A dual step transfer model: Sport and non-sport extracurricular activities and the enhancement of academic achievement

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Abstract

This paper explores the influence that school sport and non-sport extracurricular activities (ssEC and nsEC) can have on academic achievement. A central thesis of this paper is that, despite the literature on the perceived and presumed benefits of school sport and of non-sport activities, theorising a model of the process by which the benefit is attained, which we conceptualise as a case of transfer, has been neglected. Cognisant of the long-standing literature on transfer and the recent resurgence in transfer research, we present a dual step transfer hypothesis by which ssEC and nsEC activities confer academic achievement benefits. Key to this dual step transfer hypothesis is the influence these activities have on non-cognitive skills, whereby the activity promotes non-cognitive skills (i.e. motivational-social skills), which in turn promotes learning and academic achievement. We present an overview of transfer from the early discussions framing transfer to either mental muscle or identical elements mechanisms, to more recent discussions and new perspectives on what counts as transfer. To this discussion we compare research linking academic achievement to school physical education, school sport, and school non-sport activities. We place particular emphasis on extracurricular activities and the potential influence they can have on non-cognitive characteristics. In making our argument we weigh up the relative support for dual step transfer within extant literature on both areas, and in doing so return to take a position on the long-standing and divergent framing of transfer in terms of either mental muscle or identical elements mechanisms.

Keywords:

Academic achievement; dual step transfer; extracurricular; sport and non-sport activities..

Introduction

The presumed benefits of physical education, school sport and non-sport extracurricular activities

The presumed benefits of sport and non-sport extracurricular (ssEC and nsEC) activities during school years has been a long-standing assumption justifying schools' focus on these as part of its educational vision and mission. School children learn about a range of core academic subjects that form the basis of the school curriculum. These core academic subjects are often supported by a curricular Physical Education (PE) programme and an EC programme of both sport- and non-sport activities, to develop and promote a "whole child" education (Danish et al., 2005). These programmes are often used by schools to promote their qualities to prospective parents and students. There is a widespread belief of the importance of a healthy mind in a healthy body, and Physical Education and School Sport (PESS) are thought necessary for this (for discussion see Bailey, et al., 2009; Bailey et al., 2013). More school PE is generally assumed to mean more physical activity (PA) leading to better health. However, academic performance is usually the most important indicator used in comparing schools, with EC programmes considered as nice 'icing on the cake'. The potential for school sport to benefit the individual is discussed anecdotally from an independent school perspective in a recent edited volume (Tozer, 2012). In the 1980s, the general attitude towards sport even at some of the most prestigious independent schools in Britain was one of indifference, the amount of time spent on games already often felt to be disproportionate to the accrued benefits (Uttley, 2012). This view from the 1980s even resonates today. However, research over the last fifteen years in Positive Youth Development (PYD) has, we think, created a new context for considering the benefits of a range of in and out of school activities on youth development (Damon, 2004; Lerner, et al., 2005; Lerrner et al., 2012; Lerner et al., 2013; Masten, 2014; Inoue et al., 2015; Lerner et al., 2015). Nevertheless, observations by several heads of PE recognise and lament the fact that school examination results are still the main criterion for judging the success of academic departments and this increases the pressure to squeeze the time allocated to PE. As such, schools may reduce or even abolish PE and EC activities during the high-stakes school leaving examination years, when time for teaching and learning of cognitive subjects can take precedent. Having to justify the need for an effective PE and Sports programme can be interpreted as inherently asking

if it deserves a place alongside the core academic subjects. After all, one rarely argues for the need of effective Mathematics or English provision at schools.

This paper examines the presumed benefits of school sport (ssEC) and non-sport ExtraCurricular (nsEC) activities, on academic achievement. In broadening the activity focus to include nsEC activity the paper focuses on academic achievement, though still recognising the presumed benefits to health and overall well-being. A central thesis of this paper is that, despite the extensive literature on the perceived and presumed benefits of school PE, school sport and the influence of non-sport activities, theorising a model of the process by which the benefit is attained, has until recently been neglected. But do sport and non-sport EC activities at school benefit academic achievement? Will the development and promotion of a wide and varied EC programme benefit or hinder academic achievement? The wisdom of the ages encapsulated in the concept of *mens sana in corpore sano* (healthy mind in a healthy body) has received considerable attention in the research literature, and assumes a causal relationship leading from the healthy body to the healthy mind. Significantly, sport and non-sport EC activities have been shown to provide low to moderate benefit to academic results in terms of effect size (Camp, 1990; Shephard, 1997; Sallis, et al., 1999; Schellenburg, 2004; Schellenburg, 2006; Wetter et al., 2009; Bradley et al., 2013). However despite the proliferation of studies, until recently little conceptualisation existed over how this benefit may be caused and the actual benefits of participating in school sport and non-sport extracurricular activities (Shulruf, 2010). Results can also be conflicting (as discussed in Bailey, et al., 2009), suggesting further research is necessary to define the precise relationship between these activities and cognitive behaviour.

A recent discussion of the benefits of physical activity on the individual suggested the Human Capital Model (HCM) as a framework for these benefits (Bailey et al., 2013). Bailey's argument treated physical activity as a human 'investment' capable of delivering valuable returns on a number of levels. In the current paper, we broaden the focus to include non-sport extracurricular activities alongside physical activity and propose a new transfer-based framework to account for the benefits on school academic achievement. Building on the widening lens of what counts as transfer, we explore the potential non-cognitive benefits of ssEC and nsEC

activities. Specific personality traits and non-cognitive characteristics have been observed to be associated both with athletes of individual and team sports (Nia & Besharat, 2010), and with students of music training (Costa-Giomi, 2004). Similarly, a number of studies have associated personality and non-cognitive capacities with academic achievement (Bratko et al., 2006; Laidra et al., 2007; O'Connor & Paunonen, 2007; Smrtnik-Vitulic & Zupancic, 2011). These non-cognitive capacities are proposed as the link between the ssEC or nsEC activity and Academic Achievement. The impact on the non-cognitive characteristic from the initial activity, then subsequent influence upon the objective or target (in this case academic achievement) is what we propose as dual step transfer (Figure 1).

This paper aims to further focus upon and theorise the relationship between ssEC and nsEC activities and the assumed benefit to academic outcomes. We present an overview of the long-standing literature on transfer, key ideas in the transfer literature pertinent to our focus, and finally a discussion of ssEC and nsEC activities, academic achievement and transfer. In doing so, we present our argument as follows. We problematize claims about the perceived benefits of sport and non-sport extracurricular activities on academic achievement as there is, in our view, a missing transfer argument. Transfer of life skills attributes from youth sport has often been discussed in the positive youth development literature (for example: Danish et al., 2005; Holt, 2008). However we aim to expand this argument in examining the benefits of both a sporting and non-sporting context on academic outcomes. We present a case for a dual step transfer situation, taking evidence to support our argument from two sources (sport & non-sport activities) as a means of illustrating the proposed dual step transfer effect. Our evidence came from a literature search for studies investigating the influence of ssEC and nsEC activities on academic achievement. For ssEC activities, there are several excellent reviews of PESS and academic achievement collating the research in this area (for example: Shephard, 1997; Taras, 2005; Bailey, 2006; Trudeau & Shephard, 2008; Bailey et al., 2009; Bailey et al., 2013). We compared studies listed and cross-referenced from these reviews looking at PESS and academic achievement, focussing on those studies that recorded participation in EC school sport or presence on a school team, rather than PE per se. For nsEC activities, we searched the JSTOR database (http://www.jstor.org/; Institute subscription) for studies focussing on school academic achievement and

non-sport extracurricular activities such as music, performing arts, and prosocial activities. We supplemented this by cross-referencing to publications not listed in the JSTOR results but cited by authors from the initial literature search. The inclusion criteria for the studies listed in Tables 1 and 2 were that studies included some indicator of school academic performance, and that results were presented as an experimental and a comparison group in a form that allowed calculation of effect sizes. We calculated effect size values (Cohen's *d*) for suitable studies investigating both sport and non-sport EC activities for ease of comparison, according to Thalheimer and Cook (2002). This study was not designed to be an exhaustive literature search of the field, but a search of the key papers to allow discussion of our argument. In making our argument we weigh up the relative support for the dual step transfer within extant literature on both areas, and in doing so return to take a position on the long-standing and divergent framing of transfer in terms of either mental muscle or identical elements mechanisms.

Theoretical framework: The missing transfer explanation

We revisit the concept of transfer to investigate the relationship between ssEC and nsEC activities and academic benefit, and present a number of possible ways of considering this transfer relationship. Why has there been a resurgence of interest in transfer? First, as education becomes increasingly important in today's knowledge society, the presumed benefits of schooling are inescapably framed in terms of transfer, especially in priority areas such as STEM education (Conway & Sloane, 2005). As Engle (2012, p. 347) noted "The success of the educational enterprise requires that students are able to transfer what they have learned to future classes as well as to their professional, personal, and civic lives" (p. 347). Engle argues that, given recent research on learning and cognition, our understanding of what counts as transfer has extended beyond traditional conceptions centered on complete and immediate transfer of procedures and abstract principles. Summarising recent and current research Engle notes that transfer research is now also attending to representations (Novick & Hmelo, 1994; Barnett & Ceci, 2002), perceptually-grounded principles (Goldstone & Wilensky, 2008), learning strategies (Engle et al., 2011), dispositions (Bereiter, 1995), embodied episodic feelings (Nemirovsky, 2011), discourse practices (Engle, 2006), identity

positionings (Greeno, 2006), and other forms of organized activity (Greeno et al., 1993; Lave, 1984). Significantly in the case of our focus, the wider framing of transfer, in our view, provides a means of conceptualizing the assumed benefits of ssEC and nsEC activities on academic outcomes. In particular, contemporary transfer research on identity positionings, learning strategies and dispositions, for example, widens the lens through which we might frame our focus on transfer (Beach, 1999; Engle et al., 2012; Billett, 2013).

When Thorndike and Woodworth (1901) undertook their now classic and widely influential studies on transfer they were doing so in response to the then generally held belief that, for example, Latin functioned in transfer terms as a form of 'mental muscle' or 'general skill'. That is, the idea that Latin acted as a 'formal discipline' that prepared, sensitised and exercised the mind leading to mental agility and readiness that extended well beyond the acquisition of advanced Latin. However, questioning the then dominant 'formal discipline' thesis, Thorndike and colleagues studied and advanced a different thesis, the theory of identical elements, whereby transfer was seen to operate in a much more proximal manner, contingent on the match or high level of similarity between elements in the initial learning and subsequent transfer settings. Since the early part of the last century interest in transfer has waxed and waned but the general ('formal discipline') versus specific ('identical elements') transfer arguments have remained. Indeed the general transfer or mental muscle argument underlies, in our view, widely held contemporary positions about the perceived benefits of ssEC and nsEC activities that are presumed to function in transfer terms by providing a general readiness for learning. However, while contemporary research on transfer, as we noted above (see Engle et al., 2011), has focused on a range of ways in which transfer one hundred years on from Thorndike and Woodworth (1901) can be seen to be closer to his identical elements than the formal discipline position, there is recent evidence suggesting that non-cognitive variables and the general transfer theory still have a significant role in effective transfer (Blume et al., 2010; Gutman & Schoon, 2013). In this paper, we draw on contemporary studies of transfer (e.g. Barnett & Ceci, 2002) to advance our understanding of how ssEC and nsEC activities might function in terms of their role and contribution in education and schooling. For example, Barnett and Ceci's (2002) widely influential synthesis paper frames transfer in terms of a range of

content and contexts. They delineate content in three domains: learned skill (procedure, representation or principle/heuristic), performance change (speed, accuracy or approach) and memory demands (execute only, recognise and execute and recall, recognise and execute). They specify six contexts: knowledge domain, physical context, temporal context, functional context, social context, and modality. Two points are noteworthy here. First, Engle et al. (2011) identified the current focus on emotions and embodiment in transfer research, reflecting wider focus on affect and emotions on psychology over the last decade, as pointing to a neglected aspect in transfer research – a function of the instrumental cognitive bias in transfer. Second, Barnett and Ceci note that there has been a lack of clarity around near and far transfer since early 20th century research on transfer began. The problematic nature of the near-far distinction raises in our view the need to examine pathways of content and context more clearly.

Our dual step transfer hypothesis (Figure 1) links the observed personalities and non-cognitive traits of athletes and musicians with those of academic achievement. These personalities and non-cognitive traits are perhaps closer to the mental muscle, general transfer theory as they lack the high level of similarity between content that is the basis of the identical elements theory of transfer. However, there is potential for some confusion here between personality characteristics and non-cognitive capacities. In their study investigating music training and cognition, Corrigall et al. (2013) characterised conscientiousness and openness-to-experience as personality characteristics. Personality can sometimes be seen as fixed, non-malleable characteristics, but some personality traits can also be considered as non-cognitive malleable capacities, such as those identified by Gutman and Schoon (2013): self-perception, motivation, perseverance, self-control, meta-cognition, social competencies, resilience and coping, and creativity. Their definition of 'non-cognitive' draws on a widely influential research tradition (e.g. (Heckman et al., 2006; Cunha & Heckman, 2008) that built upon Bowles & Gintis (1976) original use of the term to analyse factors other than those measured by cognitive test scores. For the purposes of this paper, rather than framing transfer in terms of trait-like personality characteristics typically seen as fixed and non-malleable, we focus on "cognitive"/"non-cognitive" capacities and consider these as malleable. As such, our use of 'non-cognitive skills' aligns with that of Gutman and Schoon (2013). For the remainder of this paper we use the term non-

cognitive skills while recognising the importance of being clear about what they encompass (i.e. motivational-social skills) and not only what they are not.

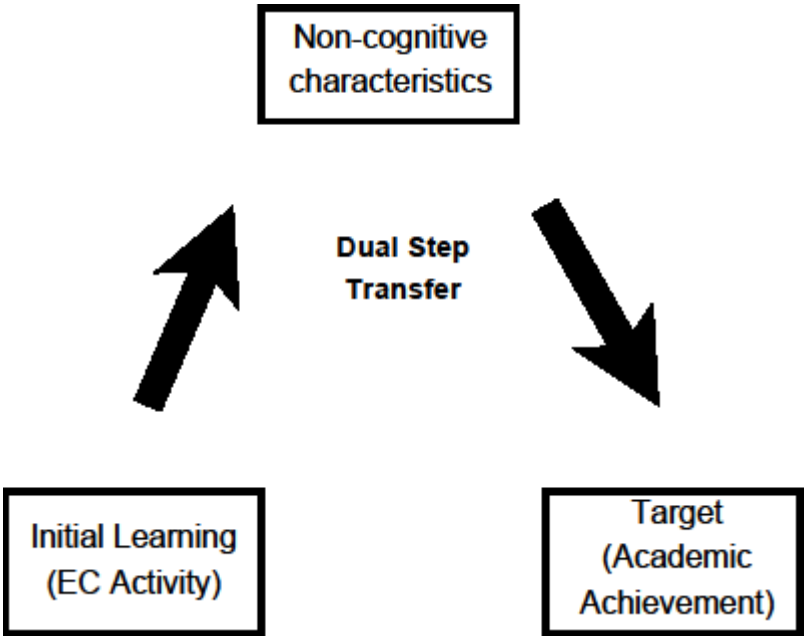

Figure 1. The Dual Step Transfer model.

Evidence for dual step transfer: PE and school sport

PESS is generally viewed as beneficial to educational attainment (Bailey, et al., 2009). Studies increasing the time devoted to PESS or to school-based daily physical activity intervention programmes, with corresponding reduction in teaching time for cognitive subjects showed no adverse impact on academic achievement and often enhanced achievement despite the reduction in teaching time (Tinning & Kirk, 1991; Sallis, et al., 1999; Shephard, 1997; Coe et al., 2006; Ahamed, et al., 2007; Donnelly, et al., 2009). These publications describe studies where time for curricular, timetabled core academic subjects was replaced with curricular, timetabled PESS. This curricular focus is often a feature of research into PESS and as the abbreviation suggests, studies investigating school physical activity often group together Physical Education and School Sport. However Physical Education and School Sport are very different, in that PE is usually a timetabled, curricular activity and School Sport an EC activity. This has the potential to have a large impact on the attitude of the participants. To continue participation in EC School Sport suggests a greater level of

application and motivation to combine the EC practice alongside academic activities such as homework, particularly if there is a school representative component conferring some level of competition for team places. High-level competitive sporting activities (interscholastic and above) are generally more selective, have more formalised rules, require a greater commitment by participants and are 'more competitive' than intermural, recreational sports (Broh, 2002). Regular participation in these higher-level sports has been shown to promote being conscientious, efficient, organised and systematic (Courneya & Hellsten, 1998; Saklofske et al., 2007; Nia & Besharat, 2010). Being part of an organised school team, practising several times per week and representing the school competitively will promote self-esteem, self-concept and social capital within the student (Holland & Andre, 1987) and develop a strong level of school connectedness. These non-cognitive capacities have also been shown to strongly promote other educational benefits such as improved school attachment and low rates of involvement in risky behaviours (Eccles & Barber, 1999). The importance of non-cognitive skills on influencing positive outcomes for young people has recently been highlighted in a literature review (Gutman & Schoon, 2013). For the purposed of the current study, we have seperated Physical Education and School Sport, and considered School Sport as an extracurricular option (ssEC).

A recent investigation explored the school leaving examination results from Irish secondary school children and their relation to participation in school sport (Bradley et al., 2013). This study showed a significant academic benefit from students participating in a competitive school team alongside their leaving certificate studies, compared to students not involved in a competitive school sports team. The mean effect size from Bradley et al. (2013) looking at the influence of EC school sport on academic achievement was 0.23 (range: -0.14 to 0.91, Table 1). The majority of published studies in this area look at PESS and academic achievement with relatively few studies looking specifically at presence on a school sports team. The small number of studies looking at the influence of sports team participation on academic achievement showed an average effect size of 0.17 (range: 0.0 to 0.36; Table 1). The evidence may be further complicated by the realisation that several studies that look at PESS and academic achievement are based on secondary analysis of larger surveys. This can raise the issue of applicability as the original data was not developed with the

purpose of testing the hypothesis of the particular study (for example, the specific influence of PESS on academic performance; Shulruf, 2010). The results from these studies suggest a low-to-moderate effect. There is even some disagreement over the minimum effect size needed to be significant. An effect size of 0.4 and above is usually considered to be significant for educational research (Ferguson, 2009; Hattie, 2012), however values of 0.2 are also suggested as being of policy interest when based on measures of academic achievement (Hedges & Hedberg, 2009). For the purposes of this discussion, any effect size above 0.2 was assumed to have a potential influence on academic performance.

The type of sport practiced by the student may also have the potential to influence non-cognitive skills and academic achievement. Several studies have shown a positive association between sports, extraversion and conscientiousness (Courneya & Hellsten, 1998; Saklofske et al., 2007). Further comparison of personality traits in athletes of individual and team sports has showed athletes of individual sports scored significantly higher on conscientiousness and autonomy and athletes of team sports scored higher in agreeableness and sociotropy (Nia & Besharat, 2010). The Bradley et al. (2013) study went on to investigate the influence of the type of sport on academic achievement. They showed a much greater impact on the LC score from Rowing (categorised as an individual sport) compared to Rugby and Soccer (categorised as team sports). This correlates with research investigating the personality characteristics of school high achievers, that suggests key indicators are motivational strategies, self-regulation and self-efficacy (Hong & Aqui, 2004; Hong et al., 2009). The higher level of conscientiousness displayed by athletes of individual sports may support higher levels of motivation to learn and a greater tendency to strive for achievement resulting in a greater benefit to academic achievement.

Identifying rowing as an individual sport may appear contentious as rowing can be performed in boats with 2, 4 or 8 athletes and well as individually. However, rowing can be performed individually whereas sports such as rugby and soccer cannot. Indoor rowing on a rowing ergometer is becoming an individual sport in its own right as well as training for water-based rowing (Rowing, 2015). Rowing can be considered a distinct 'team' sport, often thought of as a group of individuals doing work, whereas team sports such as rugby or

soccer are often considered as games (Weil, 2001). Socioeconimic status (SES) has also been shown to be related to academic achievement (White, 1982; Sirin, 2005) and the effect size of SES on academic achievement shows a moderate effect of 0.52 (range: 0.32-0.66 from 5 studies; Hattie, 2012). Rowing and rugby are often thought of as sports played largely by middle class pupils. No analysis of SES was made in the study by Bradley et al. (2013), but the study was carried out in a fee-paying secondary school in Ireland, considered as a high SES school (Rock, 2010). This would suggest a degree of homogeneity amongst the pupils and reduce the relative influence of SES on academic achievement and sports choice.

Insert Table 1 about here

Evidence for dual step transfer: non-sport EC (nsEC) activities

The academic benefits observed from participation in EC school sport may be partly due to non-cognitive characteristics. However it is not only sporting EC activities that confer these capacities. Non-sport EC (nsEC) activities may be similarly effective at developing non-cognitive capacities and therefore potentially similar academic benefits. In their study of EC activities, Eccles and Barber (1999) looked at prosocial activities (church and volunteer activities), team sports, school involvement, performing arts and academic clubs in 15-16 year old students (10^{th} grade). Students of the different EC activities all showed slightly different psychological and behavioural outcomes, but all activities were shown to improve academic performance and display an elevated level of school attachment. Participation in any of the EC groups appeared to promote identity formation and enhance self-esteem, concurring with findings from Costa-Giomi (2004), who carried out a study focusing on music instruction in 9-year old students (4^{th} grade). The study found a positive effect from three years of piano instruction on self-esteem (compared to no piano instruction) and a significant benefit to music test scores. However, only a non-significant increase in math and language tests scores was observed. These findings support earlier research showing participation in EC

activities to increase indicators of positive development such as self-concept (Winnie & Walsh, 1980), and in fact participation in arts activities overall seems to have a positive impact on self-esteem (Trusty & Olivia, 1994).

Studies investigating the impact of nsEC activities and academic achievement have largely focussed on music instruction. Within this however, a variety of study designs have been adopted. A study with 3rd grade students (aged 8.5-10.1 years) investigating academic music intervention and mathematical fraction ability showed a significant improvement in maths test scores compared to students receiving regular maths instruction (Table 2; Courey et al., 2012). This study was based on using symbols to represent actual quantity, so transfer here was more likely based on the identical elements theory than the mental muscle theory. No analysis of non-cognitive factors was carried out in this study. In apparent contrast, Kvet (1985) found no significant difference between achievement test results for reading, mathematics and language from 6th grade students (aged 12 years) being excused regular classroom activities for 70-80min per week to study instrumental music. However, further analysis of this study revealed small beneficial effects, the largest being from instrumental music instruction on mathematics tests scores (effect size = 0.23, Table 2). In a study using brain imaging methods and neuropsychological assessments (Wechsler Intelligence Scale for Children, WISC-III) to investigate the impact of six months of music training on 3rd grade students (age 8.4 years), Moreno, et al. (2009) found an increase in general intelligence and in some electrophysiological brain potentials, suggesting increased efficiency of the neural networks involved in pitch/frequency processing. They concluded that short term (6 month) music training could produce similar results to longer musical training (4 years) in children.

Some studies have combined both athletics and music extracurricular participation. In an early study in this area, Snyder and Spreitzer (1977) looked at the influence of extracurricular athletic participation and serious music involvement on educational expectations and academic achievement in the school context. Both educational expectations and academic achievement showed similar trends. Participants in both extracurricular sport and music had the highest educational expectations, showing a modest effect size

(Table 2). Sport-only participation and music-only participation showing lower but similar values. As discussed earlier, Eccles and Barber (1999) looked at participation in a number of different extracurricular activities and found all to have slightly different benefits and risks but to all be beneficial to academic performance and to promote school attachment.

Some studies started to investigate the non-cognitive, emotional aspects of EC activity influence and a possible transfer effect. To investigate the influence of music training on IQ, Schellenburg (2004) assessed the influence of one year of music training (keyboard or voice) on 6 year old children in small classes, on IQ. He found a small but significant benefit on IQ in the musically trained that was suggested to be a far transfer effect. Further studies from the same author investigated whether music training was associated with social or emotional functioning in children. Schellenburg and Mankarious (2012) tested musically trained and non-musically trained 7-8 year old children for IQ and a Test of Emotional Comprehension (TEC). They found that both IQ and TEC scores were significantly higher in the musically trained children, but interestingly they found that the TEC differences disappeared when IQ was held constant. One possibility put forward to account for this was that the TEC was 'too cognitive' to discriminate completely from IQ. Another suggestion was the private one-on-one nature of the music lessons lacked a social component that would be present in more social activities such as sports, which have previously been shown to be more predictive of a TEC. These suggest social, emotional and non-cognitive factors to be important in the musically trained. In a recent study from the same author, Corrigall et al. (2013) further identified conscientiousness and openness-to-experience as important characteristics associated with music training and academic achievement.

The studies investigating nsEC activities show a number of interesting traits. One intriguing finding is that music training can predict academic achievement even when IQ is held constant, suggesting musically trained children make good students (Corrigall et al., 2013; Schellenburg, 2006). Conscientiousness (self-discipline, organisation, and achievement-orientation) and openness-to-experience (the tendency to have an active imagination, to prefer change and variety over routine, to be intellectually curious) were suggested as

two examples of capacities that music training promoted. A greater influence from EC music practice on overall school mark was seen in Grade 6 students (age 12) who had been practising for longer than Grade 3 students (age 9; Wetter et al., 2009). Showing a similar dose-response relationship, the effect size of the impact upon the overall Ohio Proficiency Test score was greater in the Grade 9 students (aged 15 years) than in Grade 4 (age 9; Fitzpatrick, 2006). The cumulative impact of years of music practice on academic achievement appeared to make up for the negative influence of low Socio-Economic Status (SES) in these studies, shown by the greater effect sizes for low SES students from Grade 9 (Table 2) reflecting a higher Grade 9 test score (Fitzpatrick, 2006). This is also supported by Schellenburg (2006) who showed a correlation between total duration of music involvement and IQ.

Self-efficacy is an important non-cognitive skill for reinforcing an individual's own beliefs about whether or not they can accomplish a task. Together, self-concept and self-efficacy have been termed self-perception, and can be considered a precursor to motivation (Gutman & Schoon, 2013). Self-efficacy has also been recognised by music researchers as important to both persistence and achievement (Eccles et al., 1993; Schmidt et al., 2006). In a study of music self-efficacy in primary school children aged between 7 and 9 years, Ritchie and Williamon (2011) found significantly higher scores in children engaged with music tuition. Interestingly, these also correlated with the physical activities of dance and individual sports. Even though self-efficacy is considered task specific, individuals with high self-efficacy tend to exhibit certain positive personal qualities such as persistence, use of varied strategic approaches, and high achievement (Zimmerman, 2000). Any activity that has the potential to increase self-efficacy will then have the potential, through a dual step transfer to positively influence academic achievement.

A number of the studies that investigated the influence of nsEC activities and academic achievement used younger subjects aged under 10 years (Table 2). nsEC activities seem to have a beneficial impact on academic achievement at any school age from age 6, but noticeably we found no negative effect sizes published, so academic achievement seems never to fall as a result of nsEC activities. This supports

observations from sporting EC activities (discussed in Bailey et al., 2009) that increasing PESS and EC activities does not seem to have an adverse effect on indicators of academic achievement.

Several other variables in addition to direct academic achievement have been used to gauge the influence of EC activities. Students who practice fine arts as an EC activity (band, orchestra, chorus, dance, debate, drama) are 1.2x less likely to drop out of high school compared to non-participants, compared to EC sport participants who are 1.7x less likely to drop out (McNeal, 1995). Fejgin (1994) showed a similar beneficial impact on discipline problems and grades from participating in EC sport (athletics) and music/drama. As mentioned earlier, Eccles and Barber (1999) found that prosocial activities and other EC activities have been shown to increase liking of school and reduce tendency to skip school as well as to confer academic benefit. Religion itself has been shown to have strong beneficial influence on EC participation and academic achievement (Glanville et al., 2008; Mooney, 2010).

Insert Table 2 about here

Discussion

The transfer environment

A number of learning capacities have been identified that can potentially impact upon academic performance in school-children (Hattie, 2012; Table 3). The studies discussed so far and the range of factors that can influence academic performance (Table 3) suggest there are several criteria emerging for an EC activity to confer academic benefit alongside the benefits of the activity itself.

Insert Table 3 about here

In their meta-analytic review, Blume et al. (2010) showed a positive relationship between transfer and conscientiousness, neuroticism, self-efficacy and motivation to learn. Our findings suggest frequency of practice also seems to be a key requirement and earlier studies showed a positive relationship between the extent of EC participation and academic achievement (Holland & Andre, 1987). Further analysis of the results used in the Bradley et al. (2013) study (personal communication) investigated the frequency of practice associated with the three sports. Both rowing and rugby practice were 5-6 times per week and were controlled by the school. Extra practice with extra-school clubs was not permitted during term time. With soccer, practice was twice per week as a school team but membership of extra-school soccer clubs was allowed for further practice during term time. This gives an interesting difference to the potential capacities that these EC sports may develop. The inclusion criteria for the Bradley et al. study (2013) were that the school sport be performed competitively and be representing the school in these competitions. Regular participation in these higher-level sports and the associated higher frequency of practice has been shown to promote being conscientious, efficient, organised and systematic (Courneya & Hellsten, 1998; Saklofske et al., 2007; Nia & Besharat, 2010). Being part of an organised school team, practising several times each week and representing the school competitively can promote self-esteem, self-concept and social capital (Holland & Andre, 1987) within the student and a strong level of school connectedness. These factors have been shown to strongly promote educational benefits such as improved school attachment and low rates of involvement in risky behaviours (Eccles & Barber, 1999).

Whilst PESS is generally viewed as beneficial to educational attainment (Bailey, et al., 2009), there is still some debate in the literature over whether sporting EC activities per se positively influence academic achievement (for discussion, see: Eitle & Eitle, 2002; Barrow, 2008; Bailey, et al., 2009). The different

characteristics developed by the different sporting EC activities may help clarify this debate. The notion of global self-concept has been suggested as a multidimensional hierarchical construct and a moderate indicator of achievement, referring to the complex of beliefs one has about oneself (Holland & Andre, 1987; Marsh & Craven, 2006), whereas specific self-perceived competences of domain specific efficacy have stronger correlations with achievement in the relevant domain (Bandura, 1993; Harter, 1999). This lack of clarity about the global or specific conceptualisation of the self in studies perhaps accounts for some of the ambiguity over the EC activity-academic achievement relationship. With multiple factors influencing participation and achievement in different school activities (EC and curricular) such as family socio-economic status (SES), race, gender, age, family and household educational resources alongside the criteria suggested by our analysis for an EC activity to be effective at promoting academic benefits (being part of an organised school team, practising several times per week and representing the school competitively), the relationship is clearly multidimensional.

Non-sport EC activities such as music may involve similar criteria to confer academic benefit. Practising music typically involves weekly lessons and associated home/school practice on most evenings, quickly adding up to the 5-6 times per week suggested above as necessary to confer academic benefit. The competitive aspect and the representative aspect of the EC activity discussed above can be easily applied to music by being a member of a school ensemble giving regular performances. The school itself can have a key role to play here. By offering a range of EC activities to its pupils, a school can increase the chance of a student finding an activity they enjoy. Enjoying an activity will mean greater devotion to the activity by the individual pupil, involving more time and effort and organising of other activities such as school work to ensure the EC activity can be accommodated. Then, by promoting and publicising the competitive success of its pupils in these activities, the school will raise the profile of the successful pupils (and of the school itself) promoting their self-esteem and social capital in the school and improving pupils' school connectedness. The importance of "school culture" was also observed by Telford et al. (2012). They found a stronger between-school positive association of academic scores and fitness and physical activity than the between-child association in Australian primary schools. This was attributed to the attitudes of staff and

pupils to physical activity, interest in and support for research into physical activity and academic performance, and even to the way schools promoted their pupils' work.

A significant contributor to the success of EC activities to promote academic achievement will be environment of the activity. Related to the role of "school culture" identified by Telford et al. (2012), the role of the school in promoting EC achievement and school social capital is vital. However the role of the teacher or coach as mentor to the student will also be important to successful transfer. The nature of the interaction between students and teachers or coaches will determine whether the student realises the benefits of the EC activity and realise its potential (Bailey, 2006). Gutman and Schoon (2013) discuss potential interventions that can promote the non-cognitive skills that they identify as beneficial to academic and employment outcomes. They too identify the role of mentoring as a factor, to coordinate the activity and act as mentor to the individual. In sport, the success of the athlete-coach relationship is seen as fundamental to the process of coaching, determining the athletes' satisfaction, self-esteem and performance accomplishments (discussed in Jowett and Cockerill, 2003). This can equally apply to both sporting and non-sporting 'athletes'.

By choosing the activity that gives the most personal reward, greater emphasis will be placed upon the activity promoting the characteristics discussed above, such as conscientiousness, efficiency, openness-to-experience, organisation and self-concept. With judicious management this can balance the academic curriculum to mutual benefit. However, there is always the danger that the student may perceive greater potential gain from the sport (or EC activity route) and devote more time to the activity, to the detriment of academic achievement. This has been identified as a possibility in situations of cultural disadvantage leading to over-dependence on sport for social capital (Eitle & Eitle, 2002) There is little research to support the idea that too much EC activity can adversely influence academic achievement. Nevertheless, several US states operate a pass-to-play policy in high school to refocus students' attention on academic achievement (Slater, 1988). In a recent study into status and performance, Bothner et al. (2012) showed that performance

improves with status until a very high level of status is reached, after which performance wanes. This perhaps suggests that excessive social capital such as from very successful high performing individuals may be detrimental to performance and erode the personality benefits described earlier. Notwithstanding these constraints, the promotion of EC activities and promoting success seems to be a credible strategy for schools to enhance student achievement.

The application to transfer theory. Do EC activities provide a Near, Far, or Dual Step transfer benefit to academic achievement?

Using one activity to promote performance in a related or unrelated activity has been termed the transfer effect. As we have noted above, the theory of transfer of learning and knowledge has been a topic of discussion from the start of the last century (Thorndike & Woodworth, 1901) to several recent special editions in scholarly journals (for example, Journal of the Learning Sciences 21 (3), 2012; Educational Research Review 8, 2013). Transfer of training can be defined as the productive use of newly acquired knowledge and skills in application contexts on the job (discussed in Gegenfurtner et al., 2013). This can be between closely related disciplines with a high level of similarity between elements in the initial learning and subsequent transfer setting - the theory of 'identical elements', or more unrelated topics such as the influence of learning Latin on preparing, sensitising and exercising the mind leading to mental agility and readiness for other disciplines – the theory of 'formal discipline'. However there has been disagreement over the existence of the concept of transfer since the beginning of the 20th century (Barnett & Ceci, 2002).

The classic view of transfer is the direct application of prior knowledge or skills to solve a new problem or perform a new task (Belenky & Nokes-Malach, 2012). However this could not be applied to all instances of transfer and mixed findings have developed transfer to beyond the direct application of prior knowledge. In their Taxonomy for Far Transfer, Barnett and Ceci (2002) identify a number of contexts and domains that are involved in Transfer. Using this taxonomy suggests that potential transfer activities can be near in some contexts and far in others. We applied the role of EC activities in promoting academic achievement to the

Barnett and Ceci (2002) taxonomy for evaluating and assigning the type of transfer (near-transfer or far-transfer; Table 4).

Insert Table 4 about here

Applying the Barnett and Ceci (2002) taxonomy suggests the influence of EC activities on academic achievement appears to be a far transfer (Table 4). However, this assumes a direct influence of the EC activity on the academic achievement outcome. Most of the transfer research to date has looked at parameters developed in one activity that have a direct impact onto the donor activity, the extent of the impact being assigned a 'near' or 'far' description. However can non-cognitive characteristics developed from the 'mental muscle' theory of transfer be classified as 'near' or 'far', a description perhaps more suitable for the 'identical elements' theory of transfer? EC activities have the potential to bestow a series of non-cognitive capacities such as motivation, conscientiousness, openness-to-experience and increased self-efficacy that can confer a greater ability to learn other tasks such as academic activities and as such function as mediators of enhanced academic achievement. In the present case of the relation between EC activity and academic achievement, with a competitive environment, minimum frequency of practice and a strong school context, the EC activity can impact on such non-cognitive capacities that in turn can influence and benefit the learning process leading to academic achievement. This is then a dual step transfer effect, with the characteristics being influenced from EC participation acting as a pivot point to confer greater learning application and hence potential academic benefit (Figure 1).

Motivation has been one aspect that has been suggested to contribute to an alternative view of transfer. This can sit alongside the other non-cognitive capacities developed through successful participation in EC activities. Belenky and Nokes-Malach (2012) discuss the achievement goal theory in relation to motivation,

but this could equally be applied to characteristics such as conscientiousness and self-efficacy that are associated with regular and successful participation in school EC activities. As we have noted earlier, motivation is, based on Gutman and Schoon's framing, a non-cognitive skill (2013). Belenky and Nokes-Malach's contemporary empirical work on the motivation-transfer relationship (2012) demonstrates that motivation can have a large impact on knowledge transfer. As such, our argument aligns with some contemporary directions in the literature on transfer which are moving beyond 'direct application' models of transfer and reframing it as preparation for future learning (PFL) (Bransford & Schwartz, the 1999; Belenky & Nokes-Malach, 2012). Thus non-cognitive skills such as conscientiousness, self-efficacy and resilience could be theorised within a mastery-approach model of achievement (Belenky & Nokes-Malach, 2012). Furthermore, prolonged and successful participation in any EC activity and subsequent transfer to academic engagement can be understood in terms of the development of mastery approach stance by learners/students. If practiced over a number of years, the mastery-approach model may become a habit.

Limitations of Research

The majority of studies investigating the impact on academic achievement of nsEC activities have used music tuition and practice as the EC activity, with only a small number of studies looking at other activities (for example, performing arts or prosocial activities). The conclusions in the present discussion are similarly based mostly on using music as an nsEC activity. Further research around the impact of other nsEC activities upon non-cognitive factors would clarify the wider role of nsEC activities on academic achievement. The research looking at ssEC and academic achievement were largely based on secondary analysis of larger surveys (Table 1). In contrast, all but one of the studies that investigated nsEC activities and academic achievement were based on analysis of primary data collected for the purpose of the study. This may limit the comparability of these two areas of study to some extent and is something to consider when planning future investigations.

Conclusion

The aim of this paper was to both conceptualise and investigate the transfer from non-academic EC activities to core academic subjects and academic achievement. Successful transfer has been suggested to come from two potential sources: familiarity with contextual factors relating to the specific activity, and underlying cognitive skills (Marton, 2006). However, we suggest that the non-cognitive skills (i.e. motivational-social skills), argued for by Bowles and Gintis (1976) nearly forty years ago which can be developed through EC activities, are pivotal in successful transfer. Our point is that rather than conceive of the process as a "near" or "far" transfer situation, as described by Salomon and Perkins (1989), it may be more plausible to consider it as a process of dual step transfer – more akin to the 'mental muscle' than the 'identical elements'. As such, our argument is not dissimilar to Gutman and Schoon when they identify eight non-cognitive skills (self-perception, motivation, perseverance, self-control, meta-cognition, social competencies, resilience and coping, and creativity) that are the attitudes, behaviours and strategies thought to underpin success in school and at work (Gutman & Schoon, 2013). These non-cognitive skills can be seen in terms of what Bransford and Schwartz (1999) term 'preparation for future learning' (PFL). Importantly, they note that historically transfer theories have typically relied on a narrow assumption of direct application (DA) as the model for transfer, and thereby miss out and can't account for other forms of transfer – in our case non-cognitive skill-based preparation for future learning. If transfer is influenced by differences in general cognitive capacities as discussed in Barnett and Ceci (2002) and by general non-cognitive skills as discussed in Gutman and Schoon (2013) that operate independently of context, then transfer can perhaps be considered to operate in two separate perspectives. EC activities have the potential to impact upon a number of non-cognitive skills in a dual step transfer capacity that in turn can improve achievement in academic and professional practices. Barnett and Ceci's taxonomy for transfer focuses largely on content and context. Including the non-cognitive skills developed through EC activities adds an extra dimension to the transfer taxonomy and could contribute to a dual step transfer benefit.

In developing our dual step transfer model, we note other work that uses the term double transfer paradigm (Schwartz & Martin, 2004). Double transfer in their paradigm refers to a 'transfer in' from a pedagogical intervention to learning a new resource/task situation and a 'transfer out' from this task to a new target problem. In our dual step transfer model, extra-curricular activities lead to non-cognitive (i.e. motivational-social skill) skill development (i.e. Step 1 in Figure 1) which in turn is deployed to good effect (Step 2 in Figure 1) in the academic achievement.

Writing from a social theory perspective, Bailey et al. (2013) suggested the Human Capital Model as a framework for understanding the life-long benefits of physical activity. Our model focuses only on the benefit on academic achievement. However, our work focuses on both sport and non-sport activity whereas Bailey et al. focus solely on physical activity. The individual capital component (i.e. non-cognitive skills, goal setting, enthusiasm/intrinsic motivation, commitment/self-discipline/self-control/persistence, social skills/life skills) of Bailey et al.'s human capital model (2013) aligns well with the non-cognitive skills in our model. What is common to both is an emerging focus in research and policy on understanding the benefits of engagement in various activities in and out of school, home and community. For some researchers these are framed within social theory-informed human capital models, and for others within psychological theory informed transfer models (Schwartz & Martin, 2004; Engle, 2012; Goldman & Pellegrino, 2015). A detailed analysis of the nature and consequences of these differences are beyond the scope of this paper.

We suggest that any school EC activity that is performed competitively in an organised school environment, practiced several times per week and with strong school representation may enhance the development of non-cognitive skills (motivational-social skills) such as motivation, conscientiousness, openness-to-experience and increased self-efficacy in the individual through a transfer effect. This in turn may enhance academic achievement through a second transfer effect, that is, a dual step transfer situation.

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Table 1. School Sport Extracurricular (ssEC) activities and academic achievement: comparison of effect sizes (Cohen's ***d***; Cohen, 1988).

Reference	Age Group	Activity	Data Source	Comparison Group	Outcome Variable	Effect Size
Bradley et al. (2013)	Year 6 (17-18yr)	Representative School Sports Team	Primary data collection	No School Sports Team	Leaving Certificate Score	0.23
Bradley et al. (2013)	Year 6 (17-18yr)	School Rowing Team	Primary data collection	No School Sports Team	Leaving Certificate Score	0.91
Bradley et al. (2013)	Year 6 (17-18yr)	School Rugby Team	Primary data collection	No School Sports Team	Leaving Certificate Score	0.24
Bradley et al. (2013)	Year 6 (17-18yr)	School Soccer Team	Primary data collection	No School Sports Team	Leaving Certificate Score	-0.14
Shulruf (2010)	High School	Individual or Team Sport	Meta-analysis	No sporting activity	GPA	0.15
Eccles & Barber (1999)	Grade 12 (17-18yr)	Participating in School Sports Teams	Secondary data source: Michigan Study of Adolescent Life Transitions (MSALT)	No participation	GPA	0.0
Snyder & Spreitzer, 1977	Senior High School (9-12yr)	School Sport Participation	Primary data collection	No Participation	GPA	0.08
Fox, Barr-Anderson, Neumark-Sztainer, & Wall (2010)	Middle School (11-14yr)	Sports Team Participation	Secondary data source: Eating Among Teens (EAT) Project	No participation	Student grades	0.09 (girls) 0.17 (boys)
Fox, Barr-Anderson, Neumark-Sztainer, & Wall (2010)	High School (14-18yr)	Sports Team Participation	Secondary data source: Eating Among Teens (EAT) Project	No participation	Student grades	0.32 (girls) 0.36 (boys)

Notes: GPA: Grade Point Average.

Table 2. Non-Sport Extracurricular (nsEC) activities and academic achievement: comparisons of effect sizes (Cohen's ***d***; Cohen, 1988).

Reference	Age Group	Activity	Data Source	Comparison Group	Outcome Variable	Effect Size
Courey, Balogh, Siker, & Paik (2012)	Grade 3 (8.5-10.1yr)	Semiotic "Academic Music" instruction	Primary Data Collection	Conventional instruction	Maths: Fractions	1.05
Eccles & Barber (1999)	Grade 12 (17-18yr)	Pro-social activity (church, volunteering)	Secondary data source: Michigan Study of Adolescent Life Transitions (MSALT)	No participation	GPA	0.62
Eccles & Barber (1999)	Grade 12 (17-18yr)	Performing Arts (school band, drama, dance)	Secondary data source: Michigan Study of Adolescent Life Transitions (MSALT)	No participation	GPA	0.43
Fitzpatrick (2006)	Grade 4 (9yr)	Instrumental Music Student	Primary Data Collection	Non-instrumental Music student	Overall OHIO Proficiency Test: Low SES	0.39
Fitzpatrick (2006)	Grade 4 (9yr)	Instrumental Music Student	Primary Data Collection	Non-instrumental Music student	Overall OHIO Proficiency Test: High SES	0.55
Fitzpatrick (2006)	Grade 6 (11yr)	Instrumental Music Student	Primary Data Collection	Non-instrumental Music student	Overall OHIO Proficiency Test: Low SES	0.18
Fitzpatrick (2006)	Grade 6 (11yr)	Instrumental Music Student	Primary Data Collection	Non-instrumental Music student	Overall OHIO Proficiency Test: High SES	0.47
Fitzpatrick (2006)	Grade 9 (15yr)	Instrumental Music Student	Primary Data Collection	Non-instrumental Music student	Overall OHIO Proficiency Test: Low SES	0.67
Fitzpatrick (2006)	Grade 9 (15yr)	Instrumental Music Student	Primary Data Collection	Non-instrumental Music student	Overall OHIO Proficiency Test: High SES	0.61
Kinney & Forsythe (2005)	Grade 4 (9yr)	Arts IMPACT curriculum	Primary Data Collection	Conventional Arts Curriculum	Overall OHIO Proficiency Test	0.28

Kvet (1985)	Grade 6 (12yr)	Absent from regular curriculum for music lessons	Primary Data Collection	No music lessons	Reading	0.05
Kvet (1985)	Grade 6 (12yr)	Absent from regular curriculum for music lessons	Primary Data Collection	No music lessons	Language	0.15
Kvet (1985)	Grade 6 (12yr)	Absent from regular curriculum for music lessons	Primary Data Collection	No music lessons	Maths	0.23
Moreno et al. (2009)	Grade 3 (8.4yr)	Music training	Primary Data Collection	Painting training	WISC-III (IQ)	0.47
Ritchie & Williamon (2011)	Year 4 (8.1yr)	Regular Music Tuition	Primary Data Collection	No Music Tuition	Self-Efficacy Score	0.68
Schellenburg & Mankarious (2012)	7.8yr	Musically trained	Primary Data Collection	No music training	WASI (IQ)	0.94
Schellenberg (2004)	6yr old	1 year of keyboard and voice music lessons	Primary Data Collection	1 year of drama and no music lessons	WISC-III (IQ)	0.37
Shulruf (2010)	High School (14-17yr)	Performing Arts (dance, music, theatre, cheerleading)	Meta-analysis	No Performing Arts activity	GPA	0.17
Snyder & Spreitzer (1977)	High School Girls (14-17yr)	Music Participation	Primary Data Collection	No Participation	GPA	0.23
Snyder & Spreitzer (1977)	High School Girls (14-17yr)	Music & Sport Participation	Primary Data Collection	No Participation	GPA	0.24
Wetter, Koerner, & Schwaninger (2009)	Grade 3 (age 8yr)	Practice Music at school and home	Primary Data Collection	Not practice music	Overall average school mark	0.26
Wetter, Koerner, & Schwaninger (2009)	Grade 6 (age 12yr)	Practice Music at school and home	Primary Data Collection	Not practice music	Overall average school mark	0.95

Notes: GPA: Grade Point Average; IQ: Intelligence Quotient; SES: Socioeconomic Status; WASI: Wechsler Abbreviated Scale of Intelligence; WISC-III: Wechsler Intelligence Scale for Children, third edition.

Table 3. Factors that can impact on academic performance (from Hattie, 2012).

Factors	**Average ES**	**Range**	**Number of studies**
Motivation	0.48	0.23-0.73	6
Self-concept/Self-esteem	0.47	0.32-0.76	7
Sport	0.10		1
Outdoor Education Programmes	0.52	0.46-0.61	3
Physical Fitness	0.32	0.25-0.36	3
Extracurricular Activities (such as after school care programs, general activities, sports, work, supplemental education)	0.19	-0.01-0.47	8
Exercise/Relaxation (as Physical Fitness above with one relaxation study added)	0.28	0.12-0.36	4
Drama/Arts Programs	0.36	0.06-0.67	5
Music	0.35	0.06-0.80	5
Goals	0.50	0.12-0.82	13
Personality	0.18	0.05-0.54	8

Notes: ES: Cohen's ***d*** Effect Size.

Table 4. EC activity and academic achievement transfer (applied to the taxonomy model of Barnett and Ceci, 2002).

Content: What transferred					
Learned Skill	Procedure		Representation		***Principle or Heuristic***
Performance Change	Speed		Accuracy		***Approach***
Memory Demands	Execute only		Recognise and execute		Recall, recognise and execute
Context: When and Where Transferred from and to					
	Near				**Far**
Knowledge Domain	Mouse vs. Rat	Biology vs. Botany	Biology vs. Economics	Science vs. History	***Science vs. Art***
Physical Context	Same room at school	Different room at school	School vs. Research lab	School vs. Home	***School vs. The beach***
Temporal Context	Same session	***Next day***	Weeks later	Months later	Years later
Functional Context	Both clearly academic	Both academic but one non-evaluative	Academic vs. Filling in tax forms	Academic vs. Informal questionnaire	***Academic vs. At play***
Social Context	Both individual	Individual vs. Pair	Individual vs. Small group	Individual vs. Large group	***Individual vs. Society (school social capital)***
Modality	Both written, same format	Both written, multiple choice vs., essay	Book learning vs. oral exam	***Lecture vs. wine tasting (nsEC activities)***	***Lecture vs. wood carving (ssEC activities)***

Notes: Content and Context relevant to ssEC and nsEC activities are highlighted in ***bold italic***.