Owen, S. McGilloway, S, & Murphy, J. (2019). Supporting the development of well-being and resilience in schools: The role of non-cognitive skills. Irish Teachers' Journal, 7(1), pp…

Article · November 2019

CITATIONS
0

READS
124

1 author:

Shane Owen
National University of Ireland, Maynooth
1 PUBLICATION **0** CITATIONS

SEE PROFILE

Supporting the development of wellbeing and resilience in schools: The role of non-cognitive skills

SHANE OWEN, SINÉAD MCGILLOWAY, JONATHAN MURPHY

Abstract

It has been recognised increasingly that academic performance and ultimate success in life require non-cognitive skills that go beyond simply mastering curriculum content. The aims of this paper are to provide an overview of the non-cognitive literature in the context of educational performance and to provide a rationale for the use of non-cognitive interventions to support the development of wellbeing and perseverance among the student body. This rationale is expanded to key areas of concern within the Irish educational system to which non-cognitive approaches may be applied.

Keywords: **Wellbeing, resilience, non-cognitive skills, STEM**

Introduction

A growing body of evidence suggests that specific skills are required for academic success in school and for adequately preparing students for modern work, civic and social environments. These go beyond the simple mastery of curriculum content knowledge. Thus, Farrington and colleagues (2012) argue that "students must develop sets of behaviors, skills, attitudes, and strategies that are crucial to academic performance in their classes, but that may not be reflected in their scores on cognitive tests" (p. 2). These are commonly referred to as non-cognitive skills which, in an educational context, refer to traits or skills not usually included in tests of ability and knowledge but which are considered to be a factor in academic performance and life success (Kautz, Heckman, Diris, ter Weel and Borghans, 2014; West et al., 2016). Interventions which enhance students' non-cognitive skills have been shown to make lasting improvements in academic performance (Kautz et al., 2014).

For many years now, the intelligence quotient (IQ) has been a long-standing predictor of educational attainment (Lynn and Mikk, 2009). However, according to Kautz and colleagues (2014), non-cognitive skills may predict educational attainment as effectively as (if not more so than) IQ. For example, Duckworth and Seligman (2005) found that self-discipline was a significantly better predictor of educational outcomes than IQ. However, recent evidence also suggests that learning occurs due to an interplay of both cognitive and non-cognitive skills (Farrington et al., 2012). For example, Poropat's (2009) meta-analysis

Email: author@into.ie

ISSN 2009-6860 (Print) 2009-6879 (Online)

www.into.ie

found that academic performance in primary, secondary and tertiary education was correlated with items on the 'Five Factor Model' of personality, including, in particular, conscientiousness, which demonstrated a large effect vis-à-vis academic performance (r= .19, d= 0.46, grade difference= 0.31). The effect size of conscientiousness was similar to that of cognitive ability (r= .23, d= 0.52, grade difference= 0.35) and as outlined by Poropat (2009), was similar to the effect size of socio-economic status (SES) on academic performance (r= .32, d= 0.68, grade difference= 0.46) reported in Sirin's (2005) meta-analytic review. Likewise, other research has found non-cognitive skills to be a significant contributory factor in academic performance (Durlak et al., 2011, Jones and Bouffard, 2012; Simonsen et al. 2012).

Farrington and colleagues (2012) outline five inter-related categories of non-cognitive skills involved in academic performance including:

1. Academic behaviours – defined as outward, visible manifestations of academic engagement and effort. Farrington et al. (2012) suggest that all other non-cognitive skills work through academic behaviour to affect performance (see Figure 1).
2. Academic perseverance – involving the ability to focus on and persist with academic objectives or pursuits. This comprises skills such as tenacity, delayed gratification, self-discipline, self-control, and grit (Duckworth, Peterson, Matthews and Kelly, 2007; Duckworth and Quinn, 2009).
3. Academic mindsets – defined as "the psycho-social attitudes or beliefs one has about oneself in relation to academic work" (Farrington et al., 2012 p.9). Positive academic mindsets are motivational factors which encourage academic persistence. Persistence, in turn, manifests through academic behaviours to affect academic performance. This relationship is cyclical and can be either positive or negative (Farrington, 2013).
4. Learning strategies – the strategies and process employed in order to aid cognitive processes such as thinking, learning and remembering (Farrington et al., 2012). Learning strategies allow students to take full advantage of learning opportunities by maximising the benefits derived from academic behaviours. These encompass a range of variables such as metacognition, study skills and goal setting (Zimmerman, Schunk and DiBenedetto, 2015).
5. Social skills – defined as skills which enable a person to navigate social protocols and interact effectively with others. These involve variables that are beneficial both in academic and career settings such as empathy, responsibility, cooperation and interpersonal skills (Casner-Lotto and Barrington, 2006; Schawbel, 2012).

The often-complex interactions between these inter-related categories and the classroom, school and socio-cultural context, are shown in Figure 1.

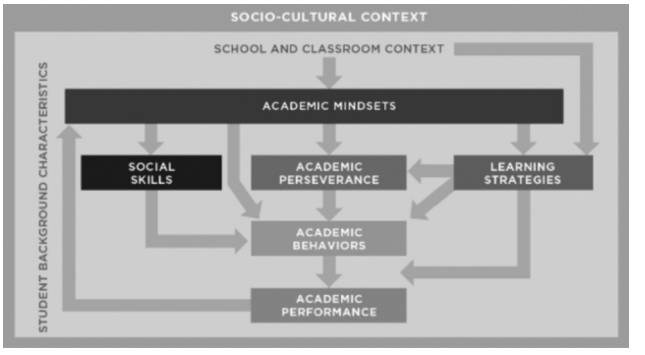

Figure 1: Hypothesised model of how non-cognitive skills affect academic performance within a classroom/school and socio-cultural context. (From: Farrington et al., 2012 p. 12. Reproduced with permission.)

In Ireland, there has been an increasing recognition that non-cognitive skills are important in education. For example, O'Brien's (2008) review makes a strong case for the importance of enhancing student wellbeing and resilience and indeed, these are now recognised as crucial factors in academic success within the junior cycle of post-primary education (National Council for Curriculum and Assessment, 2017). However, wellbeing and resilience are complex constructs which may incorporate, and be influenced by, a range of potentially interacting factors. For example, if resilience is defined as the ability to adapt successfully in the face of adverse conditions, then it is possible that non-cognitive skills, such as academic mindset, may play a role in its development (or enhancement). Broadly speaking, mindsets can be divided into two types including 'fixed mindsets' whereby ability is viewed as unalterable, and 'growth mindsets' which are premised on the idea that effort predicts performance (Dweck, 2006). Growth mindset interventions involve shifting students' rigid/inflexible implicit theories of intelligence toward an attitude which views mental abilities as malleable and capable of being developed and cultivated through effort and tuition. This kind of attitude allows students to engage better with learning opportunities whilst also being able to endure difficulty and not be as easily deterred by initial failures, all of which lie at the heart of resilience (Dweck, 1999, 2006, 2008; Farrington et al., 2012). Likewise, aspects of wellbeing, such as autonomy and personal mastery (Ryff, 1989, 1995), may be linked to, and support the development of, mindsets.

The understanding that non-cognitive skills are a factor in educational performance and attainment has led to the development of a variety of different interventions aimed at increasing academic performance. Broadly speaking these include categories of interventions designed to alter students' theory of learning (Dweck, 1999, 2006, 2008), shift students' behavioural tendencies through attitudinal change (Duckworth, Grant, Loew, Oettingen and Gollwitzer, 2011), develop adaptive attributions (Aronson, Fried and Good, 2002; Yeager, Purdie-Vaughns, Garcia, Pebley and Cohen, 2014), foster productive self-regulatory strategies (Zimmerman, Schunk and DiBenedetto, 2015) and enhance social belonging and wellbeing (Walton and Cohen, 2011).

Mediating and moderating factors

Research suggests that a number of socio-demographic factors influence the effectiveness of non-cognitive interventions. These include primarily gender, race/ethnicity and socio-economic status (SES).

Gender

Gender imbalances exist across education, with males and females outperforming each other in different domains. For example, at present, there are gender imbalances within Irish STEM (science, technology, engineering and maths) subjects (Harmon and Erskine, 2017). According to the STEM Education Review Group (2016), this is an issue which requires urgent attention. Likewise, the *STEM Education Policy Statement 2017-2026* (Government Publication, 2017) states that there is a need to overcome gender-related stereotypes concerning misconceptions about STEM abilities. Such stereotypes have been identified as a barrier to optimal educational performance (Aronson, Cohen and McColskey, 2009; Nguyen and Ryan, 2008). For example, Spencer, Steele and Quinn (1999) found that the presence of gender-related stereotypes affected negatively females' performance in maths. A more recent meta-analysis by Picho, Rodriguez and Finnie (2013) concluded that, whilst contextual factors matter, females in stereotypical conditions perform worse on mathematics tests than controls (d =|10.24|).

Some authors have argued that gender imbalance in STEM subjects emerges due to differences in specific cognitive abilities, whilst others have argued that social and cultural factors are responsible (Hyde, 2014; Reilly, Neumann and Andrews, 2017). In either case, non-cognitive interventions have been shown to reduce the magnitude of gender differences in performance. For example, a systematic review by Sabatine and Lippold (in progress) suggests that growth mindset interventions are beneficial to students in general but are particularly useful for reducing 'stereotype threat'. Similarly, when comparing students' grades, Grant and Dweck (2003) found that among those with fixed mindsets, males tended to outperform females, but among those with growth mindsets, females performed slightly better than males. Likewise, Good, Aronson and Inzlicht (2003) conducted an intervention to overcome stereotype threat and found that teaching an incremental theory of intelligence (the proposition that intelligence is malleable and can be developed) led to better academic performance amongst ethnic minority and low-income students when compared to controls but with a larger effect among females.

Several authors have suggested that some of the gender variation in participation in STEM subjects is due to differences between males and females with regard to subject and career preferences (e.g. Stoet, Bailey, Moore and Geary, 2016). However, a systematic literature review by Pennington, Heim, Levy and Larkin (2016) on the mediating variables of stereotype threat, supports the idea that under 'threat conditions', the extent to which an individual can employ their cognitive abilities, appears to be mediated by non-cognitive variables. Put simply, reducing non-cognitive barriers may be an effective means of addressing gender disparities/performance in STEM subjects in Ireland.

Ethnic minority status

Non-cognitive interventions may also be used to address performance disparities in terms of ethnic background. It has been found that ethnic/racial minority students are more likely to have negative experiences in education than their Caucasian counterparts (Aronson, Cohen and McColskey, 2009; Mendoza-Denton et al., 2010). Thus, the enhancement of non-cognitive skills within these sub-groups may allow for a better overall educational experience whilst also improving academic performance. Cohen, Garcia, Apfel and Master (2006) conducted an intervention which aimed to improve the academic performance of minority students by reaffirming their sense of personal adequacy. They found an average treatment effect for African American students of .30 grade points following their intervention; which corresponds to a 40% reduction in what is known as 'the racial achievement gap'.

In another study, Aronson at al., (2002) delivered a mindset intervention which resulted in students' grade point average increasing by .23 points with black students (but not white students) reporting greater enjoyment from the academic process. Walton and Cohen (2011) found that an intervention designed to reduce students perception of threat to their social belonging, was particularly beneficial for minority students, with positive effects on health outcomes and significant increases in grade point average (GPA) for African American students ($B = 0.30$, $t(65) = 2.54$, $P = 0.014$). Similarly, a meta-analysis conducted on 23 studies by Nadler and Clark (2011) found that when stereotype threats were nullified, minority students' scores improved ($d = 0.52$). These findings speak to the idea that non-cognitive interventions offer a viable means of reducing racial achievement gaps, whilst also promoting wellbeing and allowing minority students to derive a better experience from both the social and academic aspects of education.

Socio-economic status

Socio-economic factors may also influence academic performance; thus, those of lower SES are less likely to benefit from formal education than their more advantaged counterparts (Strand, 2014). According to West and colleagues (2016) "disparities in so-called non-cognitive skills appear to contribute to the academic achievement gap separating wealthy from disadvantaged students" (p. 148). Similarly, research by Liu (2016) on socio-economic achievement differences in the early school years found that disparities in non-cognitive skills can magnify socio-economic achievement gaps. This is problematic because initial differences in the benefit derived from education may increase incrementally over time (called a 'Matthew effect'), eventually affecting overall educational attainment. This is not to suggest that non-cognitive skills are the only factor in determining SES or social background itself. Rather it suggests that they may be among the contributory factors involved in the academic achievement gap which tends to emerge between those at different points on the socio-economic ladder.

Socio-economic factors in Ireland are thought to play a role in the likelihood of school completion and attainment of Leaving Certificate points (Higher Education Authority, 2010; McCoy, Smyth, Watson and Darmody, 2014). Likewise, socio-economic differences are thought to be a factor in the type of higher education institution in which students enrol. According to the Higher Education Authority (2010, 2016), the socio-economic profile of

students attending universities and institutes of technology differs to the extent that the composition of students in universities tends to be skewed towards those in the middle and upper ends of the socio-economic ladder. Considering the potential for differences in non-cognitive skills to magnify socio-economic achievement gaps in education, future research could be directed towards exploring the potential for non-cognitive skills interventions to be used as a means of reducing the extent to which SES impacts the benefits derived from education.

Transition to employment

According to the Organisation for Economic Co-operation and Development (OECD) (2016), educational attainment is strongly related (across all countries) to labour force participation, type of occupation and earnings. Statistics further suggest that those who have attained a third level qualification are almost twice as likely to be employed as those with primary level education (Central Statistics Office, Ireland, 2011). Similarly, in all OECD countries, educational attainment appears to be linked to earnings, with those who have a tertiary level qualification, earning more than those with secondary and primary education qualifications (Organisation for Economic Co-operation and Development, 2015; 2016). With regard to the Irish context, OECD figures for 2014 show that Irish tertiary graduates in employment (aged 25-64 yrs) earned, on average, 63% more than the OECD benchmark. Likewise, OECD research has linked educational attainment with the ability to retain employment, as well as a number of other social outcomes such as levels of health, trust, democracy and social cohesion (Organisation for Economic Co-operation and Development, 2016).

It is also important to consider the skills which employers desire, in order to ensure that these are better reflected within the educational system. Competency in the core skills of a discipline is a necessary prerequisite for employment, but evidence suggests that broader skills are also desired. For example, Casner-Lotto and Barrington (2006) found that oral communication, teamwork/collaboration, professionalism/work ethic, and critical thinking/problem solving, were the skills which employers valued most among college graduates. Another more recent study by Schawbel (2012) found that, whilst employers valued education, they placed a greater emphasis on competencies such as adaptability, communication skills and positive attitude. The Irish literature reflects similar findings with employers desiring 'soft skills' pertaining to communication, teamwork and problem-solving skills (Department of Education and Skills, 2015). Furthermore, a recent report by the World Economic Forum (2016) suggests that the subject knowledge acquired within technical disciplines will become outdated in the near future, thereby leading to increasing (and disruptive) changes in the thirty-five skills and abilities identified as most desirable across most occupations, Thus, it seems likely that the non-cognitive skills which underlie the learning process and facilitate the acquisition of new skills are likely to become increasingly important in the near future.

The Irish context

The *National Strategy for Higher Education to 2030* recognises that the role of education extends beyond the "the simple acquisition of knowledge" (Department of Education and Skills, 2011, p. 57) whilst, at the same time, concerns have been expressed about the lack of the kinds of skills required to help students engage effectively with the demands of higher education; these relate specifically to critical thinking, problem-solving and independent learning skills (Department of Education and Skills, 2011). Thus, the development of non-cognitive skills is likely to play a key role in helping to address these kinds of issues. For instance, in a comparison of higher versus ordinary level students in leaving certificate maths, the *Chief Examiner's Report* stated:

> At higher level in both papers it was apparent that candidates made a determined effort to complete the entire examination paper. They were prepared to make a number of attempts in many questions and to persevere in solving problems even when, because of errors, the numerical values were not user-friendly (State Examinations Commission, 2015, p. 20).

At Ordinary level, however, the same determination and perseverance were not observed: "there was little evidence of the same diligence and perseverance when problems arose. Candidates at this level generally abandoned the work as soon as difficulty was encountered, rather than trying different ideas" (p. 20). Mutodi and Ngirande (2014) found that students who do well in maths tend to attribute their success to effort and perseverance, whilst unsuccessful students tend to attribute their failure to a lack of ability. Similarly, research on distinguishing features between academically successful and unsuccessful minority and low SES students found that resilience-promoting conditions were associated with more success in mathematics and greater academic engagement (Borman and Overman, 2004). Thus, it seems likely that weaker students, in particular, would benefit from interventions/programmes designed to enhance non-cognitive skills known to support academic perseverance.

In summary, the development/enhancement of non-cognitive skills at secondary school level may help to address, at least in part, some of the issues related to gender, SES and racial achievement gaps, thereby supporting the provision of an education which reflects the diverse requirements of present and future employers. Previous research has outlined methods of optimising non-cognitive investment and economically streamlining targeted implementation strategies (Cunha and Heckman, 2008; Cunha and Heckman, 2009; Heckman and Kautz, 2012; Dee and West, 2011; Heckman and Mosso, 2014). The ability to implement targeted interventions make non-cognitive programmes ideal for equilibrating Ireland's education goals with the economic vision of a high-skills, knowledge and innovation-based economy (Government Publication, 2004). The research outlined above would suggest that non-cognitive skills, and, in turn, interventions/programmes designed to promote them, should be considered in the context of school and classroom ethos/culture.

School ethos/culture

As shown earlier in Figure 1, non-cognitive skills also affect academic performance in the context of the ethos and cultures within schools and classrooms. Thus, school cultures which are perceived as supportive by students, predict a variety of positive outcomes. For example, longitudinal research indicates that students' perception of school culture predicts academic engagement which, in turn, influences academic achievement (Wang and Holcombe, 2010; Wang and Eccles, 2013). Similarly, a systematic review by Kidger, Araya, Donovan and Gunnell, (2012) found that students' perception of a supportive environment was associated with better emotional health and wellbeing.

Some schools, in countries throughout the world, have incorporated non-cognitive thinking into their culture. For example, the Life Academy of Health and Bioscience in Oakland, USA, is located in an area with high levels of crime and predominantly caters to the needs of students who are socio-economically disadvantaged (Boaler, 2015; Life Academy of Health and Bioscience, 2016). The school's culture revolves around the understanding that non-cognitive skills promote academic ability. The core principles of the school include fostering academic behaviours, skills and mindsets which fall within the taxonomy of non-cognitive skills outlined earlier. For example, the school's grading system recognises the value of academic perseverance, resilience and growth mindset. When student attainment falls below a passing grade, a designation of 'no credit' is given; this indicates the class is still in progress and is only revised when the student perseveres to meet the required academic standard. By changing how grades are viewed, the school has shifted students' focus successfully toward deep learning through the continual improvement and development of learning strategies. This perspective encourages and rewards resilience, determination and academic perseverance in the face of difficulty. This, in turn, facilitates the development of a growth mindset as there is a clear relationship in the student's mind, between effort, improvement and outcome. The results of this initiative are impressive in that the proportion of students who graduate is higher than nearby wealthier schools whilst the rate of acceptance into third level educational institutions for the school's students, is also the highest in the region (Boaler, 2015; Dweck, 2015).

Similarly, the Knowledge is Power Programme (KIPP), consists of charter schools in the USA which also incorporate a non-cognitive ethos into their school culture. KIPP schools comprise predominantly minority students who are socio-economically disadvantaged (Knowledge is Power Program, 2017). KIPP schools use the term 'character' to describe the non-cognitive skills which they aim to develop. The emphasis KIPP places on non-cognitive skills extend to initiatives such as character development report cards for students. Research on KIPP schools has shown they have a statistically significant positive effect on students' academic performance and academic behaviour (Tuttle et al., 2013; Tuttle et al., 2015). The percentage of KIPP students who complete secondary education (93%) and enrol in third level education (80%) is higher than the US low-income average and national average (Knowledge is Power Programme, 2015). KIPP credits the matriculation and success of their alumni to several factors, notably the development of non-cognitive skills such as grit and self-control (Knowledge is Power Program, 2011).

Research conducted with schools elsewhere in the United States report similar effects in terms of student engagement, increased academic behaviours and improved academic performance (Angrist, Pathak and Walters, 2013; Dobbie and Fryer, 2015; West, et al., 2016). These results were achieved by identifying the non-cognitive skills required by the respective student bodies and then incorporating their development into the school's ethos. This approach provides a means of creating school cultures which are sufficiently flexible to respond to the demands of 21st-century education.

Classroom

Though the academic requirements of each classroom may differ, the approach outlined above is equally valid at the classroom level. For example, given the willingness of many Irish math students to withdraw effort when faced with adversity, it could be argued that this lack of perseverance is related to mindset. In classrooms, perseverance can be promoted through the development of growth mindsets by techniques such as mindset messaging. Growth mindset messages are communications which express the idea that abilities are malleable and can change with effort (for review see Dweck, 2007). There are opportunities for teachers to impart these messages to students, for example how students' mistakes are addressed or the manner in which feedback is constructed and delivered to students (See Figure 2).

Figure 2: Aspects of classroom teaching that communicate mindset messages. (From: Boaler, 2013, p. 146. Reproduced with permission.)

Broadly speaking, when teachers employ growth mindset messaging in their teaching practice, their students tend to engage in positive learning strategies and have better academic outcomes (Cutts, Cutts, Draper, O'Donnell, and Saffrey, 2010; Schmidt, Shumow and Kackar-Cam, 2015). A specific example is teacher feedback, which plays a role in shaping students' mindsets (Yeager, Walton and Cohen, 2013). Thus, students with fixed mindsets have been found to be more likely to respond defensively to such feedback (Forsythe and Johnson, 2017). Non-cognitive techniques provide teachers with a means of constructing feedback in a manner which reduces such defensive behaviour whilst helping to develop growth mindsets. For example, Yeager, et al., (2014) constructed critical feedback in a manner which assuaged "mistrust by emphasizing the teacher's high standards and belief that the student was capable of meeting those standards" (p. 804). This technique was found to

increase academic perseverance as well as the quality of students' work. Yeager and colleagues (2014) found that similar techniques such as attributional retraining (the adoption of personally controllable attributions following a poor performance) also improved academic performance among minorities and reduced the academic achievement gap.

At the classroom level, non-cognitive programmes can be embedded alongside existing curricula, with the potential for cross-productive effects (Cunha and Heckman, 2009) whilst also maximising utility by using teachers' experience to assess and respond dynamically to students' needs.

Corrective interventions

Another potentially promising application for non-cognitive understandings pertains to interventions designed and tailored specifically to target problematic areas within Irish education. West and colleagues (2016) argue that non-cognitive skills "may be more amenable to direct intervention than cognitive ability" (p. 2). Kautz and colleagues (2014) present a similar point of view stating "that the productivity of later-age investment in non-cognitive skills is substantial" and in cases where the early years have been compromised, focusing on the development of non-cognitive skills is more effective than directly trying to develop cognitive skills (p. 63).

Issues pertaining to the Irish STEM initiative appear to emerge at least partially for non-cognitive reasons. Previous research suggests that employing interventions designed to develop non-cognitive skills such as mindset and perseverance may help to redress the issues in STEM. For instance, Grant and Dweck (2003) explored the effect on academic achievement of a students' orientation toward validating their own intelligence or toward learning goals. These orientations closely align with fixed and growth mindsets (Blackwell, Trzesniewski and Dweck, 2007). The growth mindset orientation predicted better final grades and the ability to recover from an initial poor grade, whereas fixed mindset students often failed to recover from initial setbacks. Similarly, Blackwell, Trzesniewski and Dweck (2007) aimed to promote positive change in classroom motivation by teaching an incremental theory of intelligence. Mathematics grades for both the experimental group (N=48) and control group (N=43) had been reducing prior to the intervention. Post-intervention the control group continued on a downward trajectory, while the experimental group stabilised, resulting in a difference of .30 grade points between the two groups.

In another study, Blackwell, Trzesniewski and Dweck (2007) found that students with growth mindsets did significantly better in maths than their counterparts who, previously, had equally good maths achievements. This divergence was mediated by several variables. Students who possessed growth mindsets were better orientated towards learning goals and deep learning as opposed to just grades. Secondly, regardless of current ability level, students with growth mindsets believed that their abilities reflected their efforts and that their efforts improved their abilities. Students with fixed mindsets tended to believe that effort was a requirement for those who lacked ability and was unnecessary for them. In response to setbacks, students with growth mindsets were less inclined to denigrate their own abilities or employ negative strategies such as withdrawing effort and instead were more likely to engage in positive strategies such as increasing effort. Summarising the research, Dweck

(2008) states that "when students believe that their intelligence can increase, they orient toward doing just that, displaying an emphasis on learning, effort, and persistence in the face of obstacles" (p. 4).

Non-cognitive strategies for improving academic performance and developing perseverance are not limited to mindset interventions. For example, Duckworth, and colleagues (2011) developed and delivered what is known as a mental contrasting with implementation intentions (MCII) intervention. MCIIs are a metacognitive approach which combine visualisation techniques and self-regulatory goal pursuit strategies in an effort to improve students' academic perseverance. Post MCII intervention, Duckworth and colleagues (2011) assigned the same academic task to both an experimental group (N=35) and a control group (N=31), the latter group not having been exposed to the MCII. The experimental group demonstrated considerably more perseverance, completing 60% more questions.

Likewise, the use of metacognitive strategies has been shown to have a relationship with increased delay of gratification, which in turn has a relationship with effort regulation (r = 0.58) (Bembenutty and Karabenick, 1998).

Looking to the future

The benefit of investment in education is well-established, with a broad range of outcomes linked to such investment (Cunha, Heckman and Schennach, 2010; Psacharopoulos and Patrinos, 2004; Patrinos and Psacharopoulos, 2011). Similarly, educational investment in disadvantaged youth is an economically efficient approach which reduces the effect of disadvantage, as well as a range of associated economic and societal costs (Cunha and Heckman, 2008; Cunha et al., 2010; Dobbie and Fryer, 2013). The ability to streamline the implementation of non-cognitive programmes by utilising past research (Cunha and Heckman, 2008; Cunha and Heckman, 2009; Heckman and Kautz, 2012; Dee and West, 2011; Heckman and Mosso, 2014) alongside the potential added value of improving academic performance whilst promoting wellbeing and perseverance, should be an incentive for policymakers to consider supporting further research in the area of non-cognitive interventions. Given the recent *STEM Education Policy Statement 2017-2026* (Government Publication, 2017) and the National Council for Curriculum and Assessment's (2017) *Junior Cycle Guidelines* – which now include 300-400 hours of dedicated time for wellbeing – it is an ideal time to begin developing a non-cognitive framework which specifically caters to the requirements of the Irish education system.

Conclusion

The literature suggests that the development of non-cognitive skills programmes could provide a flexible means of supporting the NCCA's goals of developing student wellbeing and resilience. Non-cognitive interventions have been used to cultivate skills which are conducive to, and perhaps underlie the development of, resilience. Likewise, such interventions have been shown to promote a range of positive social and academic outcomes which, in turn,

help to promote wellbeing. Furthermore, non-cognitive programmes may also provide a means of optimising aspects of Ireland's education system such as redressing specific academic achievement gaps and areas of low performance.

References

Angrist, J.D., Pathak, P.A., and Walters, C.R. (2013). Explaining charter school effectiveness. *American Economic Journal: Applied Economics*, 5(4), pp. 1-27.

Aronson, J., Fried, C.B., and Good, C. (2002). Reducing the effects of stereotype threat on African American college students by shaping theories of intelligence. *Journal of Experimental Social Psychology*, 38, pp. 113-125.

Aronson, J., Cohen, G., and McColskey, W. (2009). *Reducing stereotype threat in classrooms: A review of social-psychological intervention studies on improving the achievement of Black students*. National Center for Education Evaluation and Regional Assistance. Institute for Education Science, U.S. Department of Education.

Bembenutty, H., and Karabenick, S.A. (1998). Academic delay of gratification. *Learning and individual differences*, 10(4), pp. 329-346.

Blackwell, L.S., Trzesniewski, K.H., and Dweck, C.S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, 78(1), pp. 246-263.

Boaler, J. (2015). Mathematical Mindsets: Unleashing Students' Potential through Creative Math. *Inspiring Messages and Innovative Teaching*. San Francisco: Jossey-Bass, p. 99.

Borman, G.D., and Overman, L.T. (2004). Academic Resilience in Mathematics among Poor and Minority Students. *The Elementary School Journal*, 104(3), pp. 177-195.

Cam, H. (2015). Exploring Teacher Effects for Mindset Intervention Outcomes in Seventh-Grade Science Classes. *Middle Grades Research Journal*, 10(2), pp. 17-32.

Casner-Lotto, J., and Barrington. L. (2006). *Are They Really Ready to Work? Employers' Perspectives on the Basic Knowledge and Applied Skills of New Entrants to the 21st Century U.S. Workforce*. The Conference Board, Inc., the Partnership for 21st Century Skills, Corporate Voices for Working Families, and the Society for Human Resource Management.

Central Statistics Office, Ireland (2011). Quarterly National Household Survey Educational Attainment Thematic Report 2011. Ireland: Central Statistics Office.

Cohen, G.L., Garcia, J., Apfel, N., and Master, A. (2006). Reducing the racial achievement gap: A social-psychological intervention. *Science*, 313, pp. 1307-1310.

Cunha, F., and Heckman, J.J. (2008). Formulating, identifying and estimating the technology of cognitive and noncognitive skill formation. *Journal of Human Resources,* 43(4), pp. 738-782.

Cunha, F., and Heckman, J. (2009). The economics and psychology of inequality and human development. *Journal of the European Economic Association*, 7(2-3), pp. 320-364.

Cunha, F., Heckman, J.J., and Schennach, S.M. (2010). Estimating the Technology of Cognitive and Noncognitive Skill Formation. *Econometrica*, 78(3), pp. 883-931.

Cutts, Q., Cutts, E., Draper, S., O'Donnell, P., and Saffrey, P. (2010). Manipulating mindset to positively influence introductory programming performance. In: *SIGCSE 10 Proceedings of the 41st ACM Technical Symposium on Computer Science Education*. Milwaukee, USA, pp. 431-435.

Department of Education and Skills (2011). National Strategy for Higher Education to 2030: Report of the Strategy Group. Dublin: Department of Education and Skills.

Department of Education and Skills (2015). National Employer Survey: Employers' Views on Irish Further and HE and Training Outcomes. Dublin: Higher Education Authority, SOLAS, Quality and Qualifications Ireland.

Dee, T.S., and West, M.R. (2011). The non-cognitive returns to class size. *Education Evaluation and Policy Analysis*, 33(1), pp. 23-46.

Dobbie, W., and Fryer, R.G. (2015). The Medium-Term Impacts of High-Achieving Charter Schools. *Journal of Political Economy*, 123(5), pp. 985-1037.

Duckworth, A.L., and Seligman, M.E.P. (2005). Self-discipline outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, 16, pp. 939-944.

Duckworth, A.L., Peterson, C., Matthews, M.D., and Kelly, D.R. (2007). Grit: Perseverance and passion for long-term goals. *Journal of Personality and Social Psychology*, 92(6), pp. 1087-1101.

Duckworth, A.L., and Quinn, P.D. (2009). Development and validation of the Short Grit Scale (GRIT–S). *Journal of Personality Assessment*, 91(2), pp. 166-174.

Duckworth, A.L., Grant, H., Loew, B., Oettingen, G., and Gollwitzer, P.M. (2011). Self-regulation strategies improve self-discipline in adolescents: Benefits of mental contrasting and implementation intentions., *Educational Psychology: An International Journal of Experimental Educational Psychology*, 31(1), pp. 17-26.

Durlak, J.A., Weissberg, R.P., Dymnicki, A.B., Taylor, R.D., and Schellinger, K.B. (2011). The impact of enhancing students' social and emotional learning: a meta-analysis of school-based universal interventions. *Child Development*, 82(1), pp. 405-432.

Dweck, C. (1999). *Self-theories: Their role in motivation, personality, and development*. New York: Psychology Press.

Dweck, C. (2006). *Mindset: The New Psychology of Success*. New York: Ballantine Books.

Dweck, C. (2007). Boosting Achievement with Messages that Motivate. *Education Canada*; 47(2), pp. 6-10.

Dweck, C. (2008). *Mindsets and math/science achievement*. Retrieved from: www.opportunityequation.org [Accessed 03/11/2017]

Dweck, C. (2015). Forward, In J. Boaler: *Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching,* (pp. vii-viii). San Francisco: Jossey-Bass.

Farrington, C.A., Roderick, M., Allensworth, E., Nagaoka, J., Keyes, T.S., Johnson, D.W., and Beechum, N.O. (2012). *Teaching adolescents to become learners. The role of noncognitive factors in shaping school performance: A critical literature review*. Chicago: University of Chicago Consortium on Chicago School Research.

Farrington, C.A. (2013). Academic Mindsets as a Critical Component of Deeper Learning, Consortium on Chicago School Research: A White Paper prepared for the William and Flora Hewlett Foundation.

Forsythe, A., and Johnson, S. (2017). Thanks, but no-thanks for the feedback. *Assessment and Evaluation in Higher Education*, 42(6), pp. 850-859.

Good, C., Aronson, J., and Inzlicht, M. (2003). Improving adolescents' standardized test performance: An intervention to reduce the effects of stereotype threat. *Journal of Applied Developmental Psychology*, 24(6), pp. 645-662.

Government Publication. (2004). A Brief Description of the Irish Education System. Communications Unit Department of Education and Science.

Government Publication. (2017). STEM Education Policy Statement 2017-2026. Department of Education and Skills.

Grant, H., and Dweck, C.S. (2003). Clarifying achievement goals and their impact. *Journal of Personality and Social Psychology*, 85, pp. 541-553.

Harmon, D., and Erskine, S. (2017). EUROSTUDENT SURVEY VI: Report on the social and living conditions of higher education students in Ireland 2016. Higher Education Authority.

Heckman, J., and Kautz, T. (2012). Hard Evidence on Soft Skills. *Labour Economics*, 19(4), pp. 451-464.

Heckman, J., and Mosso, S. (2014). The Economics of Human Development and Social Mobility. *Annual Review of Economics*, 6, pp. 689-733.

Higher Education Authority (2010). A Study of Progression in Irish Higher Education. Retrieved from: www.hea.ie/sites/default/files/study_of_progression_in_irish_higher_education_2010.pdf [Accessed 15/09/2017]

Higher Education Authority (2016). A Study of Progression in Irish Higher Education 2012/13 TO 2013/14. Retrieved from: hea.ie/assets/uploads/2017/06/A-Study-Of-Progression-in-Irish-Higher-Education-201213-201314.pdf [Accessed 15/09/2017]

Hyde, J.S. (2014). Gender similarities and differences. *Annual Review of Psychology*, 65(1), pp. 373-398.

Jones, S.M., and Bouffard, S.M. (2012). Social and Emotional Learning in Schools: From Programs to Strategies. *Sharing Child and Youth Development Knowledge*, 26(4), pp. 3-22.

Kautz, T., Heckman, J., Diris, R., ter Weel, B., and Borghans, L. (2014). *Fostering and Measuring Skills: Improving Cognitive and Non-Cognitive Skills to Promote Lifetime Success*, revised September 2017. NBER Working Paper No. 20749.

Kidger, J., Araya, R., Donovan, J., and Gunnell, D. (2012). The Effect of the School Environment on the Emotional Health of Adolescents: A Systematic Review. *Paediatrics*, 129(5), pp. 925-949.

Knowledge is Power Program (2011). *The Promise of College Completion: KIPP's Early Successes and Challenges*, Available: www.kipp.org/wp-content/uploads/2016/09/CollegeCompletionReport.pdf [Accessed 03/09/2017]

Knowledge is Power Programme (2015). How we measure success. Retrieved from: www.kipp.org/results/national/#question-4:-are-our-students-climbing-the-mountain-to-and-through-college [Accessed 03/09/2017]

Knowledge is Power Programme (2017). KIPP Student Demographics. Retrieved from: www.kipp.org/results/national/#question-1:-are-we-serving-the-children-who-need-us [Accessed 03/09/2017]

Life Academy of Health and Bioscience (2016). Our Students. Retrieved from: lifeacademyoak.org/our-school-and-our-students/our-students/

Liu, A. (2016). Non-Cognitive Skills and the Growing Achievement Gap, Population Studies Center: Research Report 16-861. Institute for Social Research, University of Michigan.

Lynn, R., and Mikk, J. (2009). National IQs predict educational attainment in math, reading and science across 56 nations. *Intelligence*, 37(3), pp. 305-310.

McCoy, S., Smyth, E., Watson, D., and Darmody, M. (2014). *Leaving School in Ireland: A Longitudinal Study of Post School Transitions*. ESRI Research Series, 36.

Mendoza-Denton, R., Goldman-Flythe, M., Pietrzak, J., Downey, G., and Aceves, M, J. (2010). Group-value ambiguity: Understanding the effects of academic feedback on minority students' self-esteem. *Social Psychological and Personality Science*, 1, pp. 127-135.

Mutodi, P., and Ngirande, H. (2014). The Influence of Students' Perceptions on Mathematics Performance: A Case of a Selected High School in South Africa. *Mediterranean Journal of Social Sciences*, 5(3), pp. 431-446.

Nadler, J.T., and Clark, M.H. (2011). Stereotype Threat: A Meta□Analysis Comparing African Americans to Hispanic Americans. *Journal of Applied Social Psychology*, 41(4), pp. 872-890.

National Council for Curriculum and Assessment. (2017). Guidelines Wellbeing for Junior Cycle. Retrieved from: www.juniorcycle.ie/NCCA_JuniorCycle/media/NCCA/Curriculum/Wellbeing/Wellbeing-Guidelines-for-Junior-Cycle.pdf [Accessed 20/10/2017]

Nguyen, H-H.D., and Ryan, A. (2008). Does Stereotype Threat Affect Test Performance of Minorities and Women? A Meta-Analysis of Experimental Evidence. *The Journal of applied psychology*, 93, pp. 1314-1334.

O'Brien, M. (2008). *Well-being and post-primary schooling: A review of the literature and research*. Dublin: National Council for Curriculum and Assessment.

Organisation for Economic Co-operation and Development (2015). *Education at a glance 2015 OECD indicators: A Country Profile for Ireland Statistics Section*. Ireland: Department of Education and Skills.

Organisation for Economic Co-operation and Development (2016). *Education at a glance 2016 OECD indicators: A Country Profile for Ireland Statistics Section*. Ireland: Department of Education and Skills.

Patrinos, H.A., and Psacharopoulos, G. (2011). Education: past, present and future global challenges. The World Bank, Policy Research Working Paper Series, 5616.

Pennington, C.R., Heim, D., Levy, A.R., and Larkin, D.T. (2016). Twenty Years of Stereotype Threat Research: A Review of Psychological Mediators. *PLoS ONE* 11(1).

Picho, K., Rodriguez, A., and Finnie, L. (2013). Exploring the Moderating Role of Context on the Mathematics Performance of Females Under Stereotype Threat: A Meta-Analysis. *The Journal of Social Psychology*, 153(3), pp. 299-333.

Poropat, A.E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin*, 135(2), pp. 322-338.

Psacharopoulos, G., and Patrinos, H.A. (2004). Returns to investment in education: a further update. *Education Economics*, 12(2), pp. 111-134.

Reilly, D., Neumann, D., and Andrews, G. (2017). Gender Differences in Spatial Ability: Implications for STEM Education and Approaches to Reducing the Gender Gap for Parents and Educators. In: *Visual-spatial Ability in STEM Education: Transforming Research into Practice*, pp. 195-224.

Ryff, C. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57, pp. 1069-1081.

Ryff, C., and Keyes, C. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology*, 69, pp. 719–727.

Sabatine, E., and Lippold, M. (in progress). *Stereotype threat and growth mindset: A systematic review of competence building interventions for academic achievement.* University of North Carolina at Chapel Hill.

Simonsen, B., Eber, L., Black, A., Sugai, G., Lewandowski, H., Myers, D., and Sims, B. (2012). Positive behavioral interventions and supports in Illinois: Lessons learned for large-scale Implementation. *Journal of Positive Behavior Interventions*, 14, pp. 5-16.

Sirin, S.R. (2005). Socioeconomic Status and Academic Achievement: A Meta-Analytic Review of Research. *Review of Educational Research*, 75(3), pp. 417-453.

Spencer, S.J., Steele, C.M., and Quinn, D.M. (1999). Stereotype Threat and Women's Math Performance. *Journal of Experimental Social Psychology*, 35, pp. 4-28.

State Examinations Commission (2015). Leaving Certificate Examination 2015. Mathematics, Chief examiner's report. Retrieved from: www.examinations.ie/misc-doc/EN-EN-53913274.pdf [Accessed 19/07/2017]

Stoet, G., Bailey, D.H., Moore, A.M., and Geary, D.C. (2016). Countries with Higher Levels of Gender Equality Show Larger National Sex Differences in Mathematics Anxiety and Relatively Lower Parental Mathematics Valuation for Girls. *PLoS ONE*, 11(4), e0153857.

Strand, S. (2014). School effects and ethnic, gender and socioeconomic gaps in educational achievement at age 11. *Oxford Review of Education*, 40, (2), pp. 223-225.

The STEM Education Review Group (2016). STEM Education in the Irish School System, A Report on Science, Technology, Engineering and Mathematics (STEM) Education: Analysis and Recommendations the STEM Education Review Group. A Report on STEM Education presented by the STEM Education Review Group to the Minister of Education and Skills.

Tuttle, C.C., Gill, B., Gleason, P., Knechtel, V., Nichols-Barrer, I., and Resch, A. (2013). *KIPP middle schools: Impacts on achievement and other outcomes.* Washington, DC: Mathematica Policy Research.

Tuttle, C.C., Gleason, P., Knechtel, V., Nichols-Barrer, I., Booker, K., Chojnacki, G., Coen, T., and Goble, L. (2015). *Understanding the Effect of KIPP as It Scales: Volume I, Impacts on Achievement and Other Outcomes. Final Report of KIPP's Investing in Innovation Grant Evaluation, Executive Summary*. Washington, DC: Mathematica Policy Research, Inc.

Walton, G.M., and Cohen, G.L. (2011). A brief social-belonging intervention improves academic and health outcomes among minority students. *Science*, 331, pp. 1447-1451.

Wang, M., and Holcombe, R. (2010). Adolescents' Perceptions of School Environment, Engagement, and Academic Achievement in Middle School. *American Educational Research Journal,* 47(3), pp. 633-662.

Wang, M., and Eccles, J.S. (2013). School context, achievement motivation, and academic engagement: A longitudinal study of school engagement using a multidimensional perspective. *Learning and Instruction*, 28, pp. 12-23.

West, M.R., Kraft, M.A., Fin, A.S., Martin, R., Duckworth, A., Gabrieli, C.F., and Gabrieli, J.D. (2016). Promise and paradox: Measuring students' non-cognitive skills and the impact of schooling. *Educational Evaluation and Policy Analysis*, 38(1), pp. 148-170.

World Economic Forum (2016). *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution.* Global Challenge Insight Report, REF 010116.

Yeager, D., Walton, G., and Cohen, G.L. (2013). Addressing Achievement Gaps with Psychological Interventions. *Phi Delta Kappan*, 94(5), pp. 62-65.

Yeager, D.S., Purdie-Vaughns, V., Garcia, J., Pebley, P., and Cohen, G.L. (2014). Lifting a barrier of mistrust: "Wise" feedback to racial minorities. *Journal of Experimental Psychology: General*, 143(2), pp. 804-824.

Zimmerman, B.J., Schunk, D.H., and DiBenedetto, M.K. (2015). A personal agency view of self-regulated learning: The role of goal setting. In F. Guay, H. Marsh, D. M. McInerney, and R.G. Craven (Eds.), *International advances in self research. Self-concept, motivation and identity: Underpinning success with research and practice.* Charlotte, US: IAP Information Age Publishing, pp. 83-114.