenting. This would be a form of the screening hypothesis – schools are not actually forming the orientation; rather individuals are demonstrating dispositions formed elsewhere. A third was that individuals are self-selecting themselves for work. Those who display an interest orientation in school choose to enter or are selected for those jobs that offer the opportunity and environment for creativity and innovation.

In his assessment of our study and interpretations, Dore favoured the second interpretation. The differences, he asserted, are most likely 'to have to do with differences of basic temperament or family-formed personality or their particular mode of self-presentation in daily life' (Dore 1997). As educators in the classroom, Singh and I were more concerned whether there is anything we can do to intervene, to influence the motivation of learners and learning, and were 'attracted intuitively by the plausibility of the first and the third' explanations (Little and Singh 1992).

4.3 Philippines – The GOALS-S study

In their study of 1,026 high school students in the Philippines (mean age 14.6 years) King and Ganotice (2013) included a 'social relationships' dimension similar to the SLOG 'significant others' dimension. They studied the relationships between social support (parent, teacher, and peer), achievement goals (mastery, performance, social, and work avoidance), self-regulated learning strategies (elaboration, organisation, rehearsal, planning, monitoring

and regulating), and achievement (maths, science, and English). Social support from parents, teachers, and peers were designated as exogenous variables which had a proximal influence on the four types of achievement goals. These achievement goals, in turn, predicted the use of various self-regulated learning strategies which had an impact on subsequent achievement. The measures used were as follows.

Social relationships

Parent support (four items, e.g. 'My father doesn't pay any attention when I bring home report cards'), teacher support (six items, e.g. 'Teachers are positive to me at school'), and peer support (four items, e.g. 'Most students in my class will go on to college or university') were measured through the relevant subscales in the Facilitating Conditions Questionnaire (FCQ) developed by Dowson and McInerney (2004).

Achievement goals and learning strategies

The Goal Orientations and Learning Strategies Survey (GOALS-S, Dowson and McInerney 2004) was used to measure goals (academic and social) and self-regulated learning strategies (cognitive and meta-cognitive).

The three academic goals were:

- Work avoidance goal (six items, e.g. 'I choose easy options in school so that I don't have to work too hard')
- Mastery (six items, e.g. 'I want to do well at school so that I can learn new things')
- Performance (six items, e.g. 'I want to do well in school because being better than others is important to me').

The five social goals were:

- Social affiliation (six items, e.g. 'I want to do well at school so that I can feel close to my group of friends')
- Social approval (six items, e.g. 'I want to do well at school so that I can get praise from my teachers')
- Social concern (six items, e.g. 'I try to do well at school so that I can help my friends with their schoolwork when they need it')
- Social responsibility (six items, e.g. 'I want to do well at school to show that I am being a responsible student')
- Social status (six items, e.g. 'I do good schoolwork so that I can get a good job in the future').

Learning strategies included both cognitive and metacognitive strategies. The cognitive strategies were:

- Elaboration (six items, e.g. 'When learning things for school, I try to see how they fit together with other things I already know')
- Organisation (six items, e.g. 'I organise my school notes when I want to learn things for school')
- Rehearsal (six items, e.g. 'When I want to learn things for school, I practice repeating them to myself').

The metacognitive strategies were:

- Monitoring (six items, e.g. 'I often ask myself questions to see if I understand what I am learning')
- Planning (six items, e.g. 'I often look through books to see how they are arranged before I start reading')
- Regulating (six items, e.g. 'If I don't understand my schoolwork, I ask the teacher to help me').

A 5-point Likert-type scale was used for all the self-report questionnaires, ranging from 1 ('strongly disagree') to 5 ('strongly agree'), with higher values indicating a greater degree of endorsement. The FCQ and GOALS-S questionnaires had previously been validated among Filipino students (King and Watkins 2011, 2012; Ganotice, Bernardo and King 2013).

Students' final grades in mathematics, science, and English were obtained from the school records and used as indicators of their academic achievement.

4.4 The Study Process Questionnaire study

Drawing on research on 'approaches to learning' conducted by a number of researchers, mainly in Australia and the UK, in the 1970s and 1980s, Biggs et al. (2001) offer a revised and short version of the Study Process Questionnaire (SPQ). Designed for students in tertiary education, it might be adapted for Young Lives secondary school samples. Many of its items resonate with those used in the interest and assessment orientation of SLOG and the OECD student approaches to learning (SAL) items used in PISA studies.

An approach to learning describes how students perceive a learning task and then go about learning it. The approaches are labelled a Deep Approach (DA) and Surface Approach (SA). Each approach comprises two subscales, a Motive (M) subscale and a Strategy (S) subscale. Item examples from each subscale are:

- Deep Motive (DM): I find that studying academic topics can at times be as exciting as a good novel or movie.
- Deep Strategy (DS): I test myself on important topics until I understand them completely.
- Surface Motive (SM): I find I can get by in most assessments by memorising key sections rather than trying to understand them.
- Surface Strategy (SS): I generally restrict my study to what is specifically set as I think it is unnecessary to do anything extra.

The original questionnaire has been shortened to 20 items. While the original scales were developed in Australia (and drew on similar studies elsewhere), the revision took on board insights from the learning approaches of Asian students in Hong Kong and a reconsideration of intrinsic motivation linked with the Deep Approach. Interviews with Asian students provided evidence that courses that provided good career preparation could generate very positive motivation which was compatible with intrinsic motivations to learn. Hence, the wording of items intended to characterise surface learning needed to reflect a tendency to minimise the cognitive level of the task rather than career motivation (Biggs et al. 2001: 104).

Biggs et al. (2001) are at pains to underline the context-dependent nature of learning approaches. Learning approaches are located at the centre of a 3P model of learning:

Presage (student factors and teaching context); *processes* (including learning approaches); and *product*. Student factors (e.g. prior knowledge and preferred approaches to learning) and teaching context (content and method of teaching) interact with on-task approaches to learning and result in learning outcomes. All three - presage, process and product – interact and form a dynamic system of learning.

Approaches to learning are not stable individual traits, even if individual students develop learning approach preferences over time. Moreover, SPQ scores can be used, the authors suggest, as quality indicators at the presage, process and product levels. These are referred to as the preferred approach, the ongoing approach, and the contextual approach. They write:

- At the presage level, SPQ scores may describe how individuals differ within the same learning context (preferred approach).
- At the process level, scores may describe how a specific task is being handled.
- At the product level, SPQ scores may describe how teaching contexts differ from each other (contextual approach). Through the calculation of subgroup means one may assess variation in learning contexts at the school, class or other subgroup level. The contextual approach could also be used to assess the effects of an intervention.

It is clear that the underlying premise of the model is that a Deep Approach is more effective than a Surface Approach for learning.

Contextual approach scores can tell us when the system is working (when motives, strategies and approaches are predominantly deep) and when it is not working (when motives, strategies and approaches are predominantly surface). (Biggs et al. 2001: 137)

However, in their description of the earlier scales, the authors do not cite evidence in support of this claim. The article is very useful for its methods of establishing scale reliability.

4.5 Previous Young Lives studies

4.5.1 Outes et al. (2010)

In their paper on the long-term implications of undernutrition on non-cognitive skills among Young Lives samples, Outes et al. (2010) employ the measures of self-efficacy, self-esteem and aspirations that were used with the Young Lives Older Cohort in Round 2, when the Older Cohort children were aged 11-12 years. The measure of self-efficacy was based on three items selected from a cluster that had been labelled 'Agency' were:

- If I try hard I can improve my situation in life.
- I like to make plans for my future studies and work.
- If I study hard at school I will be rewarded by a better job in the future.

The measure of self-esteem was based on nine items drawn from ten items that had been labelled by Young Lives as PRIDE (these in turn had been derived from Rosenberg's self-esteem scale (Rosenberg 1965) which focused on the positive and negative dimensions of pride and shame):

- I feel proud to show my friends or other visitors where I live.
- I am ashamed of my clothes.

- I feel proud of the job done by the head of household.
- I am often embarrassed because I do not have the right books, pencils or other equipment for school.
- I am proud of my achievements at school.
- I am embarrassed by/ashamed of the work I have to do.
- I am ashamed of my shoes.
- I am worried that I do not have the correct uniform.
- The job I do makes me feel proud.

The measure of aspirations was based on the response to the question: 'What level of formal education would you like to complete?' The reliability (Cronbach's alpha) of the self-efficacy measure, based on just three items and reported only for the pooled sample, is low at 0.47; and for self-esteem, based on nine items, higher at 0.67.

The main finding of the analysis was that height-for-age predicts self-efficacy, self-esteem and aspirations. In the case of self-esteem and aspirations, the results hold even after controlling for a set of wealth variables.

4.5.2 *Yorke (2013)*

In her Young Lives Paper on psychosocial skills, Yorke (2013) sought to validate measures of student's academic self-concept and academic stress in Vietnam using exploratory factor analysis, Rasch analysis, and confirmatory factor analysis.

The academic self-concept items yielded two factors – best described as academic confidence and academic effort. Items expressing academic confidence (or perhaps more accurately, low self-confidence) were:

- I day dream a lot in class.
- Most of my classmates are smarter than I am.
- My teachers feel that I am poor in my work.
- I often forget what I have learnt.
- I get frightened when I am asked a question by the teacher.
- I often feel like quitting school.
- I am always waiting for the lessons to end.
- I always do poorly in tests.
- I am not willing to put in more effort in my school work.

Items expressing academic effort were:

- I can follow the lessons easily.
- If I work hard I think that I can go to college or university.
- I pay attention to the teachers during lessons.
- I study hard for my tests.
- I am usually interested in my school work.

- I am willing to do my best to pass all subjects.
- I am good in most of my school subjects.

Though termed 'academic effort' some of these items reflect a self-perception of academic achievement – how good one is in one's studies. The two sub-factors are noticeably different in that the first set of items reflect *low* self-confidence (the respondent needs to 'disagree strongly' with a statement in order to achieve a score of high confidence), while the second reflects *high* academic effort (one needs to 'disagree strongly' with an item in order to achieve a score of low effort).

Items expressing academic stress were:

- Do you worry about exams/tests?
- Do you feel under pressure to perform well at school?
- Do you find it difficult to complete homework?
- Do you fear teachers' punishment?
- Are you physically bullied at school?
- Are you hit by parent(s)?

4.5.3 *Psychosocial measures in India and Ethiopia*

The psychosocial measures used in the first round of school survey in Vietnam were described in section 4.5.2. The following measures were administered in India and Ethiopia in the first school survey, with some slight differences.

Wellbeing at school:

- I am not happy in this class.
- I feel bored when I am in lessons.
- I feel nervous (worried) about being at school.
- I feel happy going to school every day.
- I enjoy all my lessons at this school.
- I feel lonely when I am at school.
- This is the best school for me to attend.

Inclusion/exclusion:

- Most of the children in my school are unkind to me.
- Most of the students do not want to play with me during break times.
- In my class everybody is my friend.
- My teacher treats me fairly.
- My teacher treats me worse than other children.
- Children in my class tease me.
- I am treated unfairly by my class teacher.
- Girls are treated unfairly by my class teacher.

Academic self-esteem:

- I am really good at learning maths.
- I am really good at learning Telugu.
- I am really good at learning English.
- Doing maths is very difficult for me.
- It is difficult to understand when the lessons are in English.
- Most children in my class score better than me.

Personal agency:

- I can do well in school if I work hard.
- I cannot do well in school, even if I try hard.
- Making an extra effort rarely leads to success.
- Going to school is of no use to me.
- I can do my class work at school without help.

Social agency:

- There is no one at home to help me with my school homework.
- I can ask another student to help me if I 'get stuck' with my school work.
- I never ask my teacher for help when I 'get stuck'.
- If I need help with my school homework I can ask someone at home.
- I can't ask other students to help me with my school work when I 'get stuck'.
- I can talk to my class teacher freely about anything that concerns me.

Pride at school:

- I feel proud that I go to this school.
- I am ashamed of the clothes I wear to school.
- I am often embarrassed because I do not have the right books.
- I am proud of my achievements in school.
- I feel bad when other students do better than I do.

School environment:

- There is a place at school where I can play.
- My classroom has a lot of noise from outside.
- I have access to books other than textbooks in my class.
- I attend extra classes with my teacher after school.

Safety at school:

- I am afraid of going to the toilet at school.
- I feel safe when I am at school.

Teacher behaviour:

- My class teacher will question me if I do not bring the correct books and pencils.
- My teacher has physically hurt somebody else in my class this year.
- My class teacher often does not come to school.
- My class teacher is often late to school.
- My class teacher notices if I do not come to school.
- My class teacher never uses physical punishment.

Parental involvement:

- At least one of my parents or household members knows my rank in class.
- My homework is regularly checked by my parents or other household members.
- No one at home is able to help me with my studies.

For measuring psychosocial scales in the Ethiopia Round 2 school survey, the following constructs were used to measure teacher–student relations:

- Overall, adults at my school treat students fairly.
- Adults at my school listen to the students.
- At my school, teachers care about students.
- My teachers support me when I need them.
- The school rules are fair.
- Overall, my teachers are open and honest with me.
- I enjoy talking to the teachers here.
- I feel safe at school.
- Most teachers at my school are interested in me as a person, not just as a student.

4.5.4 *Age-appropriate items for the Older Cohort*

In designing non-cognitive scales for the Young Lives household survey in Round 5, age-appropriate items have been identified that will measure labour market readiness, skills and other behavioural traits that may be important for the Older Cohort sample (aged about 22 years at the time of the Round 5 survey in 2016) as they transition to the labour market. After piloting four scales in all four countries, six subscales will be retained for the survey, as outlined below:

Consistency of interest:

- New ideas and projects sometimes distract me from previous ones.
- I have been obsessed with a certain idea or project for a short time but later lost interest.
- I often set a goal but later choose to pursue a different one.
- I finish whatever I begin.

Perseverance of effort:

- Setbacks don't discourage me.
- I am a hard worker.
- I have difficulty maintaining my focus on projects that take more than a few months to complete.
- I am diligent.

Conscientiousness:

- I am someone who does a thorough job.
- I am someone who can be somewhat careless.
- I am someone who is a reliable worker.
- I am someone who tends to be disorganised.
- I am someone who tends to be lazy.
- I am someone who perseveres until the task is finished.
- I am someone who does things efficiently.
- I am someone who makes plans and follows through with them.
- I am someone who is easily distracted.

Neuroticism:

- I am someone who is depressed, blue.
- I am someone who is relaxed, handles stress well.
- I am someone who can be tense.
- I am someone who worries a lot.
- I am someone who is emotionally stable, not easily upset.
- I am someone who can be moody.
- I am someone who remains calm in tense situations.
- I am someone who gets nervous easily.

Cooperative teamwork:

- I like cooperating in a team.
- I cooperate well when working in a team.
- I am good at cooperating with team members.

Leadership ability:

- I can be a good leader.
- I am capable of being a good leader.
- I am seen as a capable leader.

5. From constructs to theory and measurement

Constructs are positioned between theory on the one hand, and measures on the other. While it is tempting for researchers to rush into finding suitable items and scales, it is important to consider theories and models in order to justify our choice of concept and measures and to help us to construct a hypothetical model of school, class, teacher, and student factors.

5.1 Theories of motivation

A useful summary of theories of student motivation is offered by Martin and Dowson (2005). Most of these theories have been developed in the West, and more particularly the United States. As such, there has been a strong emphasis on the self and individualism.

Significantly, and in contrast to earlier presentations of these same theories, Martin and Dowson emphasise the role of others – the social dimension – in their accounts and make the case for inclusion of the social dimension in research on student motivation. In collectivist societies the development of self-concepts and motivational patterns are likely to involve perceptions and expectations of others (e.g. teacher, parent, family, peer) to a great degree. This had also been recognised in the SLOG study.

Martin and Dowson (2009) summarise the role of others within dominant motivation theories.

Attribution theory focuses on the causes ascribed by the student or teacher to outcomes and events in one's life (including in school) and the impact of the causal attributions (which vary in terms of their locus, stability and controllability) on behaviours, affect and cognition. The consequences of attribution (e.g. a sense of control) can be developed through feedback from, and observation of, significant others.

Self-efficacy theory refers to the belief in one's capacity and agency to achieve a desired outcome. This sense of capacity and agency can be instilled through direct and vicarious influence, modelling and open communication from others.

Expectancy-value theory. Atkinson viewed the motivation to achieve success as a product of the individual's perceived probability of success and the incentive value of that success. Conversely the motivation to avoid failure is a product of the perceived probability of failure and the negative incentive value of failure. Students who believe they are capable of mastering their schoolwork typically have positive expectations for success and hence high motivation and achievement.

Goal theory focuses on the why of behaviours communicated through the values and expectations of significant others (at individual, groups and organisational level). Goals include the desire to affirm competence (mastery goal), the desire to demonstrate superiority (performance goal), and social goals (affiliating with others, gaining approval from others and complying with group norms). Goals may be directed towards approach or avoidance. Avoidance goals drive withdrawal from activities or avoidance of negative implications and consequences.

Self-determination theory proposes that for one to be motivated and to function at an optimal level a set of psychological needs must be supported. These are relatedness, competency and autonomy. Ryan and Deci's (2000) work is very important here – with the key constructs of intrinsic and various types of extrinsic motivation (external regulation, introjected regulation, identified regulation and integrated regulation).

Self-efficacy theory focuses on individual's beliefs in their capacity to successfully carry out given tasks and the consequent impact this self-belief has on motivation and achievement. Self-efficacy supports a generative capacity such that individuals high in self-efficacy generate and test alternative courses of action when they do not meet with initial success. High self-efficacy can also enhance functioning through elevated levels of effort and persistence, and can enhance one's ability to deal with problematic situations by influencing cognitive and emotional processes related to the situation.

Self-worth theory describes the bases of the processes involved in protecting or enhancing one's self-worth. Students' self-worth is largely derived through their ability to perform academically and competitively. Students come to equate worth with ability since their worth, in part communicated to them by significant others, is made conditional on achievement. These conditional relationships impact on students' propensity to self-protect.

6. Measurement issues

The design of cross-national surveys presents challenges of interpretation that go beyond those posed by single country or single culture surveys. In addition to the need for reliability and validity, constructs and question items need to attain interpretative and procedural equivalence of meaning across the sampled countries. Interpretative equivalence refers to the cross-cultural/country comparability of the meaning of constructs and items, while procedural equivalence is concerned with the methods used to establish cross-cultural equivalence. The tasks involved in addressing these measurement issues include:

- Employing back-translation procedures involving country experts to ensure that questions convey the intended meaning.
- Using good question wording practices (e.g. using short and simple sentences, avoiding slang or technical terms).
- Using follow-up questions at a pre-test stage to identify problems with item interpretation.
- Convincing respondents to attitudinal/motivational questions that, unlike their responses to achievement test items, there are no 'right' or 'wrong' answers.

An additional challenge faced by cross-cultural/country surveys concerns the propensity of individuals to judge similar events in different ways. For example, in the absence of an appropriate benchmark, ratings of health status on a scale from 'very poor' to 'excellent' are likely to imply different underlying 'true health' for an active 20 year old, than a sedentary 80 year old. Similarly, 20 year olds in different cultures/countries are likely to judge their own health in relation to different benchmarks and in relation to different judgement norms. For example, individuals in different cultures vary in their propensity to make extreme judgements.

More and more researchers are using 'anchoring vignettes' to adjust the self-reports of individuals in different countries/cultures. PISA used two vignettes in the 2012 student questionnaire and used responses to them to adjust the score on the 4-point Likert items. Each vignette described behaviours (rather than attitudes) of a hypothetical mathematics teacher indicative of lower or higher levels of classroom management or teacher support. Students were asked to indicate their level of agreement (out of three) with a statement about the hypothetical teachers described in each of the vignettes. Since the three descriptions of teacher behaviours were constant across countries, differences in the ratings made by students of high or low classroom management or teacher support were then attributed to differences in the interpretation of the rating scale and general differences in preferred response behaviours. Answers to the 4-point Likert items in the general student questionnaire are then based on the self-reported answer relative to the personal standard captured by the rating of the vignettes. Although two sets of vignettes were trialled, the vignettes capturing 'classroom management' seemed to work better than those intended to capture 'teacher support' – hence only the classroom management vignette was used to anchor the Likert items.

The approach makes several assumptions. The first is vignette equivalence, that the vignette conveys equivalent meanings to all respondents. The second is response consistency, that respondents use the same standards both in evaluating themselves and in providing an evaluation. The third is that responses to one set of vignettes about the behaviour of another (in this case a teacher) can be used to anchor Likert items on a wide range of self-reported attitudes. The PISA technical report recommends that adjusted indices using anchoring vignettes should be interpreted 'in addition to classical indices, not as a replacement' (OECD 2012).

One final point about student responses to self-report attitude questionnaires concerns the student's perception of the importance of the questionnaire itself. If students perceive the questionnaire as being of importance to their future education or life chances, as having 'high stakes', they will find it very easy to produce 'right answers' (and much easier than producing 'right answers' to cognitive test items). It is vital that when the questionnaire is introduced to students the administrator emphasises that there are no 'right' and 'wrong' answers to the items, that the researchers are interested only in what the student thinks or feels, and that the questionnaire results will have no bearing on educational or occupational selection. Test instructions also need to reflect this.

7. Towards defining measures for the school survey

Clearly the non-cognitive terrain is broad. This review gives rise to a number of questions to be addressed collectively by the Young Lives team. These include:

- What are our hypotheses about the relationship between non-cognitive measures and academic performance and, more specifically, gains in performance over the periods of time dictated by the school survey design?
- On which constructs/measures do we wish to focus?

- Do we have a long-term ambition to follow students from their academic achievements into the world of work – and if so, does this influence our choice of constructs/measures?
- Given that we have planned to assess performance in selected subjects should our non-cognitive measures reflect performance in these subjects (e.g. maths) or be more general?
- What assumptions, if any, do we need to make about the consistency of response across time and context?

While choices of constructs and items need to reflect Young Lives' intellectual purpose, they also need to be fashioned by procedural and logistical considerations. These include:

- How much time can a student be expected to spend answering non-cognitive questions in any one session?
- How many sessions can be conducted in any one school? How many test administrators will be involved?
- How many test administrators will need to be trained for pilot and main study work?
- What is the optimum number of items needed for a scale related to any one concept – for trialing and for the final version?
- Who will conduct the item content validity exercise (in which students are invited to respond to pilot items and then produce an explanation for their response)?
- In how many languages/cultures do our measures need to be available? What are the implications for the initial development of items in each language/cultural group? How much time/resources will be needed for translation and back translation?

8. A model of the role of non-cognitive factors and learning outcomes

The literature review presented in this working paper indicates the breadth and depth of the non-cognitive terrain. The Young Lives school surveys focus on the determinants of *learning gains across a school year*. All the research reviewed above measures academic achievement at a single point in time, rather than gains in academic achievement over time. With its focus on achievement gains, as well as achievement more generally, Young Lives is well placed to contribute to findings on the relationship between learning and the non-cognitive domain.

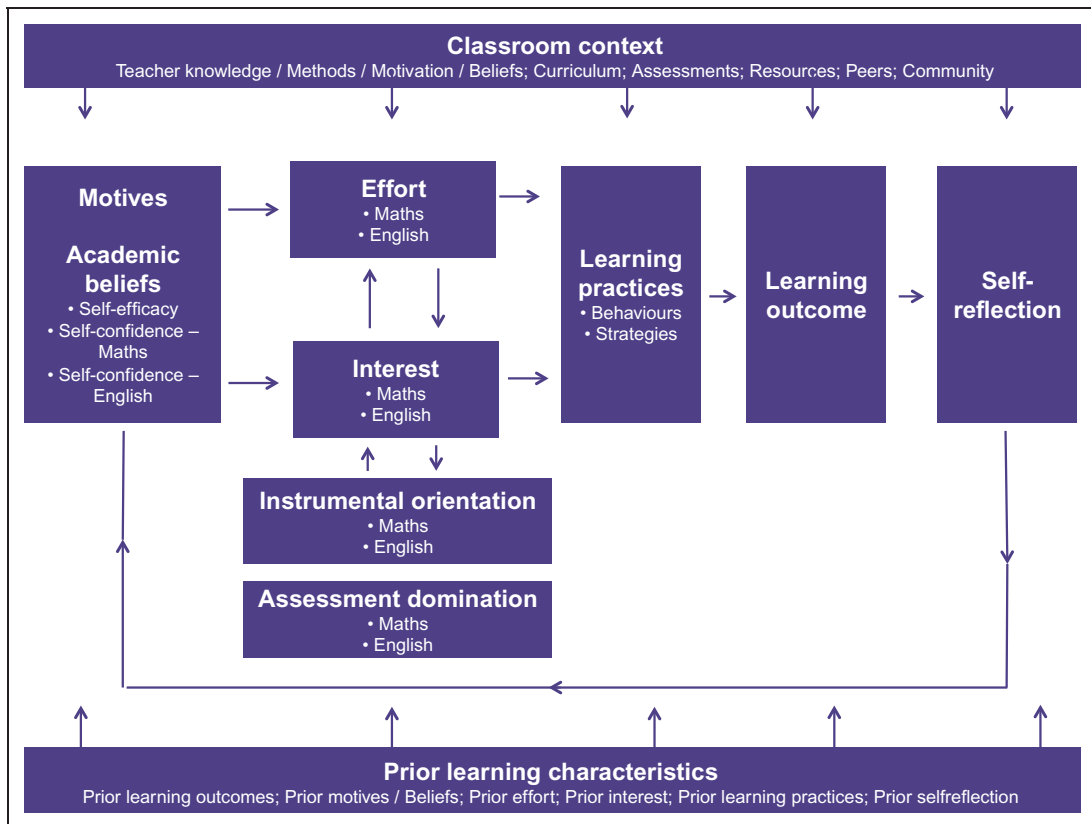
In order to move the work forward it is helpful to work with a model of motivation and learning, outlined below. While the model encompasses all the areas identified above, it also acts as a sketch map that guides us to making decisions about the constructs on which we wish to focus and for which we will develop measures during a pre-pilot and pilot phase.

The model focuses on the non-cognitive domain. It starts from general motives for learning and general academic beliefs. It moves to more specific effort invested and interest in

specific subject domains, as well as perceptions of the instrumentality of this subject for one's future. It also suggests the inclusion of a construct described as 'assessment domination', which refers to which students feel that they are driven more by the imperatives of assessment and examinations than by an interest in the subject. Then, from general and subject-specific motives and beliefs, the model moves to the types of learning practices and strategies that students report employing in their learning; and further to learning outcomes. A final stage of self-reflection leads to feedback to motives and beliefs and subsequent cycles of learning.

All motives, beliefs and practices are framed by classroom context on the one hand, and prior learner characteristics on the other. Classroom context is described in terms of teacher knowledge, teaching methods, teacher beliefs, as well as the nature of curriculum, assessment practices, learning resources, peers and community. Prior learning characteristics refer to prior learning outcomes (probably the best predictor of achievement), motives and beliefs, effort, interest, learning practices, and self-reflection.

Figure 1. *A model of non-cognitive factors and learning outcomes*



This working paper represents the first step in the development of measures of constructs in the non-cognitive domain of functioning. The Appendix presents guidance notes for the pre-piloting of items and scales. Further details on the pre-piloting and piloting of these measures in Ethiopia, India and Vietnam can be found in Little and Azubuike (2017). Data from the Young Lives school surveys will be publically archived and available for download in 2018.¹

¹ See <http://younglives.org.uk/content/use-our-data> for more details about the archived dataset.

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Appendix: The pre-pilot study

Suggested constructs and items

Subsequent to drafting of this working paper and team discussions held between June and August 2016, the following constructs (potential scales) and items were suggested for trialling during the forthcoming pre-pilot and pilot phases.

Summary		
Construct (potential scale)	Domain	Items
Learning motives – general	Significant others	10
	Personal development	10
	Future orientation	12
Academic self-beliefs	Self-efficacy: general	13
	Low academic confidence: general	9
	Positive self-concept maths	8
	Positive self-concept English	8
Effort	Maths effort	15
	English effort	15
Subject interest	Maths interest	12
	English interest	12
Instrumental orientation	Instrumental orientation maths	5
	Instrumental orientation English	5
Assessment domination	Maths assessment domination	6
	English assessment domination	6
Cognitive learning strategies – general	Elaboration	6
	Organisation	6
	Rehearsal	6
Total		164

Guidance for pre-pilot work

- (i) Discuss the constructs and some of the items in an open-ended way with small numbers of teachers, education field workers and students.
- (ii) If, during the course of discussion, another construct appears to be very salient for academic achievement, explore in detail and suggest items. Suggest which constructs to employ.
- (iii) Translate items (in the course of translation adaptations of the English will arise; note all changes).
- (iv) Decide on response categories – trial one or two types of response category.
- (v) For each construct, trial each item in the following form. This may be done in writing or verbally face-to-face. The purpose of the exercise is to confirm whether the item is being interpreted by the student as intended. However, the student must understand that there are no right or wrong answers and that at this stage we are trying to improve the wording of the items.
 - a ITEM and RESPONSE.

- b. Can you tell me/write why you responded in that way? (once again, the student must not feel that we are querying/questioning their response. We simply want them to help us to check our wording).
- (vi) For logistical reasons it will be impossible to pre-pilot every item (currently 164 items) with every student. Split the items between groups of students.
- (vii) Following this stage, conduct the pilot in the standard way. Subject items to rigorous statistical analysis of reliability.

'Non-Cognitive' Constructs and Measures for the Young Lives School Surveys

In their studies of academic achievement, the Young Lives school survey research teams wish to include a range of psychosocial measures. This working paper prepares the ground for this work. It reviews international literature on psychosocial constructs and measures, often referred to as 'non-cognitive' factors, in the determination of academic achievement and longer term outcomes. The review focuses on five recent meta reviews, and also describes a number of studies in low- and middle-income countries not included in these meta reviews, but which have relevance for Young Lives research. It emphasises the importance of linking constructs to theory as well as to measures, and raises a number of measurement and procedural issues. Based on evidence to date, the paper proposes a model of the role of non-cognitive factors and learning outcomes. Finally, it provides guidance on the pre-pilot work.



An International Study of Childhood Poverty

About Young Lives

Young Lives is an international study of childhood poverty, involving 12,000 children in 4 countries over 15 years. It is led by a team in the Department of International Development at the University of Oxford in association with research and policy partners in the 4 study countries: Ethiopia, India, Peru and Vietnam.

Through researching different aspects of children's lives, we seek to improve policies and programmes for children.

Young Lives Partners

Young Lives is coordinated by a small team based at the University of Oxford, led by Professor Jo Boyden.

- *Ethiopian Development Research Institute, Ethiopia*
- *Pankhurst Development Research and Consulting plc, Ethiopia*
- *Centre for Economic and Social Studies, Hyderabad, India*
- *Save the Children India*
- *Sri Padmavathi Mahila Visvavidyalayam (Women's University), Andhra Pradesh, India*
- *Grupo de Análisis para el Desarrollo (GRADE), Peru*
- *Instituto de Investigación Nutricional, Peru*
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