Metacognition in schools: what does the literature suggest about the effectiveness of teaching metacognition in schools?

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Abstract

This paper focuses on a neglected area of school policy and practice: metacognition. As education becomes increasingly evidence-informed policy makers, school leaders and teachers are becoming increasingly research literate and have ready access to an ever-growing range of evidence about 'what works' in schools. Influential sources of evidence, such as the Education Endowment Foundation's Teaching and Learning Toolkit, often indicate that teaching metacognition in schools can have a very positive effect on pupils' outcomes. In this paper, we examine over fifty studies to ascertain the effect of teaching metacognition in schools on pupils' outcomes and their wellbeing. Following our review it is clear that there is strong evidence indicating the when metacognition is effectively taught in schools then there is a very positive effect on pupil outcomes; there is less evidence about the relationship between teaching metacognition and pupil wellbeing, but the evidence which does exist is also very positive. Having identified that teaching metacognition can help improve pupil outcomes in schools, we then pose questions about the English government's attitudes towards evidence-based practice. We ask why the government adopts some policies and strategies which have an international evidence base, while not adopting other policies or strategies which have at least an equally strong evidence base. This paper concludes by suggesting how policies and practices can be improved at in schools, Initial Teacher Education establishments and at the level of national policy.

Keywords: Metacognition; thinking skills; evidence based practice; policy

Introduction

Teaching is becoming an "evidence-informed profession" (DfE 2016a, p.37). There is a growing cultural acceptance that teaching is more complex and sophisticated than simply transmitting knowledge, which is leading to vigorous, informed discussions about 'what works'. Such discussions are supplanting the old debates, such as 'traditionalist' versus 'progressive' education, or quantitative research versus qualitative research, although these still rumble on in the Twittersphere. This is slowly encouraging an environment where practitioners and policy makers are becoming increasingly research literate and confident about identifying high quality research. This, in turn, means that professionals are able to make up their own minds about what is most likely to work best in their own contexts. We are writing in the context of the English education system, where the emerging 'evidence-friendly' environment is fostered by organisations such as the Education Endowment Foundation the Chartered College of Teaching, as well as the government itself. It is in this context that we examine what the evidence suggests about one particular strand of pedagogical practice: thinking skills, also known as metacognition.

The reason for focusing on metacognition as a specific strand of pedagogical practice is simple. Multiple studies make strong claims that when children are effectively taught metacognitive skills, they tend to make better progress than children who are not taught such skills. In this paper we will examine the evidence for such claims by reviewing much of the key literature from the last twenty years. We are seeking to answer one main question:

- What does the literature suggest about the effects of teaching metacognition in schools?

To help investigate this question we seek to answer four sub-questions:

Question 1: What does the international literature suggests about the effectiveness of metacognition on pupil outcomes classrooms?

Question 2: What does the literature say about the relationship between metacognition and particular groups of pupils?

Question 3: What does the literature say about the relationship between metacognition and pupil wellbeing?

Question 4: What are the implications of what the international literature says about these questions for educational policy?

These are important questions because, as this paper will demonstrate, very strong evidence exists indicating that the effective teaching of metacognitive skills can make a significant difference for pupil outcomes. However, there is little to suggest that schools are using such strategies in any widespread manner, and metacognition is not promoted by the English Department for Education (DfE), while it does promote other strategies. Such as situation raises broader questions, such as why some strategies are championed by practitioners or policy makers, while others remain on the shelf. This paper begins to address these issues and indicates where further research or work is required.

A relatively conventional structure has been adopted for this paper. Initially we define our terms and present our methodology. The central literature review section of this paper seeks to answer the first three sub-questions, focusing on what the international literature says about metacognition in schools. Following the review of the literature, we identify some of the limitations of our work. We then offer our interpretations of how policies could be altered to re-vitalise the teaching of metacognitive skills in classrooms; in this section we offer our tentative answers to Question Four. Our conclusion offers answers to the main

question, ‘What does the literature suggest about the effects of teaching metacognition in schools?’.

In the following section we define what we mean by ‘metacognition’, locating it in the wider context of contemporary schools and school systems. As noted above, we are writing in the context of the English education system, but we are very conscious of the international environment; this helps to shed some light on English policies and practices.

Definitions and context

Metacognition, or ‘thinking about thinking’, is well established as an internal, psychological process necessary for effective learning and problem solving (Flavell 1979). The concept has been extensively written about, with different theorists and writers adopting differing definitions. For the purposes of this paper we will use the definition offered by the Organisation for Economic Co-operation and Development (OECD), which states that metacognition is,

> …a second or higher-order thinking process which involves active control over cognitive processes.
>
> (Mevarech and Kramarski 2014, p. 36)

The majority of researchers separate metacognitive knowledge from metacognitive skills (e.g. Veenman, Hout-Wolters, and Afflerbach 2006). Thus, there is a difference between knowing about metacognition and being able to successfully employ such skills to complete novel tasks. In addition to this, we accept the three level model suggested by Donker et al who recognise “an interaction of cognitive, metacognitive and motivational processes, which

work together during information processing."(Donker et al. 2014). Various studies make strong claims for the significance of metacognition on pupils' learning. Veenman and Beishuizen, for example, suggest that metacognition accounts for roughly 17% of a child's ability to be successful at school, while intelligence accounts for approximately 10%. This is a significant statistic, reinforced by other studies (e.g. Muijs, Kyriakides, van der Werf, et al. 2014) which clearly suggests the necessity for schools to teach metacognitive skill effectively.

We have chosen to use 'metacognition' as an overarching term, encompassing other commonly used terms, such as 'self-regulated learning', 'thinking skills', and 'Learning to Learn' (L2L). There are also the skills which have become generically known as '21st Century Skills' (Voogt and Roblin 2012), although these often form a broader framework of skills than the higher-order thinking skills which are the specific focus of this review. 21st Century Skills often include metacognitive skills, but they also tend to include a broad range of IT and communication skills (Laar et al. 2017). While we fully accept the importance of such skills, especially in contemporary workplaces, they are largely tangential to our study, and thus do not form a significant part of our research.

We recognize that metacognition is a 'fuzzy' concept (Akturk and Sahin 2011, Bassey 2001) and that a number of related terms are contested (Proust 2010). However, the central aim of this paper is to understand the effects of using and assessing metacognitive skills in classrooms with a view to improving children's outcomes. As such we have attempted to be as inclusive as possible about approaches that have been shown to make a difference, and fall within the scope of what we consider to be metacognitive strategies.

Because metacognition has such a fuzzy quality, there is no agreed typology of metacognitive strategies used in classrooms (cf. Pintrich 2002). However, most educators would include strategies that help pupils to monitor, plan, evaluate and regulate their performance whilst completing a particular task, as well as strategies that consciously help pupils solve novel problems. These could include, for example, writing frames (Myhill and Newman 2016), Mind Maps (Buzan and Buzan 2000), concept maps (Hay and Kinchin 2006) or any other taught strategies which seek to equip pupils with an increased understanding of how to learn, as opposed to an increased knowledge specific to a subject domain. The key thing is that pupils can use such strategies in a controlled, conscious way to solve novel problems.

Methods

This paper employs Systematic Literature Review (SLR) techniques suggested by Cooper (Cooper 2010) to identify relevant search terms and literature databases. ERIC, SAGE Journals Online, Taylor and Francis Online and PsycINFO have been used as the principle databases, and they were trawled between February 2017 and March 2017. Articles were limited to English language, peer-reviewed and published between 2000 and 2017. Following initial searches, further filters were added so that the search was refined to focus on schools, school-age children or teachers. Articles for inclusion in this report were selected following abstract analysis, resulting in 51 core studies. These included:

- Quantitative Studies: 29
- Qualitative Studies: 2
- Literature Reviews: 15
- Meta-analyses: 3

An additional range of relevant texts providing helpful historical and policy contexts have also been used in this paper. Several texts were excluded from this report, as they did not reach the threshold for high quality research; this was typically because the methodology was judged to be relatively weak, or there was judged to be a conflict between the size of research sample and the strength of the claims being made.

In the next section of this paper, we will place metacognition in its historical context, before discussing the policy context of metacognition in schools. We will then move onto the deeper analysis of what recent research suggests about the use of metacognition in schools.

Metacognition in Historical and Policy Contexts

The development of metacognition as a helpful way to understand learning is most widely attributed to the pioneering work of John Flavell (Flavell 1979), who built on the work of Vygotsky (Vygotsky 1978) and in particular the concept of the Zone of Proximal Development (ZPD). Following Flavell, the study of metacognition focussed on the field of psychology. This focus has since broadened to include other fields, including education. Quickly a consensus emerged that children who develop effective metacognitive skills are more likely to become successful learners than children who hold less effective metacognitive skills. In England, at least, this led to a growing interest in the use of metacognition across education. Various commercially available programmes designed to improve students' metacognitive skills were developed, such as the Cognitive Acceleration programmes originating from King's College London (Let's Think 2017), the Somerset Thinking Skills Course (Blagg 2017) and Building Learning Power (Claxton et al. 2011). Although the dates of such programmes appear relatively contemporary, they each have their roots in the 1980s or 1990s. Such commercially available programmes did not gain significant traction in schools, despite the strong evidence base underpinning them. One of

the reasons for this lack of take-up could well be that metacognition has not been a formal part of either the National Curriculum in England, nor a part of the recognised metrics used for accountability purposes. School leaders, understandably, tend to focus on things which are mandated or measured, and thus side-line other strategies which might be felt to be 'nice-to-have', rather than essential. The evidence suggests that such a view is short-sighted. As this paper demonstrates, metacognition can help to significantly improve pupil outcomes, but the pressures which school leaders face are understandable.

However, although there was no explicit requirements for schools in England to use metacognitive strategies the Labour government of the 2000s did develop a national strategy for Personal, Learning and Thinking Skills (PLTS) (QCA 2009). Recognising the value of six groups of skills for employers, this policy aimed to develop children who would become:

- Independent enquirers
- Creative thinkers
- Reflective learners
- Team workers
- Self-managers
- Effective participators

The aim was for schools to teach children to develop these skills in children aged 11-19, and it was envisaged that the PLTS policy would be integral to the ultimately doomed Diploma qualifications. Yet, the PLTS framework was side-lined by the newly elected Coalition Government from 2011, along with the Diploma qualifications; although it still exists in the field of apprenticeships, it is rare to find schools utilising PLTS (Braun, Maguire, and Ball

2010). It should not come as a surprise that the PLTS framework became associated with the apprenticeship movement when one considers the degree of overlap between this framework and the so-called 21st Century Skills referred to above, which are generally supported by industry. What is more surprising, in some ways, is the willingness of the government to side-line this framework when it so clearly supports schools to help prepare young people for the world of work. There is a possibility that a version of this framework could be revitalised with the recently announced Technical Level initiative (Boles 2016), which we will discuss later in this paper, but the government is surprisingly quiet about metacognition.

The government's lack of engagement with metacognition is all the more surprising when one considers the willingness of the English government to adopt policies and practices from countries and jurisdictions that traditionally do well in the PISA tests. Programmes such as Shanghai Maths, for example, have been heavily promoted by ministers (Gibb 2016). Something that receives less attention, however, is the extent to which high performing school systems, including Shanghai, Hong Kong and Finland teach metacognitive skills across their schools (Retna 2016, Cheng and Wan 2017, Yeung 2015, Vainikainen, Hautamaki, et al. 2015, Vainikainen, Wustenberg, et al. 2015). Shanghai has been developing approaches to 'Design Thinking' (Retna 2016), which encourages students and teachers to engage with academic work using creative strategies typically associated with the design industry. Hong Kong is encouraging schools to adopt critical thinking approaches to classroom activities (Cheng and Wan 2017) as well as Higher Order Thinking skills (Yeung 2015). Finland has also put considerable effort into the development of thinking skills across the curriculum (Vainikainen, Hautamaki, et al. 2015, Vainikainen, Wüstenberg, et al. 2015). This raises interesting and important questions about the reasons for the promotion and adoption of some strategies that are used in high performing school systems over others. This

also raises linked questions about the government's reasons for adopting some strategies, which appear to be rooted in strong evidence, whilst not adopting other strategies, which appear to be rooted in equally strong evidence. We will discuss this issue later in this paper.

Other parts of the UK appear to be adopting a different approach. The Welsh Government, for example, has identified that their curriculum requires modernising, and that, "The case for fundamental change is powerful." (Donaldson 2015, p.11). There is a growing concern that the current system in Wales is not providing all children with the opportunities to become successful, 21st century adults (OECD 2014, Hopkins 2016) and that the Welsh system is unsuccessfully attempting to balance the competing pressures of preparing children for an increasingly complex society, with meeting increasingly stringent accountability measures (e.g. Ball 2013). Such concerns have led to the development of a new, evidence-based curriculum for Wales, intended for full implementation over the coming years (Welsh Assembly 2015).

Having established the historical and policy contexts of metacognition in schools, we now turn our attention to reviewing what the literature says about the effectiveness of teaching metacognition in schools.

In the following section of this paper we explore what the literature suggests about the effects of teaching metacognition on pupil's outcomes, where outcomes primarily refers to academic progress data. Strong evidence, derived from rigorous primary research, indicates that having metacognitive knowledge coupled with the ability to use metacognitive skills is a very effective way of predicting successful learning (Stel and Veenman 2008b, Lai 2011, Zumbrunn, Tadlock, and Roberts 2011, Chang et al. 2012, Ellis, Bond, and Denton 2012).

Although some contest the role of metacognition (e.g. Kozulin 2011), a growing range of research indicates that metacognition is central to improving learning outcomes across age ranges and across school subjects (EEF 2016a, Hattie 2016, Baas et al. 2015, Dignath, Buettner, and Langfeldt 2008b, Donker et al. 2014, Perry, Albeg, and Tung 2012).

We begin by discussing three of the most well-known projects which have attempted to synthesise the findings of various primary research programmes (Dignath, Buettner, and Langfeldt 2008a, EEF 2016a, Hattie 2016). Much of the discussion revolves around the different effect sizes which different sets of authors identify for different strategies. We will then move on to examine single studies to understand what they suggest about the effects of teaching metacognition in schools. Broader attitudinal effects, such as wellbeing and motivation are explored later in this paper.

Metacognition and Pupil Outcomes

In the UK the Sutton Trust-Education Endowment Foundation Teaching and Learning Toolkit (EEF 2016a) is becoming an influential resource for practitioners and policy makers (DfE 2016a). Most of their evidence is taken from quantitative studies, **which allows the EEF to calculate effect sizes; however, this does exclude qualitative studies as well as introducing potential research biases (EEF 2015, Katsipataki and Higgins 2016), and raising the issue of the role of Randomized Control Trials in education research. The EEF strongly favours the use of RCTs in its funded research, and this methodology has gained significant traction in the minds of policy makers.. However, there is significant concern about the extent to which RCTs can explain the direct causes of effects and thus improve student outcomes in predictable ways which are replicable across multiple contexts (Biesta 2010, Thomas 2016). Such concerns raise multiple issues, both for the**

current paper and the ways in which educational policy in England is influenced. Regarding the first issue, we have deliberately chosen not to rely on studies that are dependent on RCTs. Rather, as described above, we have reviewed as much of the international literature as possible, including qualitative studies, so that we could include 'everything we've got.' (Thomas 2016, p. 406). We will return to the second issue later in this paper.

Taking such caveats into account, the Sutton Trust-EEF Toolkit indicates that metacognition is a relatively highly effective and efficient approach for improving pupil outcomes, with a mean effect size of .62 (EEF 2016b), typically adding approximately eight month's progress. The 'Toolkit' succinctly displays three elements for each strand; these are the cost, the strength of available evidence and the impact. Taking these three elements into account it becomes clear that metacognition is amongst the very best performing strands of the EEF's Teaching and Learning Toolkit. Metacognition is identified as very low cost, with very strong supporting evidence and an impact equivalent to adding eight month's progress.

The work of the EEF draws upon several studies, including Dignath et al.'s (Dignath, Buettner, and Langfeldt 2008b) rigorous meta-analysis of research carried out with primary school pupils. Through their research, they identified three concepts with an average effect size of .69 for those pupils who had been trained in metacognitive strategies:

- Academic performance .62
- Cognitive and metacognitive strategy use .73
- Motivational aspects .76

This indicates that the effect sizes are relatively high, although the authors suggest that effects on academic performance in specific subjects are more difficult to predict, with the clearest signs of a positive impact of metacognition found in mathematics education (Dignath, Buettner, and Langfeldt 2008b, p. 118); this view is shared by more recent research (Sahin and Kendir 2013). When academics turn their attention to the teaching of science, similar outcomes are observed (Zohar and Barzilai 2013), leading some to the conclusion that metacognition is most effective when used with mathematics or science. However, when research is conducted to specifically explore the cross-curricular impact of metacognition (Perry, Albeg, and Tung 2012, Mannion and Mercer 2016) the data suggests that metacognition has a much wider applicability. Indeed, it is fair to say that the evidence suggests that teaching and learning metacognitive skills and knowledge can add value across the whole curriculum. Wherever metacognitive skills are taught in lessons, there appears to be improvements in pupil outcomes, irrespective of which subjects are being taught.

John Hattie's Visible Learning (Hattie 2016) project is perhaps the most ambitious, and well-known, meta-analysis of research studies attempting to quantify how much difference specific strategies make in the classroom. His most recent work indicates that metacognitive strategies have an effect size of 0.53, which is broadly in line with both the EEF and Dignath et al. However, he also indicates that other strategies which can be broadly considered to be in line with metacognitive methodologies also have significantly positive effect sizes, such as 'Self-Questioning' (0.64 effect size) and 'Problem solving' (0.63 effect size). The Visible Learning project also examines research about different forms of assessment which link with metacognition, as will be discussed below.

The positive effects of teaching pupils metacognitive strategies are echoed by other classroom-based studies in differing contexts (e.g. Veenman, Hout-Wolters, and Afflerbach 2006, Stel and Veenman 2008a, Baas et al. 2015, Mannion and Mercer 2016). One of the most prolific academic to study metacognition is Marcel Veenman who has extensively studies the relationship between metacognition and intelligence. Over a period of nearly twenty years, Veenman and his colleagues have studied children and young people in a variety of contexts from primary schools to universities. Using sophisticated quasi-experimental techniques, rooted in quantitative methods, Veenman is able to make a number of strong claims about metacognition. A central claim is that metacognition can be successfully taught from primary school level to university level (Veenman and Beishuizen 2004, Veenman and Spaans 2005, Veenman, Hout-Wolters, and Afflerbach 2006, Stel and Veenman 2008a, 2010). Another claim is that in order to maximise the impact of the teaching, several conditions need to exist. Firstly, metacognition should be embedded across the curriculum, rather than taught in discrete 'metacognition lessons'; secondly, the purpose of the learning, including the metacognitive element should be clearly explained to the pupils; and thirdly, the learning should be extended over a long period of time (Veenman and Beishuizen 2004, p. 635). They also conclude that metacognition is a strong predictor of academic performance, implying that there is a strong relationship between the two (Veenman, Wilhelm, and Beishuizen 2004). This view is reinforced by Hattie (Hattie 2013), who suggests that pupils are very clear about their own academic performance when taught appropriate skills of metacognition.

Another key element of successfully teaching metacognition is the successful utilisation of group work in schools. This makes sense, as many elements of metacognition involve social-cognitive theories (Dignath, Buettner, and Langfeldt 2008b, Mannion and

Mercer 2016). This has implications for classroom practice, as Dignath et al. note; to work successfully in groups, children must first learn how to work successfully in groups. This, in turn, has implications for Initial Teacher Education programmes as well as Continuing Professional Development programmes in schools. Dignath et al. suggest that this might be a particular issue for primary school teachers (Dignath, Buettner, and Langfeldt 2008b, p. 121). Yet when this is successful, the effect size of small group work can be significant (Hattie 2016) at 0.47.

Turning our attention to assessment, Baas et al. (Baas et al. 2015), explicitly studied the relationship between metacognition and Assessment for Learning (AfL) (Wiliam 2011), with AfL typically meaning that teachers are using a combination of the following strategies:

- clarifying and understanding learning intentions and criteria for success
- engineering effective classroom discussions, questions and tasks that elicit evidence of learning
- providing feedback that moves learners forward
- activating students as instructional resources for each other, and
- activating students as owners of their own learning

(Wiliam 2006)

Baas et al. found that the effective use of metacognitive strategies both supported and developed the effectiveness of AfL strategies, thus accelerating learning in a virtuous spiral. It would appear that when pupils are taught how to learn, through metacognition, in conjunction with accurate formative assessment, through AfL, the potential for academic success is high. Baas et al. found the following effect sizes,

Monitoring & task orientation	.25
Monitoring & planning	.26
Scaffolding & surface learning strategies	.25
Scaffolding & deep level learning strategies	.32
Scaffolding & process evaluation	.36

This is reinforced by Hattie (Hattie 2016). Although AfL is not treated by Hattie as a discrete strategy, many of the strategies which his project studied are in line with the principles of AfL, and many of these have significantly positive effect sizes. These include questioning (0.48), self-questioning (0.64), providing formative evaluation (0.68), feedback, (0.73) and reciprocal teaching (0.74). The Teaching and Learning Toolkit (EEF 2016a) reports similar impacts for some strategies, such as Feedback and Peer tutoring. It should be noted that there is research which suggests that the effect of feedback, for example, is more highly thought of by teachers than by students (Havnes et al. 2012), but the majority of evidence very strongly indicates that AfL is central to effective learning and teaching.

Thus, following a review of available research it is fair to suggest that teaching metacognitive knowledge and skills has a positive impact on pupils' outcomes, at least in terms of academic progress and attainment. Having illustrated that metacognition has a positive effect on pupil outcomes at the school level, we now turn our attention to pupil-group level.

To date there is little research examining the relationship between metacognition and specific groups of children. Most of the research has focused on the effects of the learning

programmes themselves, and has not examined the details of any differences between learners from different groups. There is limited, but strong, research (Pat-El, Tillema, and Koppen 2012) suggesting that metacognitive strategies are effective across different ethnic groups. In their study of first and second-generation immigrant children in the Dutch education system, the authors found that there was little difference between the ways in which children from minority ethnic groups and indigenous children valued teaching strategies, specifically feedback and scaffolding techniques. There is also emerging evidence that metacognitive strategies are effective for pupils with challenging behaviours in mainstream schools (Burgess 2012). Perhaps this should not be surprising, as most strategies which give children increased self-regulation will help them to become more successful learners.

The evidence regarding the impact of using metacognitive strategies with children from different socio-economic groups is also limited. It is widely accepted that socio-economic status (SES) is a major influence on a child's academic performance. Hattie, for example, attributes SES with an effect size of 0.54 (Hattie 2016), while 'Home environment' has an effect size of 0.52 and 'parental involvement' has an effect size of 0.49. One of the few studies to explicitly focus on the effect of metacognitive skills on children from low SES groups, Mannion and Mercer's (Mannion and Mercer 2016) work explores the effects of a 'learning to learn' curriculum in one English secondary school. Using a range of assessment measures, including Cognitive Ability Tests (CATs) score, this study concluded that the strategic employment of a whole school curriculum rooted in metacognition improved outcomes for all students, which is in line with other research. However, this study is significant because it provides relatively strong evidence that teaching metacognition skills not only narrows the attainment gap between Pupil Premium students and non-Pupil

Premium students, but actually reverses the gap (Mannion and Mercer 2016, p. 263). It should be noted that this is a relatively small study, focusing on a single, small secondary school and that further research is required to assess the generalizability of this result. However, the evidence is both strong and compelling.

There is also some research which indicates a positive relationship between pupils feeling good and achieving well at school (Maclellan 2014), as well as research indicating a strong correlation between pupils' sense of confidence and their outcomes (Stankov, Morony, and Lee 2014). These projects suggest that pupils' confidence can be increased by the successful, autonomous use of metacognitive strategies, which is perhaps unsurprising. Some of the research previously referred to in this paper examine motivational aspects of metacognition, such as Dignath et al., (Dignath, Buettner, and Langfeldt 2008b) who suggest that motivational aspects of pupils' experiences at school have an effect size of 0.76 which is highly significant. There is also sophisticated research demonstrating a strong link between pupils' abilities to overcome challenges and their wellbeing (Waaler et al. 2013). The most well-established research concerns the relationship between metacognition and motivation (see Karaali 2015, for a useful review of the literature), which generally suggests that there is a symbiotic link between the two: greater motivation leads to improved metacognition, which leads to greater motivation, and so on.

However, a note of caution should be sounded here as little of this research has been carried out in classrooms, with most of the research being laboratory based. Given the positive link between motivation, metacognition and attitudes which has been established in experimental studies, it makes sense that the relationship between these three elements would be fruitful research topics.

Limitations of this study

Thus far, we have presented what current research suggests about the effects of teaching metacognition in schools. It is clear that the majority of studies indicate that teaching metacognition in schools has a positive impact on pupil outcomes and pupil wellbeing. There is a smaller evidence base about the relative effects of teaching metacognition with particular groups of students, but where there is evidence, this also indicates a positive relationship between teaching metacognition and pupil outcomes.

It should be noted that there are several potential limitations to this review of the literature around the use of metacognition in schools. One of the biggest challenges for those involved with metacognition in classrooms is how to measure it. While there are numerous tools which can be used, including IT systems, (Nunes, Nunes, and David 2003), questionnaires (Dignath, Buettner, and Langfeldt 2008b), and inventories (Schraw and Dennison 1994, DeLuca and Lari 2013, Ozturk 2017) these all "entail limitations" (Baas et al. 2015, p. 43). The main problem is that most tools rely on self-reporting; self-reporting is not necessarily the most reliable strategy to use with adults, let alone children in classrooms. This raises many issues, not the least of which is that it is very difficult to measure metacognition in action (Georghiades 2004). This has led some to suggest that,

> Presently, it is still impossible to establish causal relations between metacognitive instruction, (changes in) metacognitive knowledge and skills, and learning outcomes.
>
> (Muijs, Kyriakides, Werf, et al. 2014, p. 240)

and that “the need for [reliable] tools to measure metacognition continues.” (Akturk and Sahin 2011, p. 3735).

Yet this paper has discussed many articles in terms of ‘suggesting’ relative strengths of data and conclusions, rather than describing absolute causalities. It is not being claimed that the use of metacognitive strategies will always lead to improved outcomes and attitudes for all pupils in all schools. What we are suggesting is that there are numerous studies presenting evidence, which we find convincing, that when metacognitive strategies are carefully used in classrooms, then most pupils will be able to improve their academic performance; this, in turn, makes most pupils feel better and be more motivated in the future.

What is also being suggested is that a priority for future research should be the development of rigorous, effective evaluation tools which can be used by teachers in classrooms to measure the impact of metacognitive strategies. At least two types of research tool should be developed: one which can measure metacognition in action; and one which can measure the longer term impact of metacognition.

Implications for school curricula, school leadership and Initial Teacher Education

This paper has demonstrated that there is wide agreement that metacognition has great potential to equip children to become successful learners. Metacognition is an inherently human characteristic, which allows people to solve novel problems in different contexts and is of particular usefulness in classrooms. It appears that teaching any subject can benefit from the use of metacognitive strategies, and it also appears that such potential exists across all age ranges. This begs several important questions about school curricula, school leadership and Initial Teacher Education.

School curricula are becoming increasingly focused on ensuring the progress of pupils is maximised in ways which align with school accountability measures, such as Progress 8 in England for example, and it appears that teaching is becoming increasingly content-centred. Thus, although there is very strong evidence that metacognition is related to better than expected pupil performance, the Teachers' Standards (DfE 2011) which operate in England do not explicitly mention metacognition or any related aspect. Such a situation appears to put the government in an awkward position. On one hand they call for an 'evidence-informed' profession (DfE 2016a), and recent guidance for Continuing Professional Development (DfE 2016b) states that CPD should be rooted in robust evidence. There is also a movement led by the Secretary of State for Education to strengthen Qualified Teacher Status (QTS) and to ensure that enhanced professional development acts as a 'golden thread' through every teachers' career (Greening 2017b). In her vision for the profession, Justine Greening stresses that teachers should be "constantly seeking to improve teaching methods, use evidence, to look at research and stay ahead of the curve." (ibid.). Yet, on the other hand, it would appear that only particular types of evidence are championed and actively encouraged. While the government has been keen to promote the 'Shanghai Maths' approach, for example, it should also be remembered that high performing school systems, including Hong Kong, Shanghai, Singapore and Finland, all include metacognition in their school curricula. **There is also a clear favouring of strategies such as Randomized Control Trials (RCT) in education research, as discussed above. Yet it has been shown many times that such approaches are not appropriate for research into education; such a positivist approach maybe attractive to politicians seeking votes and value for money, but education is intensely influenced by contexts.** Thus, despite the clear and convincing evidence about the potential of metacognition and self-regulation to help improve pupil outcomes, and the fact that such

strategies are integral to high performing school systems, they are currently absent from the English government's priorities for education.

There may be space for metacognition to be introduced into school curricula, if the proposed 'T-Levels' gain significant traction. Initially suggested by Lord Sainsbury (Boles 2016) the Technical Levels are intended to become vocational equivalents of A levels, which will have credibility with employers. Supported by Justine Greening (Greening 2017a), this could be an opportunity for metacognition to be developed in the post-16 curriculum at least, perhaps alongside other 21st century skills discussed above. This would not address the teaching and learning of metacognition in Key Stage 1, 2, 3 or 4, but it might be a start.

Perhaps, though, rather than leave it to policy makers to dictate what constitutes an appropriately 21st century curriculum, teachers and school leaders should be the ones to take up the challenge of implementing 'evidence-informed' practice and developing effective approaches to teaching metacognition across their classrooms. In terms of school leadership, it is now widely agreed that leadership has a significant impact on pupil outcomes. Leithwood et al identify that "School leadership is second only to classroom teaching as an influence on pupil learning."(Leithwood, Harris, and Hopkins 2008, p.27). This corroborates Hallinger and Heck's cautious but firm conclusion that headteachers "exercise a measurable, though indirect effect on school effectiveness and student achievement." (Hallinger and Heck 1998, p. 186). Regarding the roles of different leaders in schools, Day et al (Day et al. 2009) assert the primacy of headteachers. Leithwood and Jantzi (Leithwood and Jantzi 2005) use a meta-analytical strategy in an attempt to isolate the impact of such leadership on children's outcomes and conclude that the available evidence strongly suggests a positive link between leadership and children's outcomes; a commonly quoted figure is that the headteacher

typically accounts for between 5-7% of student learning (Leithwood, Harris, and Hopkins 2008, Braun, Gable, and Kite 2011). This theme is taken up and supported by the Organisation for Economic Cooperation and Development (OECD 2013) and McKinsey (McKinsey 2007), who both emphasise the significance of school leaders for improving student outcomes across the world. Some education systems, such as the evolving Welsh system, recognise the value of promoting metacognition in schools through leadership. The Welsh Leadership Standards (Wales 2016), state that a successful school leader, "Promotes and puts in place policies designed to enable learners to develop independence and to acquire thinking and learning skills.". Headteachers in Wales need to demonstrate that they do this in their schools; there is no such equivalent in England and metacognition is absent from the Teachers' Standards (DfE 2011), as noted above.

In the context of Initial Teacher Education, while it is obviously important to ensure that beginning teachers have excellent subject knowledge, excellent behaviour management techniques and the like, it is also vitally important that they understand the centrality of metacognition. In fact there is little evidence about beginning teachers' knowledge about metacognition (Zohar and Barzilai 2013). There is some research examining the effect of beginning teachers' own sense of metacognition (Ozturk 2017); this suggests that where they have a relatively low sense of metacognition they are less likely to incorporate such strategies into their lessons, even when they have had detailed CPD about metacognition in the classroom, which is unsurprising. There is also strong, emerging evidence about the significance of teachers explicitly role modelling metacognition (Wall and Hall 2016) and how this can have a significantly positive impact on pupil learning. This should not come as a surprise, either, drawing as it does on the long tradition of scaffolding (Holton and Clarke

2006) and other socio-cognitive and socio-cultural (Bruner 1990) approaches to education, but it has perhaps been moved into the background of ITE and CPD.

Conclusion and Recommendations

In this paper we have explored what the international literature suggests about the effects of teaching metacognition in schools. To do this we have also sought to answer four sub-questions:

> **Question 1**: What does the international literature suggests about the effectiveness of metacognition on pupil outcomes classrooms?
>
> **Question 2**: What does the literature say about the relationship between metacognition and particular groups of pupils?
>
> **Question 3**: What does the literature say about the relationship between metacognition and pupil wellbeing?
>
> **Question 4**: What are the implications of what the international literature says about these questions for educational policy?

This review of the international literature indicates that there is a very positive relationship between teaching metacognition in schools and pupil outcomes, with a mean effect size of 0.65. This is a very significant effect size and is broadly consistent across all of the studies found through this systematic review of the literature. Some evidence indicates that teaching metacognition is very helpful for pupils from ethnic minorities, as well as for pupils who present challenging behaviours. There is limited, emerging, evidence indicating that pupils from low socio-economic groups can match, or even exceed, the academic performance of their peers from higher socio-economic groups when taught metacognitive strategies. There

is limited evidence exploring the relationship between metacognition and pupil wellbeing, but there is substantial evidence that metacognition and motivation are intrinsically linked; thus it is reasonable to assume that success with metacognition will improve pupils' wellbeing and sense of agency.

The case of metacognition does raise interesting questions about the English government's attitude towards adopting 'evidence-informed practice'. Why, for example, has one pedagogical approach used in high-achieving school systems, such as 'Shanghai Maths', been encouraged by the government, while metacognition, which is also used across high performing school systems, is not encouraged by the English government? **There are also serious concerns about the reliance of Randomized Control Trials to inform education policy, which can result in a misleadingly 'positivist' interpretation of data and, thus, poorly informed policy and practice.**

Taking into account all of the evidence discussed above, then, it appears that there are potentially significant positive effects of schools developing the use of metacognition in a systematic way across the curriculum. It is apparent that pupils are more successful when a cross-curricular approach towards metacognition is taken across a school or a school system. Such an approach has implications for teacher CPD, the preparation and practice of school leaders and for Initial Teacher Education.

The next steps should include:

- The development of a whole school curriculum for metacognition, including the new T-levels

- The development of metacognitive awareness for school leaders
- The development of metacognition across ITE curricula, ITE institutions and early career developments
- The development of a 'policy adoption' framework to help identify how a policy can be successful in a new context

There also needs to be greater research and development of tools which can be used to measure the impact of metacognition in classrooms. In fact, this should be a priority, as such a tool, which could be used with ease and clarity by teachers, would allow teachers to take ownership of the concept of metacognition and develop it further in their own contexts in a **fully professional manner**. Currently, the vast majority of interest in metacognitive approaches is located with academics. This means that the impact of metacognition in the classroom will be limited; it will only expand when teachers are 'fluent' with metacognition, fully understand the benefits through their own experiences, and then have the autonomy and support to develop their own professional practice.

The available evidence strongly suggests that metacognitive approaches to teaching and learning have the potential to radically improve the outcomes and life chances of children, with some evidence suggesting that this is especially the case for disadvantaged children. Such knowledge then places a moral responsibility on policy makers to ensure that schools, school leaders and all those who support them to rapidly develop and implement practical strategies which can deliver, measure and improve metacognitive skills across all schools for all children.

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