Art for Art's Sake?

THE IMPACT OF ARTS EDUCATION

Centre for Educational Research and Innovation

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Educational Research and Innovation

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and Stéphan Vincent-Lancrin

OECD
BETTER POLICIES FOR BETTER LIVES

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Foreword

As skills become the global currency of the 21st century, education systems should equip students with the skills required by our global, knowledge-based economies. In particular, education has to foster the skills that fuel innovation in the economy and society: creativity, imagination, communication and teamwork to name a few. Arts education is particularly likely to foster these very skills. Some have argued that training in the arts also leads to better foundational skills such as reading or mathematics.

This book assesses the impact of arts education on a variety of skills by critically reviewing all the existing research on these questions. Its rich and nuanced interpretation of the results leads us to conclude that caution is needed when making statements about the impact of arts education on non-arts outcomes – and on transfer of skills, more generally.

I would like to underline three points that stand out in the report.

First, there is strong evidence that some specific forms of arts education have a positive impact on the development of certain skills. For example, theatre education clearly improves verbal skills related to reading and text understanding – but unfortunately enacted theatre is not systematically taught in our classrooms.

Second, there is far too little research on the impact of arts education on student outcomes of creativity, critical thinking, persistence, motivation, and self-concept, and this prevents us from making strong conclusions about these outcomes. The idea that arts education fosters such skills is plausible, and there is some evidence that this is sometimes the case, but such outcomes depend on how the arts are taught. The arts can be taught in a way that enhances these outcomes, or they can be taught poorly. This implies that, as important as the curriculum can be, we need to understand better the pedagogies and attitudes that lead to these kinds of outcomes.

Finally, although it is crucial for education policy to better understand how arts education – and the teaching of other subjects – contribute to fostering innovation skills, I can only agree with the final remark of the authors: even in the event that arts education did not contribute to innovation, arts education would have a place in our schools given the importance of art as a human experience. I would indeed have difficulties imagining a good life without the arts and some cultural awareness.

Barbara Ischinger
Director for Education and Skills

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The report draws heavily on the following publications by Ellen Winner and Lois Hetland:

- Hetland, L. and E. Winner (2001), "The arts and academic achievement: What the evidence shows", *Arts Education Policy Review*, Vol. 102/5, pp. 3-6.
- Winner, E. and L. Hetland, (2000a). "The arts and academic achievement: What the evidence shows", double issue of *Journal of Aesthetic Education,* Vol. 34/3-4, Fall/Winter, 2000.
- Winner, E. and L. Hetland (2000b), "Does studying the arts enhance academic achievement? A mixed picture emerges. Commentary", *Education Week*, November 1, pp. 64-46.
- Hetland, L. and E. Winner (2004), "Cognitive transfer from arts education to non-arts outcomes: Research evidence and policy implications" *in* E. Eisner and M. Day (eds.), *Handbook of Research and Policy in Art Education*, Lawrence Erlbaum Associates, Mahwah, NJ, pp. 135-161.

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Executive summary

Artists, alongside scientists and entrepreneurs, are role models for innovation in our societies. Not surprisingly, arts education is commonly said to be a means of developing skills considered as critical for innovation: critical and creative thinking, motivation, self-confidence, and ability to communicate and cooperate effectively, but also skills in non-arts academic subjects such as mathematics, science, reading and writing. Does arts education really have a positive impact on the three subsets of skills that we define as "skills for innovation": technical skills, skills in thinking and creativity, and character (behavioural and social skills)?

The report answers this question by updating and extending to behavioural and social skills the meta-analyses published in 2000 by the "Reviewing Education and the Arts Project" (REAP) directed by Hetland and Winner. Meta-analyses combine existing studies on a specific topic to assess whether a finding is consistent and has enough statistical power to be generalised. In addition to studies already reviewed in the REAP project, this new enquiry involves the systematic investigation of research databases in education and psychology in the following languages: Dutch, English, Finnish, French, German, Italian, Japanese, Korean, Portuguese, Spanish and Swedish.

The kinds of arts education examined include arts classes in school (classes in music, visual arts, theatre, and dance), arts integrated classes (where the arts are taught as a support for an academic subject), and arts study undertaken outside of school (e.g. private, individualised instrumental music lessons; out of school classes in theatre, visual arts, and dance). The report does not deal with education *about* the arts or cultural education, which may be included in all kinds of subjects.

The main results to emerge are summarised below.

Arts education and academic skills in non-arts subjects

Multi-arts education. An extensive body of correlational data in the United States reveals that students who participate in a large number of arts courses (likely a mixture of kinds of arts courses) have higher educational achievement (as measured by grades in school and scores on verbal and mathematical standardised tests) than those who take fewer or no arts courses. One study showed that this relationship

exists for students at both the high and low ends of the socio-economic spectrum. These correlational findings should not be taken as showing that the arts courses *cause* the higher educational attainment. Plausible non-causal explanations cannot be ruled out: students who excel academically and who study the arts may come from families who value both academics and the arts, or attend schools that stress both; and good scores or educational ability no doubt have a positive influence on whether students receive arts education, for example because those proficient at school have more time to spend on the activities concerned, or are encouraged more to do so by their teachers or parents. It is notable that a similar study in the United Kingdom found the reverse: students in the arts track performed less well on their national exams than did those in the academic track – pointing to the importance of considering the kinds of students who self-select into the arts. The handful of multi-arts experimental studies examining the effect of arts classes on educational attainment do not (yet) show a significant causal impact.

Music. Music education strengthens IQ (intelligence quotient), academic performance, word decoding and phonological skills and there is preliminary evidence that music education might facilitate foreign language learning. While there are a number of studies showing a positive impact of music education on visual-spatial reasoning, the sole longitudinal study on this question detected no persistent influence after three years of music, which suggests the need for caution. There is also no evidence that music education has any causal impact on mathematics scores, even though mathematicians may be attracted to music.

Theatre. Strong evidence shows that theatre education in the form of enacting stories in the classroom (classroom drama) strengthens verbal skills, but there is no evidence for a link between theatre training and overall academic skills.

Visual arts. While there is no evidence that training in visual arts improves overall academic skills or verbal skills (literacy), two new correlational studies reveal that students who study the visual arts are stronger in geometrical reasoning than students who do not study the visual arts. However, causality has yet to be established. And one experimental study found that learning to look closely at works of visual art improves skills in observing scientific images – a typical instance of close skills transfer.

Dance. Some studies show that instruction in dance improves visual-spatial skills, but such studies are still too few in number to be conclusive. We found no evidence that dance education improves overall academic skills or reading.

Arts education and skills in thinking and creativity

Everyone associates art with creativity. There are a few studies linking enhanced creativity with theatre and dance education, but the limited number of studies and statistical power of the positive evidence do not allow us to generalise this finding. Research on multi-arts education has not clearly demonstrated a causal impact on student creativity and problem solving.

One possible reason for the weak evidence on this question is the limited way in which creativity has been measured – using "domain-general" tests such as the Torrance Tests of Creativity (in which students must for example come up with original uses for common objects, or title pictures in unusual ways). Another possible reason is that anything can be taught so as to stimulate creativity and imagination, and anything can also be taught in a deadening way. Thus, a science class – indeed, a class in any subject – can teach creativity and imagination if well-taught; and an art class can leave creativity and imagination untouched if poorly taught. Even in art, these skills may well only be developed very deliberately. It is also possible that students who gain expertise in an art form develop creative abilities in that art form but that this new creativity does not spill over into other domains.

We did not find any empirical study assessing the impact of arts education on critical thinking. However, a study showed that visual arts teachers at their best aim to promote reflection and meta-cognition.

Arts education and social and behavioural skills

Arts education is often viewed by public policy makers and educators as a means of getting students to enjoy school and motivate them for learning in other academic subjects. Empirical studies show that students enrolled in arts education courses display a more ambitious attitude to academic work as well as higher levels of commitment and motivation. However, these studies are correlational and thus do not allow the conclusion that arts education is what motivates students. Possible non-causal explanations exist: for example, students taking the arts may attend schools that are better all around and thus more motivating; or students who self-select into the arts may be more motivated to begin with. Experimental (causal) studies are called for.

Finally, there is no more than tentative evidence regarding the impact of arts education in its various forms on other behavioural and social skills, such as self-confidence, self-concept, skills in communication and cooperation, empathy, perspective taking and the ability to regulate one's emotions by expressing rather than suppressing them. Initial evidence concerned with education in dramatic art appears the most promising, with a few studies revealing that drama classes enhance empathy, perspective taking, and emotional regulation – plausible findings given the nature of such education.

Conclusions: art for art's sake?

In conclusion, we argue that, even though we find some evidence of impact of arts education on different kinds of skills, the main justification for arts education is clearly the acquisition of artistic habits of mind – the current priority objective of arts education in the curricula of OECD countries. By artistic habits of mind, we mean

not only the mastery of craft and technique, but also skills such as close observation, envisioning, exploration, persistence, expression, collaboration, and reflection – the skills in thinking and creativity and the social and behavioural skills that are developed in the arts.

There is some suggestive evidence that arts education does matter for innovation because people trained in the arts play a significant role in the innovation process in OECD countries: arts graduates are for example commonly involved in product innovation. Recognising the value of arts education for innovation, an increasing number of universities are developing new types of inter-disciplinary curricula or institutions that try to take advantage of the skills developed in arts education.

If learning in the arts has "collateral benefits" in other areas, so much the better. However, we do not believe that the existence of arts education should be justified in terms of skills in other academic subjects: if one seeks first and foremost to develop skills in geometry, studying geometry – rather than music or dance – is always likely to be more effective. The primary justification of arts education should remain the intrinsic value of the arts and the related skills and important habits of mind that they develop.

Ultimately, the impact of arts education on other non-arts skills and on innovation in the labour market should not be the primary justification for arts education in today's curricula. The arts have been in existence since the earliest humans, are parts of all cultures, and are a major domain of human experience, just like science, technology, mathematics, and humanities. The arts are important in their own rights for education. Students who gain mastery in an art form may discover their life's work or their life's passion. But for all children, the arts allow a different way of understanding than the sciences. Because they are an arena without right and wrong answers, they free students to explore and experiment. They are also a place to introspect and find personal meaning.

Chapter 1

The impact of arts education: From advocacy to evidence

This chapter sets the context, the research questions and the methodology of the book. We show that policy makers put renewed emphasis on skills for innovation and mobilise arts education as part of this policy agenda. Similarly, arts education advocates sometimes find that arts education is endangered and claim strong impacts of arts education on non-arts skills. The purpose of the book is to show which of these claims are supported by strong research evidence. We present the scope of our report, discuss the concept of transfer, and summarise the goals and methods of the report. We then preview our conclusions.

Most people, including policy makers, believe that arts education fosters creativity and possibly others skills conducive to innovation. In knowledge-based societies, innovation is a key engine of economic growth, and arts education is increasingly considered as a means to foster the skills and attitudes that innovation requires, beyond and above artistic skills and cultural sensitivity. Does arts education really have positive effects on non-arts skills? Does it enhance performance in academic subjects such as mathematics, science or reading, which are also seen as crucial in our knowledge-based societies? Does it strengthen students' academic motivation, self-confidence, and ability to communicate and cooperate effectively? Does it develop the habits of minds, attitudes and social skills that are seen as critical to innovation societies? In this book we will try to answer these questions by examining the state of empirical knowledge about the impact of arts education on these different kinds of skills.

This chapter sets the context, the research question and the methodology of the book. We show that policy makers put renewed emphasis on skills for innovation and mobilise arts education as part of this policy agenda. Similarly, arts education advocates sometimes find that arts education is endangered and claim strong impacts of arts education on non-arts skills. The purpose of the book is to show which of these claims are supported by strong research evidence. We present the scope of our report, discuss the concept of transfer, summarise the goals and methods of the report, and then preview our conclusions.

Context of our study: Education for innovation, arts advocacy and arts education

Education policy – and decision – makers have to continuously revisit curricula to ensure that pupils and students are equipped with the skills needed to drive and adapt to innovation societies (OECD, 2010). How much arts education, if any, should be included in school curricula? What should be the objectives of teaching the arts? Given the peripheral position of arts education in school, arts advocates have long argued that arts education fosters non-arts academic skills. The renewed interest in fostering skills for innovation raises new questions along traditional claims about expected outcomes of arts education.

Arts education and the quest for innovation and creativity

Education and training systems are increasingly seen as instrumental in equipping people with innovation skills. As innovation and knowledge becomes a key source of growth and wellbeing, ministers from 35 countries declared in the conclusions of the 2010 OECD Ministerial Council Meeting that they "will, taking into account country-specific conditions, empower people to innovate by education and training". A few months later, at another OECD Ministerial Meeting, education ministers from 38 countries discussed the challenges of equipping students with the skills necessary for pursuing a decent life in the 21st century. They agreed to keep a focus on high standards in foundation skills and emphasised the need for an "appropriate balance" between professional skills and generic skills such as entrepreneurship, creativity and communication. In the discussion, several Ministers clearly identified arts education as an important means to achieve these objectives, highlighting notably their motivating character.

Similarly, the *Recommendation of the European Parliament and of the Council on key competences for lifelong learning* (18 December 2006, 2006/962/EC) highlighted eight key competences, including cultural awareness and expression, and noted that "critical thinking, creativity, initiative, problem solving, risk assessment, decision taking, and constructive management of feelings play a role in all eight key competences."[1]

Several international and national task forces and projects sponsored by government and businesses identified different sets of "21st Century skills", including all strong academic skills, creativity, critical thinking and social and emotional skills.

For example, the Assessment and Teaching of 21st Century Skills (AT21CS) project, sponsored by governments (Australia, Finland, Costa Rica, the Netherlands, Russia, Singapore and the United States,) and information technology (IT) companies (Cisco, Intel and Microsoft), identifies different sets of skills for tomorrow's world, including creativity, critical thinking, problem-solving, decision-making and learning, communication and collaboration. Another example lies in the skills framework developed by the Partnership for 21st Century Skills, a consortium of US government and IT companies that advocates for 21st century readiness in light of the global economic competition (Trilling and Fadel, 2009). The skills framework has four components: core subjects, including arts; learning and innovation skills (creativity and innovation, critical thinking and problem solving, communication and collaboration); information, media and technology skills; life and careers skills (adaptability and flexibility, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership and responsibility).

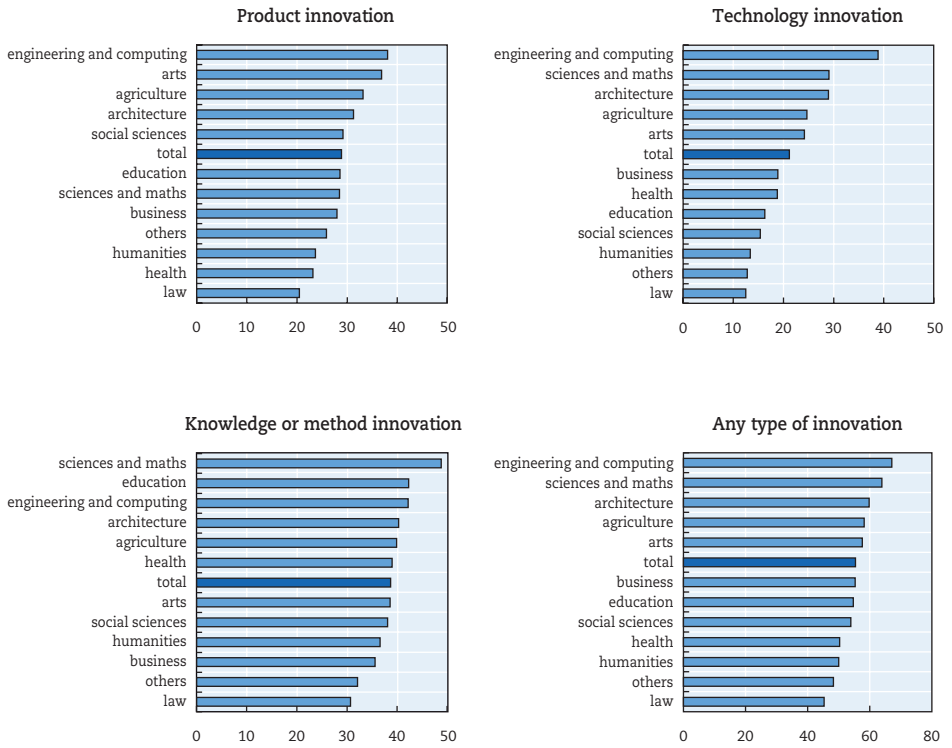
In spite of their differences, these projects share a common willingness to find a balance between different sets of skills, above and beyond content and procedural knowledge in different subjects. They renew recurrent arguments about higher order thinking skills, as well as a quest for a recognition of a variety of valuable learning outcomes that was for example forcefully supported by Gardner's work on "multiple intelligences" and "minds for the future" (Gardner, 1983, 1993, 2006). We build on these projects, ideas and theories to categorise skills or learning outcomes in three broad categories that we will examine in the book: academic or cognitive skills, which encompass know-what and know-how in specific subjects, notably basic skills; skills in thinking and creativity; and social and behavioural skills leading to outcomes such as student motivation, persistence, good communication, emotion regulation and self-confidence.

Even though people may have different views about how to best foster skills for innovation, arts education is clearly one of the avenues that is commonly envisaged to do so – and one that appears as plausible to most people. A 2011 statement by US Secretary of Education Arne Duncan exemplifies how policy talk posits arts education as a means to foster the right set of skills for tomorrow's innovative societies:

> Education in the arts is more important than ever. In the global economy, creativity is essential. Today's workers need more than just skills and knowedge to be productive and innovative participants in the workforce. Just look at the inventors of the iPhone and the developers of Google: they are innovative as well as intelligent. Through their combination of knowledge and creativity, they have transformed the way we communicate, socialize, and do business. Creative experiences are part of the daily work life of engineers, business managers, and hundreds of other professionals. To succeed today and in the future, America's children will need to be inventive, resourceful, and imaginative. The best way to foster that creativity is through arts education (PCAH, 2011, p. 1).

Indeed, correlational evidence shows that arts graduates, and probably arts education, play an important role in innovation. Based on an international analysis of tertiary graduates' job characteristics five years after graduation, Avvisati, Jacotin and Vincent-Lancrin (2013) find that arts graduates are among the most likely to hold a highly innovative job when it comes to product innovation – at par with graduates in engineering and computing. (Highly innovative jobs are defined as those held by people working in an innovative organisation and personally contributing to innovation in their job). While it is possible that arts education programmes attract people with a specific bundle of skills that makes them more likely to hold these kinds of jobs, it is plausible that specialised arts education also strengthens these skills, as self-reported by these tertiary-educated professionals (Figure 1.1).

Figure 1.1. **Percentage of tertiary graduates from specific fields having a highly innovative job**



StatLink http://dx.doi.org/10.1787/888932832877

Source: Avvisati, Jacotin and Vincent-Lancrin (2013). Based on Reflex and Hegesco.

Arts education initiatives

While they still remain marginal, education policies and initiatives based on arts education are gaining ground as a way to make education more innovative. Typically, these initiatives try to foster an innovative culture in teaching and learning in order to improve students' academic outcomes but also creative dispositions and other social and emotional skills.

In Singapore, for example, the Ministry of information, Communications and the Arts (MICA) established the School of the Arts in 2008 to develop an innovative schooling model allowing students to develop skills above and beyond those necessary to achieve high scores in examinations. This independent high school offers a 6-year education programme in and through the arts to 13 to 18 year old students. Students study their selected art forms for more than 10 hours per week but also learn regular academic subjects. Having adopted the "connected curriculum" (Perkins, 1993) as a vision for its curricular initiatives, the school teaches academic subjects through the arts. For example, students learn about physics principles through sculpture; chemistry principles through glazing and pottery; and mathematical principles through music. Moreover, practising artists work with students in the school setting so that experimentation, expression and discovery are emphasised in the process of making arts. Artistic experience is not only supported as a means of cultivating technical skills, but also as a way of building sensibilities and sensitivities.

In 2013, the first cohort of students of the School of the Arts all passed the International Baccalaureate diploma examination, and almost 44% students obtained a score of 40 or above (which places them in the top 5% students taking the examination). This is a remarkable academic outcome as the school enrols about 200 students annually through Singapore's Direct School Admission (DSA) scheme from various academic backgrounds, including students who are (statistically) unlikely to enter university given their score at the Primary School Leaving Examination. While based on a selective procedure, the Direct School Admission scheme takes place before the results of the Primary School Leaving Examination, which usually guide admission and tracking decisions in Singapore education system, are known. Research on the school processes and outcomes is still ongoing. In their initial analysis, Tan and Ponnusamy (forthcoming) attribute this success to the deliberate effort of the school to use the connected curriculum and thereby cultivate a culture of teaching and learning in which teachers solve problems collaboratively. The school seems to have fostered teachers' motivation but also to have given them the freedom and time to experiment and refine their curriculum units, as well as to re-examine their classroom practices. In the process, the arts have been reimagined and legitimised as ways of knowing instead of being peripheral activities of formal education.

In the United Kingdom, the not-for-profit organisation Creativity, Culture and Education (CCE), ran an interesting programme: Creative Partnerships. Between 2002 and 2011, Creative Partnerships has worked with over 1 million children and over 90 000 teachers in more than 8 000 projects across over 5 000 schools

in England. The distinctive feature of the programme lay in the training and deployment of "creative agents" in schools to address a specific need or problem that they wished to address. Drawn mainly from the creative and cultural industries, these creative agents were often, though not exclusively artists, but kept a role of visitors (as opposed to teachers) within schools. For example, in 2005 Prudhoe Community High School (Northumberland) started a project called "Anthem for Northumberland" around the theme of film music. After having involved other schools in the city and with the help of musicians, pupils learned to compose and perform new musical pieces for film scenes, which culminated in the composition and public performance of one piece for the whole group.

Independent research on the programme showed that it had positive impacts on students' wellbeing, attainment and retention, on teachers' professional development and on school routines (CCE, 2012). The programme included a strong focus on arts education and artistic projects, although research attributes its positive impact to the pedagogy that the creative professionals modelled in the classroom, which were subsequently adopted by the teachers and incorporated in their daily practice, rather than to the study of arts as a subject discipline. Given the nature of its impact on pupils, this approach attracted considerable international interest and, as of 2013, programmes modelled on Creative Partnerships were running in Germany, Lithuania, Norway and Pakistan – and were under consideration in some other countries. For example, a joint project by the German federal government and several Länder (Baden-Württemberg, Nordrhein-Westfalen, Berlin, Thuringia, Hamburg) called "cultural agents" supports the growth of social competencies by strengthening ties between schools and artistic institutions and artists.

It goes beyond the scope of this book to review country policy examples of programmes fostering arts education with the purpose of developing the non-arts skills that we will cover. We can however mention a few. In Chile, an increase in the time devoted to arts education in the curriculum has been announced in 2012, motivated by the belief that arts education could increase the motivation and the social and behavioural skills of pupils. An evaluation of how these skills are developed within arts education is also planned. In Austria, the "dialogue programme" funded by the Ministry of education supports the collaborative work of artists, teachers and students on school arts projects during class time, with the aim of motivating students. An evaluation of the programme was conducted based on students' perceptions about their learning: the ability to work in team and to express emotions stood out as the stronger perceived learning outcomes (Schober, Schober and Asleithner, 2007). In France, a 2013 reform reorganised the allocation of school time over the week. The government suggests using the freed time for sportive, artistic and cultural activities, claiming that it will enhance pupils' well being and intellectual curiosity. A more informal annual initiative is the "culture bazaar" that is held annually in Slovenia: it aims to encourage the building of partnerships between schools, pre-schools, and cultural institutions (museums, theatres, etc.) for quality arts education.

Finally, the integration of arts education in the promotion of science, technology, engineering and mathematics (STEM) education is worth mentioning as a new trend. In Korea, a science, technology, engineering, arts and mathematics (STEAM) project was launched in order to leverage on the self-confidence that students (supposedly) develop through arts education for the sake of STEM education and to develop their creativity. In the United States, an up-and-coming movement also advocates the integration of arts and design to the national education agenda. In 2013, a new Congressional Caucus (and the Resolution 51 of the House of Representatives) posits that "adding art and design" to STEM fields "encourages innovation and economic growth in the United States." Schools often quoted as implementing this approach include the Drew Charter School in Atlanta, the Blue School in New York City and Andover Public Schools outside of Boston.

The arts are relatively peripheral in schools world-wide

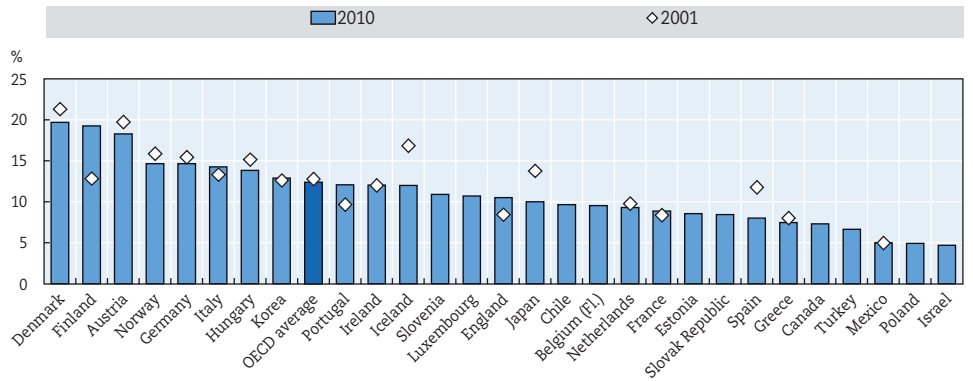
Despite their importance and centrality to human civilisation, despite policy talk on innovation and its role in global economies, and despite a host of interesting initiatives around arts education, the arts play a relatively minor role in most schools all over the world today. By and large, all school systems world-wide, both government-supported and independent, focus far more on training what are considered "academic" skills – primarily reading (and literature in the secondary years), writing, mathematics, science, history and geography (in the secondary years) – and far less on the arts. The opportunity to learn to understand and work in the visual arts, music, dance, and theatre has been grossly neglected. The arts are usually taught minimally in the early grades (e.g. at best students may have music or art class once a week for one period); at older grades, the arts are usually electives and hence only some students gain experience in the arts; and sometimes the arts are relegated to after-school, extra-curricular activities, along with participation in athletic teams. Of course there are exceptions, but we state here the general rule.

What do we know about the state of arts education world-wide? Arts are part of education policy in almost all countries in the world (Bamford, 2006). In all OECD countries, arts education is a part of the curriculum, with a focus on the major arts forms (visual arts, music, theatre, dance) (Table 1.A1.1). In particular, visual arts and music are mandatory in all OECD countries in primary and secondary education. In 2010, in public schools, 9-11 year old and 12-15 year old pupils were taught 99 and 91 hours per year in arts education on average in OECD countries for which information was available, that is, between 2 and 2.5 hours per (school) week. Arts education represented 11% (9-11 year olds) and 8% (12-15 year olds) of their mandatory intended instruction time (Figures 1.2 and 1.3). This is less than reading and literature, science, mathematics, social sciences – but much more than vocational and practical skills, technology or religion.

The lack of assessment criteria worldwide for student learning in the arts is due in part to the perceived difficulty of assessing arts learning. But this lack also reflects a common view of the arts as peripheral and as a form of entertainment rather than

as a form of serious thinking (Table 1.A1.2). In addition, how students perform in arts classes is almost never a decisive factor when it comes to deciding whether a student should repeat a grade or be promoted into academic tracks (in countries which have such tracking), as shown by recent data by the European Commission (Eurydice, 2009).

Figure 1.2. **Instruction time of arts subjects as a percentage of total compulsory instruction time for 9-11 year-olds (2001-2009)**



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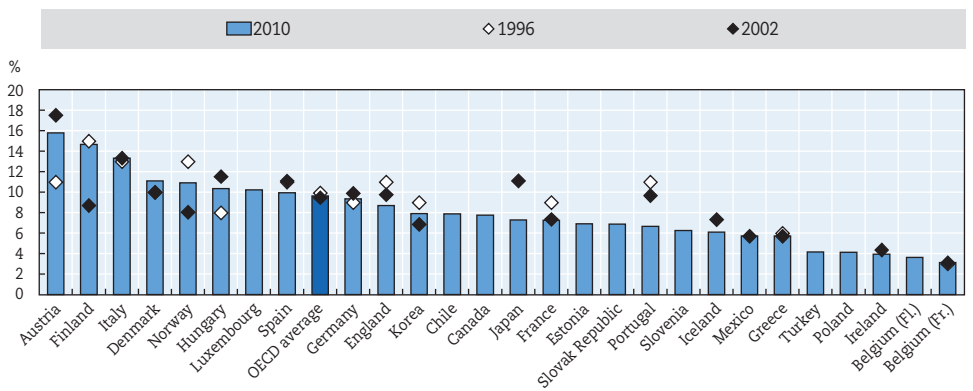
Note: Countries are ranked in descending order of 2010 instruction time of arts subject as a percentage of total compulsory instruction time. The OECD average presented is based on countries for which information is available in 2001 and 2010.

Source: OECD (*Education at a Glance* 2003, 2012).

Figure 1.3. **Instruction time of arts subjects as a percentage of total compulsory instruction time for 12-14 year-olds (1996, 2002, 2009)**



StatLink http://dx.doi.org/10.1787/888932832915

Note: Countries are ranked in descending order of 2010 instruction time of arts subject as a percentage of total compulsory instruction time. The OECD average presented is based on countries for which information is available in 2002 and 2010.

Source: OECD (*Education at a Glance* 1998, 2004, 2012).

In their arts education curricula, most OECD countries try of course to develop artistic skills. But interestingly, almost all of them also conceive of arts education as a way to develop more overarching skills that are not specific to the arts (Table 1.A1.3). Arts education curricula commonly seek to foster individual expression, creativity, imagination, problem solving, risk-taking, team work, and communication and presentation skills. Thus, the assumption that learning in the arts transfers to skills and behaviours outside of the arts seems to pervade arts education policy in most OECD countries. However, arts education curricula do not generally seek to foster non-arts academic skills such as reading, mathematic or scientific reasoning or problem solving.

Arts advocacy and claims about transfer effects of the arts

In the current educational climate, when education budgets are tight, and when nations compete on student test scores (e.g. Tucker, 2013), the arts risk being seen as peripheral and therefore expendable.

A 2006 report prepared by the National Assembly of State Arts Agencies in the United States stated that "study of the arts is quietly disappearing from our schools. In schools across the country, opportunities for students to participate in high-quality arts instruction and activities are diminishing, the result of shifting priorities and budget cuts" (Ruppert, 2006, p. 1). And a 2004 report from the Council for Basic Education about the role of the arts in US schools from kindergarten through the 12th grade concludes: "our survey uncovered both good news and bad news. The good news: we found strong evidence of growing commitment to mathematics, reading, writing, science, and secondary social studies. The bad news: we also saw ample evidence of waning commitment to the arts, foreign language, and elementary social studies. What's more, we found that the greatest erosion of the curriculum is occurring in schools with high minority populations – the very populations whose access to such a curriculum has been historically most limited" (von Zastrow, 2004). The 2011 report from the President's Committee on the Arts and the Humanities sounds the same note: "due to budget constrains and emphasis on the subjects of high stakes testing, arts instruction in schools is on a downward trend" (PCAH, 2011, p. vi).

This perception of a decline of arts education in school instruction time may not be accurate. In the past decade, on average there has been relative stability in the time devoted to arts education in countries' (intended) instruction time. In 11 out of 18 OECD countries for which we have data for 2001 and 2010, the share of time devoted to arts education has decreased in compulsory instruction time for 9-11 year old children, but the decrease has generally been very small (0.4 percentage points on average). The same is true for 12-14 year-olds with a slight decrease in 8 countries, and a small increase by 0.2 percentage points on average between 2002 and 2010. This recent stability may hide a decrease over a longer period of time, but recent change has been limited on average. A 2012 report by the US Department of Education showed that the offering of dance and theatre in US elementary schools had dramatically decreased in the past decade: in 2010, 3% of schools offered dance,

and 4%, theatre, against 20% in 2000. However, there was no decrease for music and visual arts education, which have always represented the principal forms of arts education in US elementary schools. Thus, even in the United States, the decrease of arts education has been limited. The decline concerns some specific populations though, as the report points to inequities in access with disadvantaged students having suffered the most from the decrease (NCES, 2012).

As a result of this decrease or perceived decrease, arts educators and advocates have attempted to strengthen the position of the arts in the curriculum primarily by arguing that the arts can be used to strengthen core academic skills such as reading and mathematics (Rabkin and Redmond, 2004). Many practical guides for integrating the arts with academics can now be found (e.g. McDonald and Fisher, 2006). We have mentioned the use of the "integrated curriculum" above. In the United States, there is for example a Music in Education National Consortium[2]. Many arts advocates argue that the arts should gain a stronger foothold in school because they help children learn to read, write, do math, and grasp scientific concepts. Another, more recent claim relates to the innovation and creativity agenda that pervades the policy talk about arts education. The US President's Committee on the Arts and the Humanities provides a clear example of both arguments:

> Students who do graduate from high school are increasingly the products of narrowed curricula, lacking the creative and critical thinking skills needed for success in post-secondary education and the workforce. In such a climate, the outcomes associated with arts education – which include increased academic achievement, school engagement, and creative thinking – have become increasingly important. Decades of research show strong and consistent links between high-quality arts education and a wide range of impressive educational outcomes. This is true even though, as in most areas where learning is complex, the research base does not yet establish causal proof (PCAH, 2011, p. v).

Our book examines the strength of the research evidence linking arts education and educational outcomes. In some cases we will display strong results, which establish causal (or close to causal) links; in other cases, we will show that current available evidence, as impressive as it may seem, does not allow making any conclusion yet.

But before presenting the scope and methodology of the book, let us take a closer look at some of these "transfer" claims. According to a 1995 report in the United States by the President's Committee on the Arts and Humanities, "teaching the arts has a significant effect on overall success in school" (Murfee, 1993, p. 3). The report justifies this claim by noting that both verbal and quantitative SAT scores are higher for high school students who take arts courses than for those who take none. (The SAT is the exam taken for admission to US colleges and universities.) One year later, another report from the President's Committee on the Arts and Humanities stated: "at-risk youth show increased motivation to learn and improve academically when participating in arts education programs outside of school" (Weitz, 1996).

In 1999, former US Secretary of Education, Richard Riley, stated that "the arts teach young people how to learn by giving them the first step: the desire to learn" (Fiske, 1999, p. vi). In the United States, the most recent and perhaps strongest version of such claims for the power of the arts to "transfer" to other areas beyond the arts (whether cognitive, social, or motivational) can be found in Deasy (2002), Rabkin and Redmond (2004) and Ruppert (2006). Increasingly, these claims also include references to preparing students to an innovative, global economy, establishing links with the policy talk mentioned above (e.g. Ruppert, 2010; Cheney and Jarrett Wagner, 2008, and some of the quotes above). Similar statements can also be found in Europe or the Asia-Pacific region.

The motivation for making these strong claims is clear: schools and education systems under pressure to cut the arts due to budgetary limitations would perhaps keep the arts if the arts were seen as tools to strengthen academic outcomes and other skills for innovation. But though budget cuts have spurred claims for transfer of learning from the arts, such claims in fact have a long history in educational theory (Wakeford, 2004). Given their peripheral status, there has always been a strong felt need to justify the arts in the "common curriculum." According to Wakeford (2004, p. 85), "the philosophical origins of mass arts education…were imbued with a belief that the arts were not mere ends in themselves, but rather that they were implicated in the development of sophisticated mental faculties with both academic and practical applications." Wakeford (2004, p. 84) points out that the kindergarten movement in the United States drew support from the theories of Heinrich Pestalozzi and Friedrich Froebel, both of whom believed in the importance of drawing for developing children's perception and understanding. According to Efland (1990), Horace Mann was strongly influenced by Pestalozzi and believed that drawing should be part of the common curriculum not only because drawing would strengthen perception and design but also because it would develop an emotional appreciation for beauty, provide "moral uplift," and develop communication skills and music educators defended music for its ability to improve memory and pronunciation (Keene, 1982). Inclusion of the arts in education was part of the progressive education movement's belief in educating the whole person (Wakeford, 2004).

Along with claims that teaching the arts is a way of actually developing academic skills we find the claim that the arts are important because they motivate children. The arts are said to engage students in school activities and prevent them from dropping out; the arts are said to make school more attractive, more fun, and to help students to express themselves and find their identity. The chairman of the US National Endowment for the Arts, Rocco Landesman, was quoted in a November 2009 article in the *Wall Street Journal* as saying, "we're going to try to move forward all the kids who were left behind by 'No Child Left Behind' – the kids who have talent or a passion or an idiosyncratic perspective. Those kids are important too and they should have a place in society. It is very often the arts that catches them."[3] But in an article in *Education Next*, Mark Baurerlein (2010) critiques this kind of justification for the arts: "Landesman doesn't defend arts education as a rigorous discipline… Instead, the purpose is salvation. Some students don't fit the NCLB [No Child Left

Behind] regime and other subjects don't inspire them. Talented but offbeat, they sulk through algebra, act up in the cafeteria, and drop out of school. The arts 'catch' them and pull them back, turning a sinking ego on the margins into a creative citizen with a 'place in society'." This kind of justification would never be made for mathematics or history – disciplines never questioned as serious subjects of study for *all* students.

Assessing the impact of arts education on non-arts outcomes

Before proceeding further, we discuss briefly the notion of transfer from one field (arts) to other ones, and present different assumptions that could explain the impact of arts education on non-arts outcomes. We emphasise the fact that both causal and correlational reasons could explain this impact and stress that correlation (the fact that two things are associated) should not be equated to causation (the fact that one thing leads to another thing or causes it).

What do we mean by transfer?

A brief discussion of the meaning of transfer is necessary.

A significant share of the research literature on the impact of arts education on different types of skills is based on a transfer paradigm – in line with the arts advocacy claims that we have presented above. This transfer literature represents the bulk of the research that we will review in this book. Instead of asking what skills or outcomes different kinds of arts education may lead to, many studies try to demonstrate that arts education has some impact on non-artistic outcomes measured by scores in mathematics, reading or science on standardised tests. In other cases, it can be creativity as measured by creativity tests such as the Torrance creativity tests, or academic motivation as measured by dropout (or survival) rates in school. These studies often miss measures of proximal (mediating) factors that would allow us to better understand the mechanisms through which different arts forms develop different skills that, subsequently, may have an impact on more generic academic outcomes. Consider this example. If a study finds that an arts-infused curriculum leads to improved academic performance, it would be essential to investigate mediating factors. For example, suppose that an art-infused curriculum leads students to be more motivated to attend school, and also attracts more innovative and engaged teachers. Perhaps it is these mediating factors that cause the higher test scores. This kind of more complex research is called for in the future. Or suppose that a study finds that students trained in theatre become leaders. Perhaps the proximal factor is that they have learned public speaking skills, which fosters self confidence, which in turn helps them to speak out and motivate people in a work setting. These proximal factors would need to be assessed to determine if this hypothesised causal chain is in fact what has happened.

The psychological literature on transfer is controversial, and has been reviewed in Detterman and Sternberg (1993). Transfer is often taken to refer to learning acquired in one domain that generalises to another domain. Thus the

learning of Latin was once assumed to increase general skills of learning and attention. Thorndike and Woodworth (1901) challenged this assumption when they demonstrated specificity rather than generality of learning. They concluded:

> The mind is... a machine for making particular reactions to particular situations. It works in great detail, adapting itself to the special data of which it has had experience... Improvements in any single mental function rarely brings about equal improvement in any other function, no matter how similar, for the working of every mental function group is conditioned by the nature of the data of each particular case (Thorndike and Woodworth, 1901, pp. 249-250, cited in Bransford and Schwartz, 1999).

It is important to put the research on arts transfer into the context of other research on transfer. Transfer is always difficult to demonstrate. In a book entitled *Transfer on Trial* (Detterman and Sternberg, 1993), Detterman states in the introductory chapter:

> First, most studies fail to find transfer. Second, those studies claiming transfer can only be said to have found transfer by the most generous of criteria and would not meet the classical definition of transfer (defined by Detterman as "the degree to which a behaviour will be repeated in a new situation", p. 4) [...] In short... transfer is rare and its likelihood of occurrence is directly related to the similarity between two situations (p. 15).

Thus, limitations in rigorous attempts to demonstrate transfer from the arts are in no different a position from attempts to demonstrate other forms of transfer of learning.

While noting that the traditional approach to the study of transfer is to examine whether learning in one domain predicts achievement in a transfer domain, Bransford and Schwartz (1999) suggest that transfer studies should instead examine whether learning in one domain predicts greater *preparation for future learning* in a transfer domain that is a knowledge-rich environment. If we applied this to the arts, we might investigate whether learning in the visual arts makes it easier for students to master geometry concepts when they are later exposed to a geometry class (rather than whether learning in the visual arts predicts higher geometry scores before putting students in a geometry class). Similarly, one might investigate whether learning in music makes it easier for students to master arithmetical concepts when they are later exposed to a class in arithmetic (see also Terwal, van Oers, van Dijk and van den Eeden, 2009; and Greeno, Smith and Moore, 1993). This kind of "process-oriented" research, which has not yet been carried out in the area of the arts, would make a valuable contribution to our understanding of transfer of learning from the arts.

Potential causal mechanisms underlying transfer from the arts

In this book we must rely on the existing studies examining to what extent arts education transfers to other domains. What kind of causal mechanism could account for the arts' power to percolate beyond the arts and improve cognitive,

social, and motivational aspects of students' lives? Four very different kinds of causal explanation seem possible:

- *Neurological*: learning in an art form might activate brain areas that are also involved in some form of non-arts learning;
- *Cognitive*: learning in an art form might train cognitive skills that are involved in some non-arts area;
- *Social*: learning in an art form might train social skills that are involved in some form of non-arts area;
- *Motivational* or *behavioural*: learning in an art form might be motivating or develop behaviours or attitudes that might spill over into other areas.

Consider the following ways in which learning in the arts might lead to develop skills or dispositions that could spill over into academic areas (discussed in more length in Winner and Cooper, 2000):

Common skills. Some art forms may develop specific skills that are useful in non-arts contexts and on which some academic domains build. For example, music education may improve the quality of hearing, including in non artistic contexts, and the improvement of this skill might then have a positive impact in other contexts in which hearing matters, for example in the study of language arts. In this case, an academic domain benefits from a skill that has been improved by training in the arts.

Entry points. The arts could serve as motivational entry points into an academic area for otherwise unmotivated or non-academically inclined students. For example, teachers might use music notation as a way into understanding fractions, they might ask students to dramatise a historical event to deepen their understanding of the event, or they might use a visual art project as a way to stimulate students to write – by asking them to write about their reflections on the project.

Self-confidence. Participation in the arts could boost the self-confidence of students – at least of those who discover they can perform well in an art form – and this could then lead to a more positive attitude towards school, and to making a greater effort at academic subjects.

Better working habits. The arts may develop discipline, perseverance, creativity, and high standards as students work on long-term projects which will be publically displayed. These working habits could then spill over into other subject areas. Of course this is only possible if instruction in an art form really does teach the skills of discipline etc. Hetland, Winner, Veenema and Sheridan (2013) analysed the teaching of five visual arts teachers and found that for example they stressed the importance of persistence. Any study testing the hypothesis that arts instruction teaches students to stick to tasks and work hard must first demonstrate that students actually learned to persevere in their art class. The next step would be to test whether this new skill percolates into other areas of the school curriculum.

Stress-reduction. Participation in the arts has been shown to lead to mood elevation (Coleman, Drake and Winner, 2011; Dalebroux, Goldstein and Winner, 2008; DePetrillo and Winner, 2005), and improved mood might allow students to return refreshed and motivated to their academic studies. It is well known that positive arousal states improve performance on cognitive tasks (Nantais and Schellenberg, 1999; Thompson, Schellenberg and Husain, 2001).

It is also important to distinguish the following three possible kinds of transfer from arts to academic outcomes.

First, instruction in an art form could lead to improvement in an academic outcome (though it strains credulity to think that arts instruction could have a stronger effect on an academic outcome than direct training in that outcome).

Second, instruction in an art form could lead to the improvement of artistic skills that also make the achievement of certain academic outcomes more likely (albeit to a lesser extent than direct training in this outcome). Arts education could then have collateral benefits and possibly be a "cost-efficient" educational option in fostering both artistic and academic outcomes.

And third, instruction in an art form when integrated with academic instruction might result in greater academic improvement than does academic instruction minus the arts. If an arts-integrated approach leads to the same level of improvement in an academic subject as does a traditional approach, we need not conclude that the arts integrated approach is a bad method. Rather, we have to conclude that this approach is no more effective than a traditional approach that does not use the arts as a motivator, hook, or entry point. In fact, as highlighted in the second case, it could be considered more effective if it achieves the same outcomes as the traditional approach but *also* improves arts outcomes (assuming this is not the case of the traditional approach).

It is noteworthy that the impact of different kinds of arts education on some specific skills could not only be transferred to academic domains, but also to real life situations. Let us assume that, for some students, arts education fosters self-confidence. Even if it does not transfer into better scores in mathematics, a certain level of self-confidence is typically an outcome that is valued by education policy makers and would be an interesting finding for education policy making.

Similarly, experience of public performance in an art form may lead students to better regulate their anxiety for other kinds of non-arts public performance, such as public presentations. When it takes the form of a collective practice, dance education or music education might help to foster teamwork skills. Here, transfer does not go from the arts to academic domains, but from the arts to skills that are valuable in every day life, in the labour market, or just valued by education policy makers. A few studies have examined the effects of arts training on general skills such as "attention," and attention is one kind of general skill that may spill over to performance in the workplace.

Non-causal explanations for arts-academic correlations

It is possible that no direct causal link underlies the association between arts involvement and academic achievement. As pointed out by Winner and Cooper (2000), schools that grant the arts a central role in the curriculum may also make other kinds of reform in the way that academic subjects are taught. Such schools are likely to be ones that value innovative, constructivist, project-based academic work. In the Singaporean and British examples we have presented above, researchers observed a change in teachers' motivation and teaching practices, so that good results could not be attributed to arts education alone. Such schools may also attract the best kinds of teachers of academic subjects as well as students from families that value the arts. And families that value the arts may also value academic achievement. Thus, we cannot make causal inferences from correlational findings showing that students with arts experience are also academically strong. The presence of the arts in a school's curriculum may simply be indicative of other aspects of the school that are themselves directly linked to and causally implicated in academic improvement. Some researchers have attempted to show that putting the arts in a school transforms the entire school culture. Demonstrating transfer not only requires a strong theory of transfer, but also a good understanding of the conditions in which transfer does (or does not) occur.

Transfer claims similar to those made for the arts are also made about chess. For instance, former US Secretary of Education Terrell Bell wrote that chess is a way to develop a pre-schooler's intellect and academic readiness (Bell, 1982). School principals who have instituted chess programmes have claimed that chess improves standardized test scores, increases enthusiasm for learning, boosts self-confidence, increases school attendance rates, and fosters critical thinking and problem solving. For these very reasons, the European Parliament adopted a Written Declaration "Chess in School" in 2012 – and Armenia and Hungary are two country examples that included chess in their mandatory elementary school curriculum. When we see the same kinds of claims made enthusiastically for the arts as well as chess, we might stop and wonder – just what is the evidence base for such claims?

This report examines the existing evidence for causal transfer of learning from arts education to areas beyond the arts. As noted above, transfer of learning is notoriously difficult to demonstrate and has a long and vexed history in psychology (Barnett and Ceci, 2002; Bransford and Schwartz, 1999; Detterman, 1993; Halpern, 1998; Schwartz, Bransford and Sears, 2005). The transfer of skills from one domain to another is generally not thought to be automatic: it needs to be taught (Salomon and Perkins, 1989). Most of the studies investigating transfer from the arts have not been based on explicit teaching for transfer, where students are told to try to apply the skills developed in an art class to work outside of the arts. Thus, it is hardly surprising that in this report we document many failed attempts to demonstrate transfer. Nonetheless, we also found a few robust findings of transfer as well as promising new studies that suggest that there may indeed be certain kinds of causal connections between arts learning and cognitive and social skills.

Methods of this report

How would student learning be affected if the arts were given a more central role in our schools? What do we know about the impact that arts education could have on our children's academic achievement, their capacity to innovate, their social skills, their brain development and functioning? We do not yet have definitive answers to these questions. One reason is that the strongest way to determine whether the association between arts involvement and academic achievement is a causal one is to conduct experimental studies that allow causal inference. Very few such studies have been performed. The bulk of the research on the relationship between arts and non-arts outcomes has been correlational, undoubtedly because of the difficulty of conducting experimental research in school settings.

In 2000, in a special issue of *The Journal of Aesthetic Education*, Winner and Hetland published a set of meta-analytic studies synthesising the state of the evidence about the impact of arts education on non-arts cognition. We refer to this as the Reviewing Education and the Arts Project (REAP). Both published and unpublished studies appearing between 1950 and 1998 were identified, and the topics covered were:

- The impact of "multi-arts" study on academic achievement (grades and test scores in verbal and mathematical areas);
- The impact of "multi-arts" study on creativity;
- The impact of music on spatial skills;
- The impact of music on mathematics skills;
- The impact of music on reading skills;
- The impact of drama (theatre) on verbal skills;
- The impact of visual arts on reading;
- The impact of dance on reading;
- The impact of dance on spatial skills.

In the present book, we summarise the findings of each of these meta-analyses and then review studies on each of these topics that have appeared since 1998. We have also included studies examining cognitive outcomes not considered in the Winner and Hetland report, as well as studies examining the effects of education in specific art forms on creativity, academic motivation, social skills, and the brain.

For each topic meta-analysed by the 2000 Reviewing Education and the Arts Project (REAP) report, we include two major sections: first the conclusions of the relevant meta-analysis, and then a narrative summary of the studies located since 2000 on the outcome in question. For potential outcomes not covered in the REAP report, we provide narrative summaries of relevant studies on each outcome.

Our narrative summaries could lead to a meta-analysis of each group of studies, and we know that meta-analysis is a far better method of synthesising studies than simply tallying positive and negative findings. This is a very large and challenging task, and was therefore beyond the scope of the present project. We have provided the foundation for future meta-analyses by locating and summarising all of the relevant studies.

To identify studies not included in the REAP reports, we searched two English language data bases: Psychological Information Database (PsycINFO) and Educational Resource Information Center (ERIC) for studies (including unpublished studies such as dissertations). We also searched in the following data bases for non-English languages: Dutch, Finnish (Jykdok and Nelli), French (Persée, CAIRN, Revues.org, Erudit, JStor), German (FIS), Italian (RIVI – Banca dati riviste educative), Japanese (CiNii, MAGAZINEPLUS, Journal@rchive), Korean (RISS, KISS, National Assembly Library, DBpia, KEDI, KERIS and Thesis.or.kr), Spanish (DIALNET and SCIELO), Swedish (Libris, Swepub, SND), and Portuguese (B-on, Cienciapt.net, EBSCOhost, INE, SCIELO, Academia.edu, Repositorio of Lisbon University). The search of non-English articles covered the whole time span of the data bases.

For topics not covered by Winner and Hetland (2000) we searched for studies from 1980 to the present; for studies covered by Winner and Hetland we searched for studies from 1998 on. Each search consisted of a pairing of an art form term (visual art, theater, theatre, dance, arts) with one of the following search terms:

- *Academic outcomes*: Math*, Spatial*, Verbal*;
- *Creativity outcomes*: Creativity*, Innovation;
- *Motivational outcomes*: Engagement, Persistence, School Attitude, School Attendance, School Dropout;
- *Social skills outcomes:* Emotion Regulation, Empathy, Perspective Taking, Self Confidence, Self Efficacy, Self Esteem, Social Competence, Theory of Mind;
- *Brain outcomes*: Brain.

For the domain of music, instead of searching in data bases, we identified studies by reading recent comprehensive reviews since REAP (Moreno, Marques, Santos, Santos, Castro and Besson, 2008; Patel, 2010; Rittelmeyer, 2010; Schellenberg, 2001, 2005, 2006; Schellenberg and Moreno, 2010; Schellenberg and Peretz, 2008; Schumacher et al. 2006; Spychiger, 2001). For languages where there was little relevant empirical research, we started the search with broader terms to get more hits.

Searches on topics not covered by REAP (conducted since 1980) yielded close to 350-400 hits each, except for searches using the term "brain," which yielded only about 50 hits for each search. Searches on topics covered by REAP (since 1998) yielded close to 150-200 hits. Almost all of the studies found were conducted in the United States. We then examined each article and discarded studies according to the following criteria:

- We discarded reports that were not empirical studies.
- We discarded studies that lacked control groups and simply reported that after studying the arts, a group of children improved (or not) on some outcome, since we cannot determine from such a report whether they would have improved even without the arts.
- We did not often include studies of strong arts programmes because these are not studies of the transfer of learning from the arts in which one kind of school (with the arts) is compared to a control school lacking the arts. Many such studies can be found and they showcase what appear to be excellent arts programmes: e.g. *Gaining the Arts Advantage: Lessons from School Districts that Value Arts Education* (Presidents Committee on the Arts and Humanities and Arts Education Partnership, 1999); *Gaining the Arts Advantage: More Lessons from School Districts that Value Arts Education* (Presidents Committee on the Arts and Humanities and Arts Education Partnership, 2000); *The Art of Collaboration: Promising Practices for Integrating the Arts and School Reform* (Arts Education Partnership) (Nelson, 2008); and *Third Space: When Learning Matters* (Arts Education partnership, 2005). Even when these programmes show high academic performance or other positive outcomes, we cannot consider them as evidence of the arts having a causal impact on academic performance. We cannot know whether the arts lead to the academic outcome or whether these programmes attract strong students and strong teachers to begin with. However, we did include these kinds of case studies when they addressed outcomes for which there is little research.
- We discarded the body of literature on the transitory effects of brief music listening (relevant to the claims about the "Mozart effect"), which was covered in detail by Hetland (2000). This decision was made because these studies examine the effects of very brief (e.g. 10 minutes) of music exposure, and we did not consider this sufficient exposure to qualify as "arts education." While Hetland's meta-analysis reported a positive causal relationship between music listening and transitory visual-spatial improvement, a more recent meta-analysis reports no relationship (Pietschnig, Voracek and Formann, 2010; see also Bangerter and Heath, 2004; Chabris, 1999). We also do not review here studies on the effectiveness of background music for academic performance, as we do not consider background music listening to be a form of arts education.

We mention as background information correlational (non-experimental, non-causal) studies with adult artists (for example showing that trained musicians excel in memory). We did not include such studies in our tables because our objective was to examine what is known about the effects of arts education on children and adolescents in and out of school.

The full set of studies reviewed here fall into the categories shown in Table 1.1. Table 1.1 also shows the number of studies in each category reviewed in the REAP reports and the number of studies reviewed here that were not part of the REAP reports. One academic article can report results for several categories of outcomes.

Table 1.1. **Studies reviewed in this report: Art form by outcome**

		Number of studies in REAP meta-analyses	Number of studies not in REAP meta-analyses
	COGNITIVE OUTCOMES		
MULTI-ARTS	General Academic Achievement	66	35
MUSIC	General Academic Achievement	1	3
	IQ	0	13
	Reading/Speech Perception	16	43
	Non-Native Language Learning	0	1
	Math	26	11
	Visual-Spatial Skill	29	3
	Attention	0	6
	Memory	0	2
VISUAL ARTS	General academic achievement	1	3
	Reading	13	1
	Geometric/Spatial Reasoning	0	33
	Observational Skills	0	2
THEATRE	General Academic Achievement	1	3
	Verbal Skills	80	1
DANCE	General Academic Achievement	1	4
	Reading	4	0
	Visual-Spatial Skill	4	0
	CREATIVITY OUTCOMES		
MULTI-ARTS	Creativity	16	3
MUSIC	Creativity	0	0
VISUAL ARTS	Creativity	0	2
THEATRE	Creativity	0	3
DANCE	Creativity	0	4
	MOTIVATIONAL OUTCOMES		
MULTI-ARTS	Academic Motivation	23	12
	SOCIAL SKILLS OUTCOMES		
MULTI-ARTS	Self-Concept	0	3
MUSIC	Self-Concept	0	1
	Empathy	0	2
VISUAL ARTS	Self-Concept	0	1
	Emotion Regulation	0	2
	Empathy	0	1
THEATRE	Social Behaviour	0	5
	Self-Concept	0	4
	Emotion Regulation	0	3
	Empathy	0	2
	Perspective Taking	0	6
DANCE	Self-Concept	0	3
	Social Skills	0	5

Arts as stand-alone classes vs. Arts integrated classes

Some of the studies discussed in this report examine "stand-alone" arts classes taught by specialists. Some studies examine the effects of arts integration – when art lessons are infused into an academic area to enrich and enhance learning of that topic (as for example when the visual arts are used to help children interpret a historical era). The idea of arts integration has been in the air for a long time – first advanced as a concept by Winslow (1939), who felt that all school subjects, including the arts, should be interwoven. The argument for arts integration has always been that such integration will lead to deeper and enriched academic learning (Hilpert, 1941; Wakeford, 2004). Arts integration is typically accomplished with a partnership between a school and an arts organisation that supplies visiting artists to work directly with teachers to develop arts-academic units. Such partnerships are quite common in the United States, and are increasing in number in the United States, the United Kingdom and Australia (Aprill and Burnaford, 2006). Finally some studies examine the arts as experienced in after-school programmes. Unfortunately, we found no studies that directly compare the effects of these different types of arts experience.

Preview of our conclusions

Our review leads us to the conclusion that in certain areas, there is suggestive evidence for transfer. The strongest research is in the area of music. Music education appears to strengthen Intelligence Quotient (IQ), academic performance, and phonological awareness and word decoding skills. Also strong is research on theatre. Theatre education strengthens verbal skills and may also strengthen perspective taking, empathy, and emotion regulation.

However, the claims for the transformative effects of the arts on non-arts outcomes often exceed the evidence. This does not mean that the claims are false. Rather, they have not yet been shown to be true. In some cases, the extant positive evidence is not strong or numerous enough yet to allow us to make firm conclusions. In others, the claims are not plausible as there is no good theory that could explain why arts education should have the expected effect (or there are many other plausible explanations). In some other cases, there is just no research.

We did not find support for the kinds of claims that we typically hear made about the arts – that infusing the arts in our schools improves academic performance in the form of higher verbal and mathematical test scores and better grades and makes children more innovative thinkers. It is here that we have to conclude: not yet proven! Moreover, even in the areas where we report suggestive promising evidence, we stress the need for experimental studies where causality can be concluded.

Conceptual issues

Research on the impact of arts education needs to begin with a strong analysis of the habits of mind engendered by a particular art form. Such an analysis then leads to clear hypotheses about what is learned in that art form, and what kinds of learning may be broad enough to spill over into non-arts areas of the curriculum. Some studies that we review (e.g. examining the effect of music instruction on language, and drama instruction on social-cognitive skills) have followed this approach: they have investigated other outcomes besides test scores, and have yielded promising insights into the power that the arts can have in our schools.

Methodological issues

As mentioned, one reason for the weakness of the evidence thus far is due to the difficulty of doing experimental work in schools. As described in Box 1.1, to really determine whether the arts are having a causal impact on some hypothesised outcome, it is generally necessary to carry out a true experiment, using the kind of "medical" randomised controlled trial model used to test the effectiveness of a drug. Students would need to be randomly assigned to either an arts education "treatment" or to another kind of "treatment." Without random assignment, the arts and control groups may not in fact be comparable. For example, those in the arts group may be stronger to begin with (or have a different cognitive profile from those in the non-arts group); or those in the art group may have more effective and innovative teachers. With a few exceptions (e.g. Schellenberg, 2004), these kinds of true experiments have not been carried out to test the impact of the arts on non-arts outcomes. Most of the studies conducted on transfer from the arts have been correlational (the majority) or quasi-experimental (without random assignment of participants, and hence subject to the criticism that students who self-select into an art form have pre-existing superior skills in some area, rather than having skills that are developed into superior form by training in an art form).

In a correlational study, students are not tested on an outcome before and after an arts education experience. Rather, students with much arts exposure are compared to those with little arts exposure on some outcome. Often (but not always), those with arts exposure score higher on the outcome(s) assessed. The problem with correlational studies, of course, is that we cannot infer any causality. For example, a study by Catterall (1998) (featured in Box 2.2) reported that students involved in the arts do better in school and also spend less time watching television than do students with low arts involvement. It is tempting to conclude that the strong academic achievement of these students is due to the arts education they received. But of course their achievement might equally be due to spending less time with television, or to any other of the many differences distinguishing the high vs. the low arts-involved students.

Box 1.1. **Methodological issues in the study of transfer of learning from the arts**

We sought in this report to keep the following methodological issues in mind, issues that were discussed at length by Winner and Hetland (2000). A few other resources discussing different methods to demonstrate causal inference and assessing the strength of different kinds of evidence in educational settings can also be mentioned: National Research Council (2002, 2004); Schneider, Carnoy, Kilpatrick, Schmidt and Shavelson (2007); OECD (2007).

Only studies with a true experimental design, with random assignment of students and teachers to arts vs. non-arts groups, can allow a causal inference. True experimental research means random assignment of students and teachers to arts vs. control classrooms. However, this is nearly impossible to carry out in the real and messy world of schools. Researchers must therefore adopt quasi-experimental methods. This can be done by assigning classrooms to an arts vs. a non-arts focus, but this requires the schools to cooperate. More often, researchers are forced simply to evaluate an existing arts programme by comparing it to an appropriate comparison programme that does not stress the arts. The key issue here is the nature of the comparison group. In order for clear conclusions to be drawn, the two programmes need to have students matched at pretest on the outcome in question, and need to have teachers of similar quality. Matching teachers is extremely difficult because schools that are strong in the arts are likely to attract a different kind of teacher (more progressive, probably) than do schools that give short shrift to the arts. It is also important to insure that the teaching in the two programmes does not differ in other respects besides the role given to the arts. If the arts oriented programme has more project learning and stresses more critical thinking than does the comparison classroom, we cannot know whether differences in outcome that favor the arts programme are due to the arts emphasis or to the project/critical thinking emphasis.

To evaluate the effects of a new arts programme, the ideal comparison group is one in which some other new kind of programme has been instituted (e.g. an arts programme vs. a chess programme). This is because any new programme is likely to have positive initial effects. The inspirational/energising effect of a new programme is called the "Hawthorne effect" (Cook and Campbell, 1979).

Most studies examining the relationship between arts instruction and some other non-arts outcome are correlational in design, demonstrating that students who have chosen to study the arts score higher on some non-arts outcome than are those who do not study the arts. However, such a result tells us nothing about whether or how arts learning caused the improved outcome. Studying an art form could indeed causally strengthen other areas of behaviour due to habits of learning developed in excellent arts courses (e.g. persistence, reflection, observation), which could then transfer to other areas of the curriculum. And arts instruction could cause improved behaviour in other areas because students who study the arts become more motivated and engaged in school. But it is equally possible that correlational findings are due to no causal relationship at all. Students who are academic achievers may attend schools strong in both academics and the arts; they may come from families that value both academics and the arts; they may be strong enough academically to have time left over for the arts (and have parents and teachers who therefore encourage them to study the arts); or they may simply be students who are strong in both academics and the arts. The fact that they are strong academically means they would have more free time for the arts, and might lead parents to encourage them to use their extra time by studying one or more art forms.

Dangers of instrumental claims

The studies we review in this report all focused on some hypothesised *extrinsic* effects of arts education, probably because of the felt need to justify the arts in the basic curriculum by something other than the intrinsic benefits of the arts. But instrumental justifications for the arts can be self-defeating, as we point out in our conclusions. Instrumental arguments can lead to weakening the role of the arts in schools if, for example, the arts are not shown to lead to higher academic achievement, or if they are shown to do so less effectively than direct academic instruction. Some researchers have begun to veer away from instrumental justifications, arguing that we must think carefully about the intrinsic effects of arts education, effects which are unique to the arts. A cogent case for a refocus on arts education's intrinsic value has been made by McCarthy et al. (2004), and we return to this point in the conclusion to this report.

Notes

1. Competences are defined as the combination of knowledge, skills and attitudes appropriate to the context. The eight key competences are: 1) communication in the mother tongue; 2) communication in foreign languages; 3) mathematical competence and basic competences in science and technology; 4) digital competence; 5) learning to learn; 6) social and civic competence; 7) sense of initiative and entrepreneurship; and 8) cultural awareness and expression. The Recommendation notes that "the key competences are all considered as equally important, because each of them can contribute to a successful like in a knowledge society".

2. *http://music-in-education.org/2010/03/4th-graders-study-music-math-and-composition*.

3. *http://online.wsj.com/article/SB10001424052748703932904574511320338376750.html*.

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ANNEX 1.A1

Supplementary tables and figures

Table 1.A1.1. **Status of arts classes in the national curriculum, ISCED 1 and 2 (2013)**

		Visual arts		Music		Drama		Dance		Craft		Media arts		Architecture	
	ISCED	1	2	1	2	1	2	1	2	1	2	1	2	1	2
OECD countries	Australia	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲		
	Austria	▲	▲	▲	▲	Δ	Δ	–	–	▲	▲	Δ	Δ		
	Belgium (De.)	▲	▲	▲	▲			–	–						
	Belgium (Fr.)	▲	▲	▲	▲	Δ	Δ			Δ	Δ				
	Belgium (Fl.)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		▲
	Canada (Ontario)	▲	▲	▲	▲	▲	▲	▲	▲						
	Canada (Québec)	▲	▲	▲	▲	▲	▲	▲	▲						
	Chile	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Czech Republic	▲	▲	▲	▲	Δ	Δ	Δ	Δ	Δ	Δ	▲	▲		
	Denmark	▲	Δ	▲	Δ	Δ				▲	Δ	Δ			
	Finland	▲	▲	▲	▲	–	–	–	–	▲	▲	▲	▲	▲	▲
	France	▲	▲	▲	▲	–		–	–	▲	▲	▲			
	Germany	▲	▲	▲	▲	Δ	Δ	Δ	Δ	▲	▲				
	Greece	▲	▲	▲	▲	▲	▲	–	–	▲	▲			▲	▲
	Hungary	▲	▲	▲	▲	▲	▲	▲	▲			▲			
	Iceland	▲	Δ	▲	Δ	▲	Δ	▲	Δ	▲	Δ				
	Ireland	▲	Δ	▲	Δ	▲	Δ	–	Δ	Δ		–			
	Israel	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Italy	▲	▲	▲	▲							▲	▲		
	Japan	▲	▲	▲	▲			–	–	▲	▲				
	Korea	▲	▲	▲	▲			–	–	▲	▲				
	Luxembourg	▲	▲	▲	▲					▲					
	Mexico	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Netherlands	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	New Zealand	▲	▲	▲	▲	▲	▲	▲	▲						
	Norway	▲	▲	▲	▲	▲	▲	–	–	▲	▲	–	–	▲	▲
	Poland	▲	▲	▲	▲	–	–	–	–			–	–		
	Portugal	▲	▲	▲	Δ	Δ	Δ	Δ	Δ						
	Slovak Republic	▲	▲	▲	▲	Δ	Δ	Δ	Δ						
	Slovenia	▲	▲	▲	▲	–	–	–	–	–	–	Δ	Δ		
	Spain	▲	▲	▲	▲	▲	Δ	–	–		Δ	▲	▲		
	Sweden	▲	▲	▲	▲	–	–	–	–	▲	▲	–	–	–	–
	Switzerland	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Turkey	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	UK -England	▲	▲	▲	▲	–	–	–	–	▲	▲				
	UK -Northern Ireland	▲	▲	▲	▲	–	–	–	–	▲	▲				
	UK -Scotland	▲	▲	▲	▲	▲	▲	–	–						
	UK -Wales	▲	▲	▲	▲	–	–	–	–	▲	▲				
	United States	▲	▲	▲	▲	▲	▲	▲	▲						
Partner countries	Bulgaria	▲	▲	▲	▲	–	–	▲	Δ	▲	▲	Δ	▲	Δ	Δ
	Estonia	▲	▲	▲	▲			–	–	▲	▲	–	–	▲	▲
	Latvia	▲	▲	▲	▲	–	–	–	–	–	–	–	–		
	Liechtenstein	▲	▲	▲	▲	Δ	Δ	–	–	▲	▲				
	Lithuania	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
	Malta	▲	▲	▲	▲	▲	▲	–	–	▲	▲				
	Romania	▲	▲	▲	▲										

Notes: ▲: Compulsory arts subject or part of the compulsory arts curriculum; Δ : Optional arts subject; – : Part of another compulsory non-arts subject; O : Institutional autonomy; m = missing data; Empty cell: not included in the curriculum.

Source: Extended and updated by OECD countries. Based on Eurydice for European countries and government policy papers for non-European countries.

Table 1.A1.2. **Assessment criteria for arts subjects, ISCED Levels 1 and 2 (2013)**

		ISCED1 and 2
OECD countries	Australia	–
	Austria	–
	Belgium (De.)	–
	Belgium (Fr.)	–
	Belgium (Fl.)	–
	Canada (Ontario)	▲
	Canada (Québec)	▲
	Chile	m
	Czech Republic	–
	Denmark	▲
	Finland	▲
	France	▲
	Germany	–
	Greece	–
	Hungary	–
	Iceland	–
	Ireland	m
	Israel	–
	Italy	–
	Japan	–
	Korea	–
	Luxembourg	–
	Mexico	m
	Netherlands	–
	New Zealand	▲
	Norway	–
	Poland	–
	Portugal	▲
	Slovak Republic	–
	Slovenia	▲
	Spain	–
	Sweden	▲
	Switzerland	m
	Turkey	m
	UK -England	▲
	UK -Northern Ireland	–
	UK -Scotland	▲
	UK -Wales	▲
	United States	▲
Partner countries	Bulgaria	▲
	Estonia	–
	Latvia	–
	Liechtenstein	–
	Lithuania	–
	Malta	▲
	Romania	▲

Note: ▲: Existence of assessment criteria for arts subjects; – : No criteria for arts subjects; m = missing data; Sweden: assessment criteria were defined for grades 6 and 9 in 2011-12, and assessment per se with grades started in 2012-13 in grade 6.

Source: Extended and updated by OECD countries. Based on Eurydice for European countries and government policy papers for non-European countries.

Table 1.A1.3. **Aims and objectives of arts education, ISCED 1 and 2 (2013)**

		Artistic perspective																Ability Development													
		Artistic skills, knowledge and understanding		Critical appreciation (aesthetic judgement)		Cultural heritage (national identity)		Cultural diversity (European identity/world awareness)		Enjoyment/pleasure/satisfaction/joy		Variety and diversity of arts; engaging with a variety of art forms/ media		Art and lifelong learning/interest		Identifying artistic potential (aptitude/talent)		Individual expression/identity/ development		Creativity (imagination, problem solving, risk-taking)		Social skills/group working/ socialisation/ cooperative working		Communication skills		Performing/presenting (sharing pupils' own artistic work)		Environmental awareness/ conservation/sustainability/ecology		Self-confidence/esteem	
	ISCED	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
OECD countries	Australia	▲	▲	▲	▲	▲	▲	▲	▲							▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲
	Austria	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲	▲	▲	▲	▲			▲	▲		
	Belgium (De.)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲			▲	▲	▲	▲	▲	▲		
	Belgium (Fr.)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲							▲	▲	▲	▲	▲	▲								
	Belgium (Fl.)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲							▲	▲			▲	▲			▲	▲				
	Canada (Ontario)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
	Canada (Québec)																														
	Chile	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Czech Republic	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
	Denmark	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
	Finland	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
	France	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲
	Germany	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
	Greece	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
	Hungary	▲	▲	▲	▲	▲	▲	▲	▲									▲	▲	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲
	Iceland	▲	▲	▲	▲	▲	▲	▲	▲									▲	▲	▲	▲									▲	▲
	Ireland	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲			▲	▲
	Israel	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Italy	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲							▲	▲	▲	▲			▲	▲	▲	▲	▲	▲		
	Japan	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		▲	▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		▲		
	Korea	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲	▲	▲			▲	▲	▲	▲		
	Luxembourg	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲					▲	▲	▲	▲	▲	▲						
	Mexico	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Netherlands	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
	New Zealand	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲					▲	▲	▲	▲			▲	▲	▲	▲				
	Norway	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
	Poland	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲								
	Portugal	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
	Slovak Republic	▲	▲	▲	▲															▲	▲										
	Slovenia	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲

Note: m = missing data; Empty cell: not a specified objective of arts education.

Source: OECD, based on Eurydice framework.

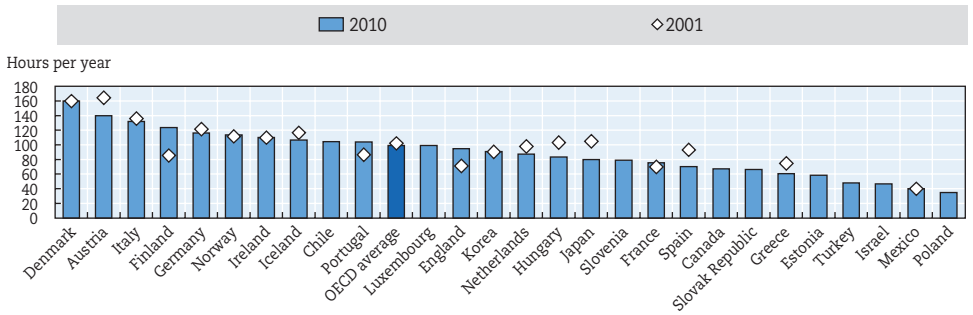
Table 1.A1.3. **Aims and objectives of arts education, ISCED 1 and 2 (2012)** (continued)

		Artistic perspective																Ability Development													
		Artistic skills, knowledge and understanding		Critical appreciation (aesthetic judgement)		Cultural heritage (national identity)		Cultural diversity (European identity/world awareness)		Enjoyment/pleasure/satisfaction/joy		Variety and diversity of arts; engaging with a variety of art forms/ media		Art and lifelong learning/interest		Identifying artistic potential (aptitude/talent)		Individual expression/identity/ development		Creativity (imagination, problem solving, risk-taking)		Social skills/group working/ socialisation/ cooperative working		Communication skills		Performing/presenting (sharing pupils' own artistic work)		Environmental awareness/ conservation/sustainability/ecology		Self-confidence/esteem	
	ISCED	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
OECD countries	Spain	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
	Sweden	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
	Switzerland	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	Turkey	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	UK - England	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲	▲	▲			▲	▲			▲	▲
	UK - N. Ireland	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲					▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
	UK - Scotland	▲	▲	▲	▲	▲	▲			▲	▲	▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
	UK - Wales	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲					▲	▲	▲	▲	▲	▲	▲	▲			▲	▲		
	United States	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲					▲	▲	▲	▲	▲	▲	▲	▲	▲					
Partner countries	Bulgaria	▲	▲			▲	▲	▲	▲					▲	▲			▲	▲			▲	▲	▲	▲			▲	▲		
	Estonia	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲							▲	▲	▲	▲					▲	▲				
	Latvia	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲		
	Liechtenstein	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲					▲	▲									▲	▲		
	Lithuania	▲	▲													▲	▲	▲	▲					▲	▲						
	Malta	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲			▲	▲			▲	▲	▲	▲	▲	▲	▲	▲	▲	▲				
	Romania	▲	▲	▲	▲	▲	▲	▲	▲									▲	▲	▲	▲			▲	▲						

Note: m = missing data; Empty cell: not a specified objective of arts education.

Source: Extended and updated by OECD countries. Based on Eurydice for European countries and government policy papers for non-European countries.

Figure 1.A1.1. **Number of hours per year of arts subject in compulsory instruction for 9-11 year-olds in the OECD area (2001, 2010)**

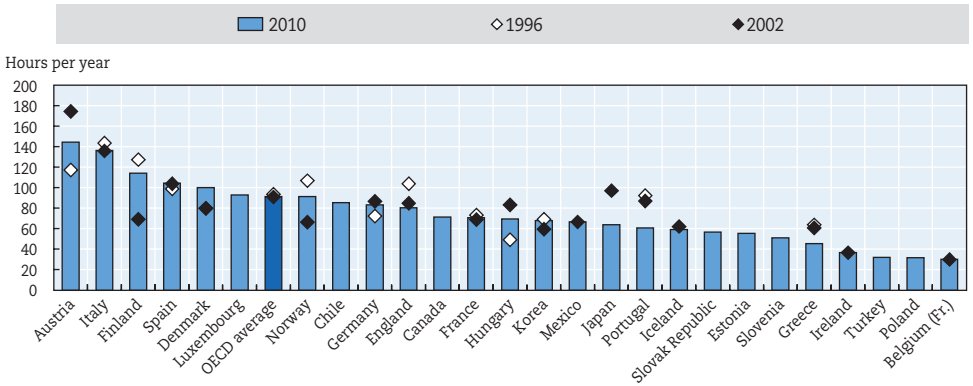


StatLink http://dx.doi.org/10.1787/888932832934

Note: Countries are ranked in descending order of 2010 instruction time of arts subject as a percentage of total compulsory instruction time. The OECD average presented is based on countries for which information is available in 2001 and 2010.

Source: OECD (Education at a Glance 2003, 2012).

Figure 1.A1.2. **Number of hours per year of arts subject in compulsory instruction for 12-14 year-olds in the OECD area (1996, 2002, 2010)**

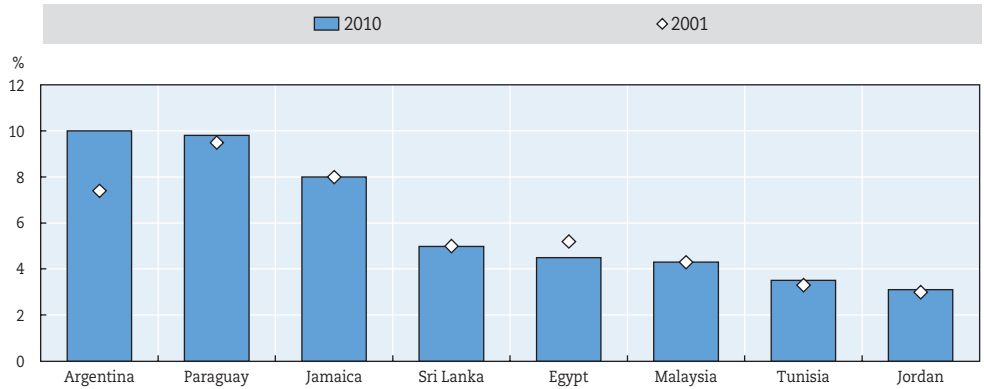


StatLink http://dx.doi.org/10.1787/888932832953

Note: Countries are ranked in descending order of 2010 instruction time of arts subject as a percentage of total compulsory instruction time. The OECD average presented is based on countries for which information is available in 2002 and 2010.

Source: OECD (Education at a Glance 1998, 2004, 2012).

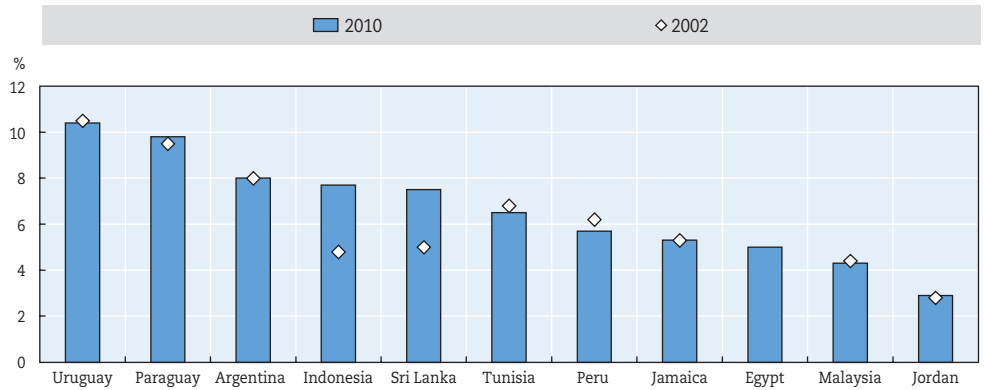
Figure 1.A1.3. **Instruction time of arts subject as a percentage of total compulsory instruction time for 9-11 year-olds in partner countries (2001, 2010)**



StatLink http://dx.doi.org/10.1787/888932832972

Source: Unesco Institute of Statistics.

Figure 1.A1.4. **Instruction time of arts subject as a percentage of total compulsory instruction time for 12-14 year-olds in partner countries (2002, 2010)**



StatLink http://dx.doi.org/10.1787/888932832991

Source: Unesco Institute of Statistics.

Chapter 2

Cognitive outcomes of multi-arts education

This chapter reviews evidence that multi-arts education is positively associated with some form of non-arts cognition. Studies on "multi-arts" education did not examine the effects of specific art forms, but compared students receiving a wide variety of kinds of arts classes (e.g. visual, music, etc.) to those receiving few or no arts classes. We show that these studies find a positive correlation of multi-arts education and general academic achievement, but that there is no evidence yet to claim that multi-arts education causes this improved academic achievement.

Is multi-arts education positively associated with some form of non-arts cognition? In this chapter we review studies examining "multi-arts" education, comparing students receiving a wide variety of kinds of arts classes (e.g. visual, music, etc.) to those receiving few or no arts classes.

The best research strategy to determine the transfer effects of arts education is to examine specific hypotheses for specific art forms: there is simply no reason to assume that music instruction might have the same kinds of effects as visual arts instruction, for example. Unfortunately, though, many studies do not distinguish among art forms and they instead examine the effects of an arts-rich education in which students experience learning across multiple kinds of arts disciplines. We refer to these studies – which do not attempt to zero in on the effects of learning in a particular art form – as "multi-arts" studies, for lack of a better word.

Many of the multi-arts studies examine programmes in which the arts are integrated with the academic curriculum (see Chapter 1, methods of this report, for a brief discussion of arts integration). Arts integration programmes typically bring in artists who work with teachers on an academic unit. When the artists leave, the teachers, it is hoped, will have acquired the ability to continue arts integrated instruction. Strong claims have been made that the experience of working with artists to develop arts integrated units is a "powerful professional development" experience for teachers (Rabkin and Redmond, 2004, p. 33). According to Aprill and Burnaford (2006), these programmes are characterised by constructivist learning, reflection (teachers and students together analyse their learning and teaching processes and products), multiple modes of assessment, authentic audiences for student work, teacher collaboration, teacher professional development, and parent involvement. These programmes are meant to engage students who are alienated from traditional schooling. Hence, the long-term large goal of such programmes is to "transform teaching across entire schools" (Rabkin and Redmond, 2004, p. 21). According to Aprill and Burnaford, these programmes lead to greater student achievement in academic areas, engagement of student with special needs, student and teacher retention, development of employable work skills, diversity and multicultural education, and teacher professional development.

It is also claimed that when the arts are integrated into an academic subject, the work becomes more authentic and hence students will be more engaged (Rabkin and Redmond, 2004, p. 25). Authentic intellectual work was defined by Newmann, Bryk and Nagoaka (2001, p. 15) as "activity that demands disciplined inquiry into a subject, requires students to digest knowledge thoroughly enough to apply it by themselves to new situations, and sets real-world standards for students' work products." The assumption that any arts integrated curriculum meets this high standard, however, has never been documented in the studies reviewed below: these studies looked for academic improvement outcomes but failed to analyse the nature of the teaching that was occurring within the arts integrated units themselves.

We classified studies under the umbrella of "general academic achievement" if these studies examined verbal and/or mathematical test scores or overall grade point averages.

REAP meta-analyses of multi-arts education and general academic achievement studies

In 2000 Winner and Cooper published a meta-analytic study based on published and unpublished research in English from 1950 through 1998 as part of the Reviewing Education and the Arts Project (REAP). Analyses were performed separately on correlational and experimental studies. Correlational studies assessed academic achievement in students choosing to have more vs. less arts education. These studies cannot match students with high vs. low arts education on all non-art variables and

thus they cannot tell us whether students who did and did not self-select into the arts differed academically prior to studying the arts. No causal conclusions about the effects of the arts can be made from such studies.

Experimental studies were ones in which two groups were compared, one receiving arts instruction and one not receiving such instruction. These studies usually had a pretest/post-test design. There were two kinds of experimental studies, matched and unmatched. In the matched studies, the two groups were matched prior to the arts experiences. Of these studies we found only two true experimental studies with random assignment to arts vs. control groups; the rest were experimental or quasi-experimental studies in which an intact arts classroom, or an intact arts-integrated classroom, was compared to an equivalent classroom receiving no special arts. The other studies were quasi-experimental ones in which students were not randomly assigned to conditions. Some of these studies attempted to match the ability level of students in the arts and control groups by statistically controlling for pre-existing differences (by covarying pre-existing differences or by analysing gain scores). Some studies lacked a pre-test and based their analyses only on a post-test comparing arts and non-arts groups. However, in most cases researchers attempted to find a comparison group in a similar school and from a similar socio-economic background. Nonetheless we cannot be certain that the groups in the non-randomly assigned studies were equivalent in ability prior to their arts exposure.

Studies were coded as assessing the effects of arts integration vs. arts classes taught as stand-alone classes. However, a clear comparison could not be made between these two kinds of approaches because almost all of the programmes in which the arts were integrated into the academic curriculum also taught the arts as separate disciplines.

For each study Winner and Cooper (2000) calculated one or more effect sizes, using the effect size *r*, as described in Box 2.1. Each effect size calculated was based on a separate sample of participants. Results in the predicted direction (arts group performing better than the control group) were reported as positive; results in the opposite direction were reported as negative.

Correlational studies of multi-arts education and general academic achievement (from REAP)

The first three meta-analyses performed by Winner and Cooper (2000) synthesised correlational studies. These studies compared the academic profile of students who do and do not study the arts either in school or in after school programmes. For example, included in the analyses was James Catterall's study (featured in Box 2.2) reporting that US students who are highly involved in the arts in middle and high school outperform those who are not involved in the arts on a multitude of academic indicators, and this relationship holds even for students in

the lowest SES quartile of the United States (Catterall, 1998; Catterall, Chapleau and Iwanaga, 1999). High arts-involved students earned better grades and test scores than low arts-involved students. The high arts students were also less likely to drop out of high school and they watched fewer hours of television than did the low arts students. Also included in the analyses was Heath's (1998a, 1998b) study showing that at risk students who participate in after-school arts organisations for at least nine hours a week over the course of at least a year are ahead of a random national sample of students on a wide range of academic indicators: their school attendance

Box 2.1. **REAP meta-analyses and effect sizes reported**

A meta-analysis is a quantitative synthesis that relies on "effect sizes." A meta-analysis first identifies a body of similar studies (using the same kind of design, and the same outcome measures), then calculates an effect size for each study, followed by an overall effect size. Statistical tests then determine whether the overall effect size is statistically significant and can be generalised to new studies on the same question.

Effect sizes indicate the strength of the relationship between two variables (e.g. between some form of arts study and some form of non-arts achievement). The REAP analyses used the statistic *r* for its effect sizes, and these could range from -1.0 to +1.0).

An effect size r is a measure of association between two variables and assesses the strength of the relationship between two variables – for example, between arts exposure and academic achievement (Rosenthal, 1991). Thus, an r of +1 would indicate a 100% positive relationship between arts study and non-arts outcome; an r of 0 would indicate no relationship; and an r of -1 would indicate a 100% negative relationship. REAP researchers chose r as their effect size estimate rather than Cohen's d of Glass's delta, for example, because of the greater flexibility of r (Rosenthal, 1991). An effect size r of .10 is considered a small effect; an r of .24 is medium in size, and an r above .37 is a large effect (Cohen, 1988). However, small effects should not be discounted if they measure an outcome we consider important (e.g. if they index a small number of students who stay in school as a result of a treatment). Important effects from medical research are often as low as r = .034 (Steering Committee of the Physicians Health Study Research Group, 1988). As stated by Rosenthal and Rosnow (1991), the relationship between level of statistical significance and effect size can be understood as follows: Significance Test = Effect Size x Study Size. The larger a study's sample size, the more significant the results will be. The same small, moderate, or large effect size could be significant or not depending only on the size of the sample, and this is frequently forgotten in the interpretation of research results.

When we report the REAP findings we always report the weighted mean r effect size – and that means the effect sizes are weighted by size of study. We also report the significance of the t- test of the mean Zr, a test that, if significant, tells us that we can generalise the findings to new studies on the same question. Only if this test is significant can we feel confident in concluding that there is indeed a relationship between some form of arts instruction and some non-arts outcome. Whether or not that relationship can be deemed to be causal, of course, depends on whether the design of the studies was correlational or experimental.

is higher, they read more, and they win more academic awards. And we included data from the College Board in the United States revealing that the average SAT scores (standardised tests required for admission to US colleges and universities) of students with four years of arts classes in high school was higher than the scores of those who took no arts courses at all in high school (College Board, 1987-1997).

Three separate meta-analyses synthesising the correlational studies were performed, each on a different academic outcome (composite verbal and quantitative outcomes summed; verbal outcomes; quantitative outcomes).

Table 2.1 lists the studies in the first meta-analysis on composite outcomes. Four of the five effect sizes were in the positive direction and were statistically significant. The mean effect size across studies (weighted by size of sample) was r = .05 (equivalent to a d of .10) and this was significantly different from zero. A t-test of the mean Zr proved highly significant, allowing us to generalise our findings to new studies on this question.

We conclude that there is a clear correlation between multi-arts education and composite measures of academic achievement, but we can say nothing here about causality.

Table 2.1. **Five correlational studies linking multi-arts education with composite test scores**

Study	Positive relationship	Mixed, null, or negative relationship
Catterall, Chapleau and Iwanaga (1999)	X	
Dwinell and Hogrebe (1984)	X	
Heath (1998a)	X	
National Center for Education Statistics (1984)	X	
Whitener (1974)		X
Weighted mean	X	

Note: The full results are presented in Table 2.A1.1.

Source: Winner and Cooper (2000)

Table 2.2 lists the eleven studies with verbal outcomes (and this included ten years of the College Board data) used for the second meta-analysis. All 11 effect sizes were in the positive direction and were statistically significant. The average weighted effect size across studies was r = .19, equivalent to d = .39, which was also highly significant. A t-test of the mean Zr proved highly significant, allowing us to generalise our findings to unseen studies on this question.

We can conclude that there is a clear correlation between multi-arts education and verbal measures of academic achievement, but we can say nothing here about causality.

Table 2.2. **Eleven correlational studies linking multi-arts education with verbal test scores**

Study	Positive relationship	Mixed, null, or negative relationship
Catterall, Chapleau and Iwanaga (1999)	X	
College Board (1988)	X	
College Board (1989)	X	
College Board (1990)	X	
College Board (1991)	X	
College Board (1992)	X	
College Board (1994)	X	
College Board (1995)	X	
College Board (1996)	X	
College Board (1997)	X	
College Board (1998)	X	
Weighted mean	X	

Note: The full results are presented in Table 2.A1.2.

Source: Winner and Cooper (2000).

Table 2.3 lists the eleven studies with math outcomes (and this again included ten years of the College Board data) used for the third meta-analysis. The 11th study was one in which 8th graders who had taken at least two years of arts classes meeting at least four times per week were compared to those with no such arts involvement on a math test.

Table 2.3. **Eleven correlational studies linking multi-arts education with mathematical test scores**

Study	Positive relationship	Mixed, null, or negative relationship
College Board (1988)	X	
College Board (1989)	X	
College Board (1990)	X	
College Board (1991)	X	
College Board (1992)	X	
College Board (1994)	X	
College Board (1995)	X	
College Board (1996)	X	
College Board (1997)	X	
College Board (1998)	X	
Demeter (1986)		X
Weighted mean	X	

Note: The full results are presented in Table 2.A1.3.

Source: Winner and Cooper (2000).

Box 2.2. Multi-arts education is positively correlated with academic performance

Perhaps the most cited study attempting to make the case that exposure to arts classes in school improves general academic achievement is an analysis of data from the 25 000 students participating in the ten year National Educational Longitudinal Study (NELS) (Catterall, 1998; Catterall, Chapleau and Iwanaga, 1999).

Catterall performed a correlational analysis of level of arts participation in school (as measured by arts classes in school and extra-curricular) and academic achievement as measured by scores on standardised verbal and mathematical tests as well as school grades in academic subjects. Students were followed from 8th to 10th grade and were classified in terms of arts involvement both in and out of school (measured by number of arts courses taken in school and out of school, and attendance at museums). High arts-involved students were ones who had been exposed to the arts since the 8th grade. The top quartile of students in terms of arts involvement was compared to the lowest quartile. Outcome measures were grades, test scores, school dropout, boredom in school, etc. A positive correlation was reported: the more arts exposure, the higher the achievement as measured by grades and test scores. High arts students also performed more community service, watched fewer hours of television, and reported less boredom in school. The same positive relationship held for a sub-analysis of the top and the bottom socio-economic quartile of students (n = 6 500 students). Thus we cannot explain away these findings by saying that children with educated parents of means are offered better schools that have not cut the arts.

This study has been widely misinterpreted as indicating transfer of learning from the arts to academic performance. This is understandable given how this study is often described. For example, in a 2006 report prepared by the National Assembly of State Arts Agencies in the United States the study is described as follows:

Students who participate in arts learning experiences often improve their achievement in other realms of learning and life. In a well-documented national study using a federal database of over 25 000 middle and high school students, researchers from the University of California at Los Angeles found students with high arts involvement performed better on standardised achievement tests than students with low arts involvement. Moreover, the high arts-involved students also watched fewer hours of TV, participated in more community service and reported less boredom in school (Ruppert, 2006).

The above quote does not directly claim causality but it is easy to read it as implying causality. Consider the following non-causal explanations of the association found. It is possible that the kinds of families who value academic achievement also value achievement in the arts, and they pass both of these values on to their children. Catterall also reported a positive correlation between arts exposure and fewer minutes per day of television watching. It is thus also possible that students with an interest in the arts have less interest in television, and the lower TV watching is what induces academic performance.

We cannot know from a correlational study whether the higher academic achievement of children exposed to the arts has anything at all to do with the arts exposure they are getting. Only a study with an experimental design or addressing the direction of causality could show this.

Ten of the 11 effect sizes (all ten of the College Board studies) were in the positive direction and were statistically significant; the 11th study by Demeter (1986) did not yield a significant association. The average weighted effect size across studies was $r = .11$, equivalent to $d = .22$, which was also highly significant. A *t*-test of the mean *Zr* proved highly significant, allowing us to generalise our findings to unseen studies on this question.

We can conclude from the College Board data that there is a clear correlation between arts education and math SAT scores. Again however, no causal conclusions are warranted given the correlational design of the studies.

Plausible non-causal explanations for correlational findings

These three meta-analyses show that students in the United States who choose to study the arts are students who are also high academic achievers. But because the studies on which these meta-analyses were based were correlational in design, they allow no causal inferences. Does art study cause higher scores? Or do those with higher scores take more art? Or, is there a third variable, such as parental involvement that causes both greater arts study and higher test scores? We cannot tell. Unfortunately, however, studies such as these have often been used erroneously to support the claim that studying the arts causes test scores to rise.

One plausible non-causal interpretation of the findings is that high academic achievers (no matter what their socio-economic background) are more likely to choose to study the arts than low academic achievers. This could occur for several reasons. As mentioned earlier, high academic achievers may attend schools strong in both academics and the arts; they may come from families that value both academics and the arts; or they may have high energy and thus have time for – and interest in – both academics and the arts. The fact that they are strong academically means they would have more free time for the arts, and might lead parents to encourage them to use their extra time by studying one or more art forms.

One piece of evidence for the "high energy" hypothesis comes from Heath (1998a). Heath's study included not only students involved in after-school arts organisations, but also those involved in sports and community service organisations. Heath allowed Winner and Hetland (2000) access to her unpublished data so that the art students' likelihood of winning an academic award could be compared to the sports students. Both arts and sports groups were significantly more likely to win an academic award than a random national sample of students, but the arts group was no more likely to do so than the sports students. The finding that both intensively involved sports and arts students did well academically is consistent with (though does not prove) the possibility that these are highly motivated students to begin with. Perhaps the drive factor is what impels these students both to involve themselves in an after school activity in a serious way as well as to do well in school. It is also possible that these students learn to become motivated from their after school organisations and this then transfers to school work.

Additional support for the high energy hypothesis comes from a comparison pointed out by Eisner (2002). He compared the SAT advantage of students taking four vs. one year of arts to that of students taking four vs. one year of an elective academic subject such as science or a foreign language. Students who specialised in any subject, whether arts or an academic elective, all had higher SAT scores than those who had only one year in that subject (with academic specialisation yielding a far greater advantage than arts specialisation). Students who specialise or focus might have higher energy than those who do not, and this higher drive could account for their higher academic achievement. It is also possible, however, that the very process of sticking to something (whether art or an academic subject) leads to better academic performance in other areas.

Another reason for the strong correlation found between arts study and SAT scores could be that in the United States, the highest achievers study the arts in order to enhance their chances of admission to selective colleges. It should be noted, in this regard, that the academic profile of students choosing to take the arts has risen consistently over the last decade. Vaughn and Winner (2000) plotted the relationship between SAT score and taking four years of arts in high school (compared to taking no arts) and found that this relationship grew stronger each year from 1988 to 1999. As our most selective colleges become more competitive each year, students may feel they need to build resumes showing strength in a non-academic area such as an art form.

Winner and Cooper (2000) reasoned that even if self-selection (high achievers choosing to study arts) explains the correlation in the United States, there might still be some causal force at work. Might it not be that once high achievers self-select into the arts, the arts then foster cognitive skills which translate into even higher academic performance? Winner and Cooper tested this hypothesis by examining the data in Catterall's (1998) study described in Box 2.2. Catterall reported longitudinal data on students who self-selected into the arts in 8th grade and remained highly involved in the arts through the 12th grade. If both factors were at work, one would expect the effect sizes showing the strength of the relationship between arts involvement and academic performance to rise over the years. But no change was found. This finding fails to support the view that the arts are causing the academic achievement of these students to be higher than that of students relatively uninvolved in the arts.

Experimental studies of multi-arts education and general academic achievement (from REAP)

While the correlational studies, and the meta-analyses synthesising them, do not permit causal inferences, studies with an experimental design do allow such inferences. We examined two bodies of quasi-experimental and experimental studies (only two were experimental) testing the causal claim that when students study the arts, their academic achievement rises. These studies compared academic performance before and after studying the arts. Typically these studies examined students at the elementary school level who had studied the arts for a year and who

studied the arts both as separate disciplines and as integrated into the academic curriculum. The academic growth of these students was then compared to the growth of similar students not exposed to any special arts programme.

Winner and Cooper (2000) found 24 studies testing the hypothesis that verbal skills improve as a consequence of studying the arts, and 15 studies testing the hypothesis that mathematics skills improve. Table 2.4 lists the 24 studies with verbal outcomes, and these yield a very mixed picture, with many studies yielding either a tiny positive effect or a negative effect (and a negative effect means that the students studying the arts performed worse than those not studying the arts).

Table 2.4. **Twenty-four quasi-experimental and experimental studies linking arts education with verbal test scores**

Study	Positive relationship	Mixed, null, or negative relationship
Ashbacher and Herman (1991)		X
Baum and Owen (1997)		X
Brock (1991a)		X
Brock (1991a)		X
Brock (1991a)	X	
Brock (1991a)		X
Brock (1991a)		X
Brock (1991a)		X
Brock (1991b)		X
Brock (1991b)		X
Brock (1991b)		X
Catterall and Waldorf (1999)	X	
Coakley (1995)		X
Dillard (1982)*		X
Gardiner et al. (1996)		X
Glismann (1967)		X
Hudspeth (1986)	X	
Jackson (1979)*		X
Marston (1997)		X
Norman (1987)		X
Tunks (1997)	X	
Tunks (1997)	X	
Tunks (1997)	X	
Tunks (1997)		X
Weighted mean		X

Note: The full results are presented in table 2.A1.4. Experimental studies are asterisked.

Source: Winner and Cooper (2000).

The meta-analysis performed on the verbal outcomes yielded a very small mean weighted effect size *r* of .01 (equivalent to a *d* between 0 and .1). This effect size was not statistically significant. The *t*-test of the mean *Zr* testing whether these results can be generalised to new (future) studies was 1.66 which was not significant, $p = .11$. In addition, the 95% confidence interval for unweighted effect sizes spanned zero showing that the mean effect size of a new set of similar studies might well be at zero. Moreover, there was no difference in the effect sizes of those 19 studies in which the arts were integrated into the curriculum vs. those five assessing the effect of the arts taught separately.

Thus we had to conclude that we had found no evidence that studying the arts, including the arts integrated with academic subjects, resulted in enhanced verbal skills.

Box 2.3. **Arts integration: Inconsistent effects on content knowledge**

In one of the studies included in Winner and Cooper's (2000) meta-analysis of experimental studies with verbal outcomes, language-based content learning was compared when the same content was taught with and without arts integration (Baum and Owen, 1997). Fourth, fifth, and sixth grade students were taught the same academic content either in traditional format without the arts, or in one in which the content was integrated with the arts. Student learning in the two kinds of classes was compared for two lessons. For one lesson, no differences were found in learning between the traditional and arts integrated class. For the other lesson, students who did not get the arts integrated lesson actually showed more learning, though the difference between groups did not quite reach significance ($p < .07$).

We need more such studies in order to find out whether integrating the arts into an academic unit improves learning. One study cannot show that arts integration does not work. Everything depends on how well the arts are integrated.

Table 2.5 lists the 15 quasi-experimental studies assessing the effects of arts study on math outcomes from Winner and Cooper (2000). These again yield a very mixed and primarily negative picture.

The meta-analysis performed on the mathematics outcomes yielded a mean weighted effect size of $r = .02$ (equivalent to a *d* between 0 and .1). The *t*-test of the mean *Zr* showed that the mean effect size was not significantly different from zero. In this meta-analysis it was not possible to statistically compare the studies with and without arts integration since all but two were based on an arts integrated curriculum. Winner and Cooper (2000) concluded that they had found no evidence that studying the arts, including the arts integrated with academic subjects, resulted in enhanced mathematics achievement.

Table 2.5. **Fifteen quasi-experimental studies linking arts education with mathematical test scores**

Study	Positive relationship	Mixed, null, or negative relationship
Baum and Owen (1997)		X
Brock (1991a)	X	
Brock (1991a)	X	
Brock (1991a)	X	
Brock (1991a)		X
Brock (1991a)		X
Brock (1991a)		X
Brock (1991b)		X
Brock (1991b)	X	
Brock (1991b)	X	
Catterall and Waldorf (1999)	X	
Gardiner et al. (1996)	X	
Glismann (1967)	X	
Luftig (1993)		X
Norman (1987)		X
Weighted mean		X

Note: The full results are presented in Table 2.A1.5.

Source: Winner and Cooper (2000).

Of the experimental studies synthesised in the REAP report, only two were true experiments with random assignment to art vs. control programmes (Dillard, 1982; Jackson, 1979) – both assessing verbal outcomes. These studies showed no relationship between arts education and academic achievement: the *r* for Dillard was .03; the effect size *r* for Jackson was .02.

One weakness of most of the experimental studies is the lack of a treated control group – a group receiving some other kind of special treatment that is not arts. Without such a control group, any positive findings for the arts group could be due to a "Hawthorne effect" in which any new kind of programme at first leads to academic improvement due to the excitement of the teachers and students.

Effect sizes in correlational vs. Experimental studies

A comparison between the correlational and experimental findings reported by Winner and Cooper (2000) shows that it is the correlational studies that are fueling the claims that arts education boosts academic achievement. Figure 2.1 displays

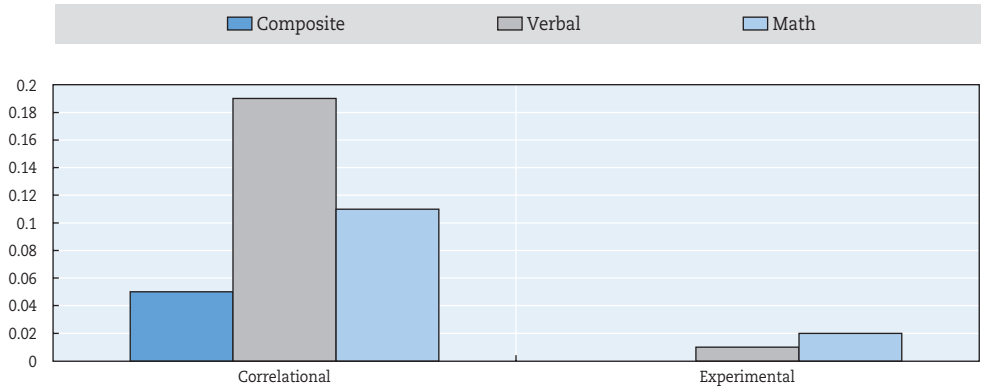
Box 2.4. SPECTRA +: Arts integration group improves no more than control group

Only one of the experimental studies synthesised by Winner and Cooper (2000) had a treated control group, a study by Luftig (1993). In this study, some of the students receiving an arts integrated programme called SPECTRA+ – often cited as a programme in which academics are strengthened by the arts – were compared to a treatment control group and to a treated control group receiving a new educational programme based on cooperative learning, flexible ability grouping, and parental involvement. All three groups showed the same rate of academic improvement in mathematics scores over the two years of the study. This is just one example we use to make the point that when advocacy claims are made, it is wise to look carefully at the data on which the claims are said to rest.

comparative findings across the five meta-analyses, showing the far higher weighted effect size *r*s for the correlational than the experimental studies, and also showing that the strongest correlational findings were for verbal outcomes.

However, as Winner and Cooper (2000) point out, many of the correlational studies examined the effects of four years of arts education; most of the experimental ones examined the effects of much briefer time periods (6 months to two years). Thus we need experimental studies examining the effects of long term exposure to arts education.

Figure 2.1. **Mean weighted effect size in correlational vs. Experimental studies**



StatLink http://dx.doi.org/10.1787/888932833010

Source: Winner and Cooper (2000).

Box 2.5. CAPE schools: High arts and high academic performance – with multiple possible explanations

One of the quasi-experimental studies synthesised by Winner and Cooper (2000) examined the effect on composite and verbal test scores of students in schools participating in a programme called Chicago Arts Partnerships in Education (CAPE) (Catterall and Waldorf, 1999). CAPE schools brought artists and teachers into partnerships so that they could develop curricular units lasting four to six weeks in which an art form was integrated with an academic subject. Typically units consisted of a visual arts project integrated into reading or a social studies topic, with the goal of enhancing learning in the academic area. Fifty-four percent of the teachers reported having developed one arts-academic integrated unit, while 24% reported having created four to five such units.

The reading and math test scores for CAPE schools were compared to scores from other Chicago public schools at grades 3, 6, 8, 9, 10, and 11. In none of the comparisons did the control schools perform better than the CAPE schools. Forty comparisons were made at the K-8 level: in 16 of these comparisons CAPE schools increased their lead over control schools in math; in 25 of these comparisons, CAPE schools increased their lead over control schools in reading. (Note that this leaves a majority of the comparisions not demonstrating this effect!) At the high school level, 8 out of 12 comparisons showed CAPE schools increasing their lead in math, and 7 out of 12 did so in reading. The differences between CAPE and control schools were statistically significant at the elementary but not at the high school levels.

This study is often cited as evidence that arts integration elevates academic achievement. For example, Ruppert (2006) refers to this study as showing the "benefits" to student success provided by arts education. However, this study does not allow such a conclusion. First of all the results were decidedly mixed. In addition, there is no way to know whether the relative advantage of the students in the arts-integrated CAPE schools in some grades is due to the role of the arts in their schools or to the energising effect of any new kind of programme (this is referred to as a "Hawthorne effect"). In addition, we are not given sufficient details about the comparison schools and thus we cannot know whether the schools were identical except for the presence of the arts. It is possible that schools that elected to participate in CAPE had better teachers to begin with. Perhaps better teachers are more likely to opt for a programme infusing the arts and bringing in teaching artists. In addition, studies of this kind all too often lack a treatment control that does not involve the arts.

Other studies on multi-arts and general academic achievement identified by REAP

Winner and Cooper (2000) identified 27 studies that could not be included in their meta-analyses: either the data provided did not allow the calculation of an effect size (necessary for a meta-analysis), or the study lacked a control group (summarised in Table 2.6). Most of these studies were correlational and reported that students attending schools in which the arts play a central role are also high academic achievers. Seventeen of these studies reported a positive outcome; ten reported null or mixed findings. A binomial probability test showed that the chances of finding 17 positive studies out of 27 did not achieve statistical significance at $p < .05$.

Table 2.6. **Twenty-seven studies examining multi-arts education and academic achievement not included in reap meta-analyses**

Study	Positive relationship	Mixed, null, or negative relationship
Annenberg Challenge (1998)	X	
Brock (1991c; Newbill (1992)		X
Catterall (1995)		X
Chapman (1998)	X	
Dept. of Test Development and Administration, Prince George's county Public Schools (1997); Maryland Alliance for Arts Education (1995)	X	
DiMaggio (1982)	X	
Fowler (1979b)	X	
Fowler (1979b)	X	
Getz (1984); Hoffa (1979); Lawton (1987)		X
Goldberg (1998)	X	
Haanstra (1999)		X
Harland, Kinder, Haynes and Schagen (1998)		X
Lardo (1982)		X
McGuire (1982)		X
Missouri Arts Education Task Force (1990), as cited in Murfee (1993)	X	
Redcliffe School Performance Profile (1990-1994); Edmunds (1991); Slay and Pendergast (1993); Welch and Greene (1995)	X	
Redfield (1990)	X	
Rombokas, Heritage and West (1995)		X
Ross (1990)		X
Spectra Rhode Island (1998)	X	
Spilke (1991)	X	
Spilke (1991)	X	
Spilke (1991)	X	
Spilke (1991)	X	
Spilke (1991)	X	
Spilke (1991)		X
Walker (1995)	X	

Source: Winner and Cooper (2000).

Two of these studies highlight the role that culture plays in how we interpret a correlational finding. In the Netherlands, Haanstra (1999) found that students who take the arts in high school to prepare for a national exam that includes the arts attain the same educational level as those with no arts electives. This study, which controlled for students' socio-economic status (SES), shows that in the Netherlands, taking the arts in high school does not predict ultimate educational level attained. In the United Kingdom, Harland and colleagues examined performance on the United Kingdom's national academic exams (GCSE) for 27 607 students from 152 schools and found that the greater the percentage of arts courses taken in high school, the poorer the performance on national exams at the end of secondary school (Harland, Kinder, Haynes and Schagen, 1998).

How can we reconcile the Dutch and British findings with the US findings that students with four years of arts score higher on their SAT exams than those who take none, or the findings of Catterall and Heath described above reporting an association between high arts involvement and high academic achievement? Harland et al. (1998) speculate that in Britain, academically weak students are often counseled into the arts track, and this could explain the negative association. In contrast, European students may feel their best chances for admission to a university lies in a focus on traditional academic subjects. US students may also feel that adding an arts portfolio gives them an extra edge in the increasingly competitive race for admission to the top college and universities in the country (Stevens, 2009).

In any case, the lack of a positive association between arts education and academic achievement in the Netherlands and in the United Kingdom should caution us against drawing causal conclusions from correlational data.

Post-REAP quasi-experimental studies of multi-arts education and general academic achievement

A number of studies have evaluated the effects of arts integration programmes since the 2000 REAP report. Programmes that have been evaluated include (listed alphabetically) the *A+ Schools Program in North Carolina* (Nelson, 2001); *Arts for Academic Achievement* (Anderson and Ingram, 2002; Freeman and Seashore, 2001; Freeman, Seashore with Werner, 2002; Ingram and Seashore, 2003); *Arts in the Basic Curriculum* (ABC) (Seaman, 1999); *Kaleidoscope* (Brown, Benedett and Armistead, 2010); *Learning Through the Arts* (Smithrim and Upitis, 2005); *Transforming Education Through the Arts Challenge (TETAC)* (Frechtling, Rieder, Michie, Snow, Fletcher, Yan and Miyaoka, 2002; NAEC, 2003); one study of a programme in just one school (Bezrucsko, 1997); and one study of a programme in just one school comparing an arts infusion approach to teaching math to a non-arts approach (Omniewski and Habursky, 1999). Table 2.7 summarises the findings of these evaluations.

Table 2.7. **Eight studies since REAP examining relationship between multi-arts education (in arts integrated programmes) and general academic achievement**

Programme evaluated	Positive effects: Arts Children Score Higher Than Controls	Inconsistent results: Gains in only some grades/ classes/ outcomes	No effect: No difference between arts vs. Control groups in test scores
A+ Schools			X
Arts for Academic Achievement		X	
Arts in the Basic Curriculum			X
Learning Through the Arts		X	
Kaleidoscope	X		
Transforming Education Through the Arts Challenge	X		
Bezrucsko (1997)	X		
Omniewski and Habursky (1999)			X

As shown in Table 2.7, findings from these studies are not conclusive with respect to the question of whether students in such arts integration programmes do better on standardised test scores than students in programmes that do not integrate the arts. Three studies report greater gains for children in the programme than for comparable children not in the programme. Two studies reported that for some grades or classes, gain scores were greater in arts integrated programmes. And three studies reported equivalent scores for students who did and did not participate in arts integration programmes (e.g. A+ Schools, Arts in the Basic Curriculum). Some report that scores improve once the programme has been implemented, but the comparisons made are not for the same children over time, but between students in one year who received the programme once it had been fully established, and students in an earlier year who received the programme before it was fully implemented (e.g. TETAC).

Why are these findings of the studies summarised in Table 2.7 not conclusive? The major problem is that there may be many differences between the arts integration programme and the programmes in the comparison schools, especially quality of teachers and type of student attending. The best way to determine whether arts integration fosters academic skills would be to design a true experiment in which the identical lessons are taught with and without arts integration, preferably with random teacher assignment to arts vs. non-arts integration, and with student random assignment as well. We do not believe that such studies are needed to justify arts integration programme. Our claim is far more circumscribed: such studies are necessary only if we wish to determine whether arts integration *by itself* improves academic performance. Thus far, the evidence is not in.

Box 2.6. Learning through the arts: Inconsistent transfer findings

In 2005, Smithrim and Upitis published a study of Learning Through the Arts (LTTA), a Canadian arts integrated programme, in which they assessed the effects of this programme on general academic achievement. The findings of this study were inconsistent.

In the Learning Through the Arts program, professional artists worked with teachers to develop an arts integrated curriculum. The 4 063 children in this programme were compared to control groups of 2 602 children either in schools with another kind of non-arts curriculum focus or in schools with no special school-wide focus.

After three years, 6th grade students (ages 10-12) showed greater gains in math computation and math estimation than the control children. However, a regression analysis showed that participation in the arts integrated programme accounted for only 1.2 percent of the variance in these two areas. Moreover, these 6th graders in the programme did not show greater gains in two other aspects of math tested – geometry and application of math concepts. Nor did they show greater gains in reading comprehension, vocabulary, or writing. And finally, it was only the 6th graders and not the children in the four other grades tested who showed this improvement. Given that the arts group improved only on two of the many cognitive tests, and that this improvement occurred only for one of the four age groups, we must conclude that these findings are inconsistent.

Qualitative interviews with LTTA students indicated high levels of engagement in school. The researchers speculate that improvement occurred selectively in math computation and estimation as a function of the greater school engagement engendered by the programme. They suggest that computation and estimation may be easier to change via attention or engagement than skills such as reading.

However, no a priori predictions were made that these functions and not others would be improved by the programme and will still miss a good theory of why this should be the case. Thus, while possible, this explanation remains highly speculative.

Conclusion

The evidence reviewed in this chapter shows that there is a clear positive correlation between multi-arts education and several measures of academic achievement: composite measures such as SAT scores, but also verbal and mathematical test scores. There is some cultural variation in the results as the Netherlands and the United Kingdom display a different pattern. However, experimental studies that allow to better grasp causality do not find a positive association between multi-arts education and cognitive outcomes. This leads to the conclusion that there is as yet no firm evidence that multi-arts instruction, whether in stand-alone arts classes or in arts-infused/arts-integration classes, leads to improvements in academic skills as measured by standardised test scores.

Moreover, we suggest that there is no theoretical reason to expect multi-arts instruction to improve academic achievement: the habits of mind trained by arts instruction are very different from the kinds of skills assessed by verbal and mathematical multiple choice tests. Study of the arts focuses on visual observation (visual arts), understanding characters (drama), motoring and auditory skill (music), etc. These kinds of skills are important but are not the kinds of skills captured by verbal and mathematical tests. However, if it can be shown that building strong arts into our schools changes the school culture such that teachers of all subjects begin to teach in a more inquiry-based, student-centreed, project-based manner, then a reasonable hypothesis to test would be that arts can improve academic learning via the indirect route of improving school culture.

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ANNEX 2.A1

Supplementary tables

Table 2.A1.1. **Five correlational studies linking multi-arts education with composite test scores**

Study	N	R	Z(p)* (*<.0001)
Catterall, Chapleau and Iwanaga (1999)	2 813	.08	4.42*
Dwinell and Hogrebe (1984)	21 479	.05	7.33*
Heath (1998a)	17 143	.04	4.88*
National Center for Education Statistics (1984)	3 367 000	.05	97.48*
Whitener (1974)	200	.04	-.31(p = 38)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.
Source: Winner and Cooper (2000).

Table 2.A1.2. **Eleven correlational studies linking multi-arts education with verbal test scores**

Study	N	R	Z(p)* (*<.0001)
Catterall, Chapleau and Iwanaga (1999)	7 440	.19	16.24*
College Board (1988)	353 679	.14	80.64*
College Board (1989)	296 189	.15	80.42*
College Board (1990)	274 168	.16	81.92*
College Board (1991)	273 034	.17	86.95*
College Board (1992)	269 453	.18	95.54*
College Board (1994)	352 824	.20	121.48*
College Board (1995)	360 911	.21	129.10*
College Board (1996)	367 314	.23	137.09*
College Board (1997)	337 517	.25	146.31*
College Board (1998)	318 392	.23	130.18*

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.
Source: Winner and Cooper (2000).

Table 2.A1.3. **Eleven correlational studies linking multi-arts education with mathematical test scores**

Study	N	R	Z(p)* (*<.0001)
College Board (1988)	353 679	.05	31.66*
College Board (1989)	296 189	.06	31.99*
College Board (1990)	274 168	.08	40.95*
College Board (1991)	273 034	.08	43.17*
College Board (1992)	269 453	.10	49.34*
College Board (1994)	352 824	.12	71.98*
College Board (1995)	360 911	.15	87.51*
College Board (1996)	367 314	.15	91.28*
College Board (1997)	337 517	.18	100.93*
College Board (1998)	318 392	.14	80.43*
Demeter (1986)	128	.00	.00 (p=.50)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.
Source: Winner and Cooper (2000).

Table 2.A1.4. Twenty-four quasi-experimental and experimental studies linking arts education with verbal test scores

Study	N	R	Z(p)* (*<.0001)
Ashbacher and Herman (1991)	520	.00	0 (p = .5)
Baum and Owen (1997)	132	.12	1.40 (p = .08)
Brock (1991a)	308	.02	.33 (p = .37)
Brock (1991a)	354	.02	.39 (p = .35)
Brock (1991a)	438	.11	2.37 (p = .009)
Brock (1991a)	438	-.07	-1.55 (p = .06)
Brock (1991a)	516	-.10	-2.37 (p = .009)
Brock (1991a)	392	-.12	-2.37 (p = .009)
Brock (1991b)	384	.05	.92 (p = .18)
Brock (1991b)	316	.00	.08 (p = .47)
Brock (1991b)	352	.00	.05 (p = .48)
Catterall and Waldorf (1999)	13 388	.02	2.33 (p = .01)
Coakley (1995)	63	.16	1.27 (p = .10)
Dillard (1982)*	97	.03	.34 (p = .37)
Gardiner et al. (1996)	80	.10	.89 (p = .19)
Glismann (1967)	149	-.03	-.31 (p = .38)
Hudspeth (1986)	32	.66	3.72*
Jackson (1979)*	245	.02	-.60 (p = .27)
Marston (1997)	40	-.25	2.23 (p = .01)
Norman (1987)	1 444	-.10	4.69*
Tunks (1997)	32	.29	1.64 (p = .05)
Tunks (1997)	32	.29	1.64 (p = .05)
Tunks (1997)	39	.26	1.64 (p = .05)
Tunks (1997)	45	.00	0 (p = .50)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2. Experimental studies are asterisked.

Source: Winner and Cooper (2000).

Table 2.A1.5. **Fifteen quasi-experimental studies linking arts education with mathematical test scores**

Study	N	R	Z(p)* (*<.0001)
Baum and Owen (1997)	90	.14	-.87 (p=.19)
Brock (1991a)	308	.13	2.37 (p=.009)
Brock (1991a)	354	.11	2.05 (p=.02)
Brock (1991a)	438	.11	2.37 (p=.009)
Brock (1991a)	438	-.02	-.44 (p=.33)
Brock (1991a)	516	-.06	-1.34 (p=.09)
Brock (1991a)	392	-.09	-1.75 (p=.04)
Brock (1991b)	384	-.05	-.92 (p=.18)
Brock (1991b)	316	.13	2.37 (p=.009)
Brock (1991b)	352	.11	2.05 (p=.02)
Catterall and Waldorf (1999)	13,388	.02	2.33 (p=.01)
Gardiner et al. (1996)	80	.34	3.03 (p=.001)
Glismann (1967)	149	.33	4.01*
Luftig (1993)	137	.00	0 (p=.5)
Norman (1987)	1,444	.05	1.41 (p=.08)

Note: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2. Experimental studies are asterisked.

Source: Winner and Cooper (2000).

Chapter 3

Cognitive outcomes of music education

This chapter reviews the research on the effects of music learning on cognitive outcomes: general academic achievement, intelligence quotient (IQ), reading and phonological awareness, non-native language learning, mathematics, visual-spatial skills, attention, and memory. Research shows that music lessons improve children's academic performance, IQ, phonological awareness, and word decoding. We can understand the relationship between music training and phonological awareness since both involve listening skills. Since phonological awareness is related to word decoding, we can also understand why music training might facilitate word decoding skills in young children. But how can we understand the effect of music lessons on IQ and academic performance? We propose the most plausible explanations in the chapter.

Learning to play an instrument requires discipline, attention, memory, and good listening skills. All of these habits of mind, if learned, could in principle transfer to other areas. The heightened memory and attention skills, for example, could become general skills that would serve the student well in all areas of the curriculum. Demonstrating that this is so, however, is very difficult. In what follows we review the research on the cognitive effects of music education. We first examine the outcomes meta-analysed in the Reviewing Education and the Arts Project (REAP): general

academic achievement, reading (including auditory perception of speech, a skill that may be related to reading), math, and visual-spatial reasoning. We then turn to outcomes not considered in the REAP research: Intelligence Quotient (IQ), attention, memory, and non-native language learning.

Children who take music lessons tend to come from families that are more educated and of higher socio-economic status (SES) than families of children who do not take music lessons (Sergeant and Thatcher, 1974). This kind of study has not been reported for children taking other kinds of arts lessons. However, it seems reasonable to assume that it is primarily music lessons that children seek outside of school (in comparison to dance, theatre, or visual arts lessons). Hence music study is likely to be more highly associated with family factors than is the study of the other art forms. Any study that examines the impact of music lessons outside of school should therefore control for the IQ and SES of the students involved. Only then can we know whether any effects attributed to music lessons are due to music rather than to the higher IQ of students taking these lessons. Unfortunately this kind of precaution is not always followed.

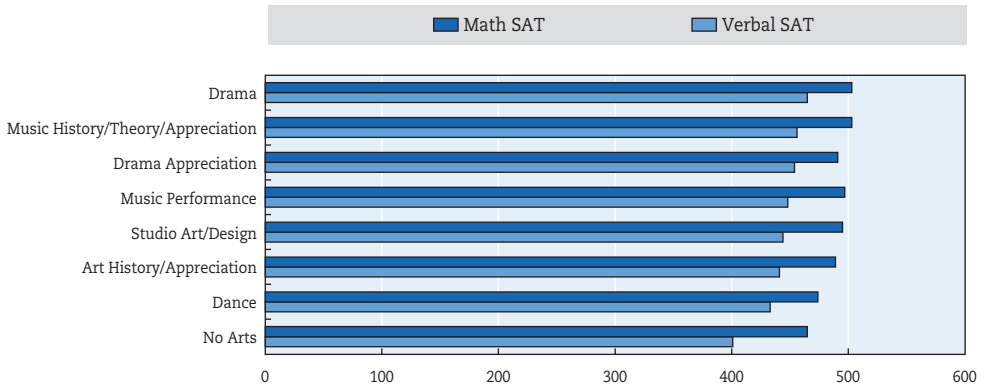
Music education and general academic achievement

Several reasons are often advanced to support the notion that music can boost academic achievement. One is that music motivates and engages students, a motivation that then spills over other school subjects. Another argument is that the rigour and discipline of music training gives students some habits of mind that they can apply successfully to other areas – for example, improved attention, heighted memory.

REAP analysis of music education and general academic achievement

Vaughn and Winner (2000) compared the SAT scores of students who took no arts in high school vs. those who took one or more courses in a specific art form. (The SAT is the exam taken for admission to US colleges and universities.) Their analyses were based on data from the College Board and IQ and family SES were not provided. Figure 3.1 below shows the SAT scores for these students. It can be seen that students taking music performance classes or music history classes have higher scpres than those with no arts: the difference range between 30 and 50 points for average verbal and math scores. T-tests comparing mean verbal SAT scores over 10 years for students with and without music performance classes proved highly significant. But no causal conclusions about the effects of music classes on SAT scores can be drawn since these analyses are based entirely on correlational data and because IQ and SES were not able to be held constant.

Figure 3.1. **The SAT scores of students who did and did not take music performance classes in high school**



StatLink http://dx.doi.org/10.1787/888932833029

Source: Vaughn and Winner (2000)

Post REAP studies of music education and general academic achievement

Correlational studies

We located four correlational studies not included in REAP, one showing a positive correlation between music aptitude (note: not music education) and academic achievement (Hobbs, 1985), and three showing a positive correlation between instrumental music participation and academic achievement (Linch, 1994; Schellenberg, 2006; Wetter, Koerner and Schwaninger, 2009) (Table 3.1).

Table 3.1. **Four correlational studies since REAP examining music and academic achievement**

Study	Positive outcome	Negative or inconsistent outcome
Hobbs (1985) (music aptitude not training)		X
Linch (1994)	X	
Schellenberg (2006)	X	
Wetter et al. (2009)	X	

Quasi-experimental studies

We also found two quasi-experimental studies since REAP investigating the effects of music training on general academic achievement (summarised in Table 3.2), and

both of these studies report no effects.In a longitudinal study in Germany examining effects of music on a variety of outcomes, Bastian (2000, 2008) followed children for six years between 1992 and 1998. This study did not randomly assign children to music vs. no music, and thus is a quasi-experimental study in which students self-selected into schools where they could study music. At the beginning of the study there were 123 children in the music group and 47 in the control group; by the end of the study, due to attrition, there were 87 in the music group and 38 in the control group. There was no effect of music instruction on academic performance (as measured in achievement in German, English, and Math).Weber, Spychiger, and Patry (1993) conducted a quasi-experimental study of approximately 1200 students in grades 1-7 in Switzerland between 1988 and 1991, comparing students who received intensive music education (five lessons per week) vs. those who received no music. One academic lesson in each main subject was cancelled to make room for these five music classes. No difference was found in academic performance between those who did and did not receive music instruction.

The authors of both of these above studies consider it a positive finding that despite extra time for music, achievement in other school subjects was not below the achievement in the control group. However, to argue that arts education does not harm academic achievement is a very different kind of claim from the claim that arts education improves academic achievement. That being said, one can see as a positive result the fact that spending more time on arts and less on other subjects does not harm academic achievement and at the same time leads to improved artistic skills. While this finding does not say anything about the impact of arts education, it demonstrates that a curriculum with more arts is possible without harming other disciplines. We would however need more studies to know how much substitution is possible and in what conditions this has actually worked.

Table 3.2. **Two quasi-experimental studies since REAP examining music and academic achievement**

Study	Positive outcome	Negative or inconsistent outcome
Bastian (2000, 2008)		X
Weber, Spychiger and Patry (2003)		X

Music education and intelligence quotient (IQ)

While Intelligence Quotient (IQ) is not a usual measure of academic achievement, IQ is an accepted measure of academic intelligence and a good predictor of academic achievement (and other measures of social success). Does music education improve children's IQ?

IQ was not a measure examined by the REAP team. Here we identify five correlational, quasi-experimental, and experimental studies that by and large demonstrate a positive relationship between music training and IQ in children (summarised in Table 3.3 to 3.5).

Correlational studies

Schellenberg (2006) has shown that duration of music lessons was positively correlated with IQ and academic ability among one hundred and forty seven 6- to 11-year-olds, even when potential confounding variables (i.e., family income, parents' education, involvement in nonmusical activities) were held constant. There was no evidence that musical involvement had stronger associations with some aspects of cognitive ability (e.g. mathematical, spatial-temporal, verbal) than with others. These results indicate that formal exposure to music in childhood is associated positively with IQ and with academic performance and that such associations are small but general and long-lasting.

One correlational study reports a relationship between both informal and formal music education and a measure of mental speed (of eye movements when identifying an image), a measure which correlates with IQ (Gruhn, Galley, and Kluth, 2003). And two correlational studies report a positive association between musical aptitude (note, not music education) and IQ (Lynn, Wilson, and Gault, 1989; Phillips, 1976) (Table 3.3).

Table 3.3. **Five studies examining correlation between music and IQ**

Study	Positive outcome	Negative or inconsistent outcome
Gruhn, Galley and Kluth (2003)	X	
Ho, Cheung and Chan (2003) - Study 1	X	
Lynn, Wilson and Gault (1989) (musical aptitude)	X	
Phillips (1976) (musical aptitude)	X	
Schellenberg (2006)	X	

Quasi-experimental studies

We found two relevant quasi-experimental studies, neither of which reported a gain in IQ for the music group (summarised in Table 3.4).

An increase in IQ in music trained children was reported in a German study in which children were followed for six years between 1992 and 1998 (Bastian 2000, 2008). This study did not randomly assign children to music vs. no music, and thus is a quasi-experimental study in which students self-selected into schools where they could study music. At the beginning of the study there were 123 children

in the music group and 47 in the control group; by the end of the study, due to attrition, there were 87 in the music group and 38 in the control group. There were no significant IQ differences between groups at the beginning of the study, as measured by the Culture Fair Intelligence Test (Cattell, 1949), which is a non-verbal measure of intelligence. After three years there were still no IQ differences between groups, but after four years (the last time IQ tests were given), the music group had significantly higher IQ scores. A second IQ test, the Adaptive Intelligence Diagnosis, was also administered. After six years of music training, the music group did not score any higher than the control group on this measure.

Ho, Cheung, and Chan (2003) were unable to demonstrate a significant gain in IQ as a function of music training.

Table 3.4. **Two quasi-experimental studies examining effects of music education on IQ**

Study	Positive effect	No effect or inconsistent effects
Bastian (2000, 2008)	X	
Ho, Cheung and Chan (2003) - Study 2		X

Experimental studies

Five experimental studies (summarised in Table 3.5) have tested the music IQ hypothesis, and all but one reported positive results, and the latter reported a non-significantly greater IQ gain in the music group.

Schellenberg (2004) showed that music lessons, compared to drama or no lessons, increases IQ scores in young children. This study is highlighted in Box 3.1.

Nering (2002) randomly assigned 10 children ages 3-7 to seven months of piano instruction consisting of two private lessons for 45 minutes a week (a total of 53 lessons). Each of these children was a monozygotic twin, and each child's twin was assigned to a control condition with no music training. Groups were equivalent in Full Scale IQ at pretest. Music trained children showed significant improvement in verbal but not performance full scale IQ. The verbal score improvement was carried by only two of the subtests, Information and Arithmetic.

Neville and her collaborators (2008) tested the hypothesis that music training improves nonverbal IQ, numeracy, and spatial cognition in young children using a true experimental design with random assignment. This study formed part of the Dana Foundation's initiative to investigate the relationship between arts and academic and brain outcomes (Asbury and Rich, 2008). Neville reasoned that if music improves cognitive outcomes, it may do so as a function of improving children's attentional skills. She therefore compared gains from music training with gains from attentional

Box 3.1. **Music lessons increase children's IQ**

In a true experimental study conducted by Schellenberg (2004), one hundred and forty four six-year-olds were randomly assigned to one of four groups: keyboard music lessons, vocal music lessons, drama lessons, and no lessons. All lessons were given in small groups of six children each for thirty six weeks. IQ was tested using the Wechsler Intelligence Scale for Children before onset of lessons and after thirty six weeks of lessons.

The keyboard group had an average IQ increase of 6.1 points, the voice group 8.6 points, the drama group 5.1 points, and the untreated control group 3.9 points. The two music groups were combined because their results did not differ statistically; the drama and untreated groups were also combined for the same reason. IQ improved 7.0 points (SD = 8.6) in the combined music groups and 4.3 points (SD = 7.3) points in the combined control groups, and this difference was statistically significant. ("SD" stands for standard deviation.) The combined musical groups also exhibited significantly greater increases than the combined control groups in all IQ subtests except Arithmetic and Information.

suggested that IQ improvement from music is due to music training being much like school; we know that school attendance leads to improved IQ (Ceci and Williams, 1997). Schellenberg speculates that the additional enjoyment of music over regular schooling may also help increase overall IQ.

training. She studied 88 children from Head Start (low SES) preschools between the ages of three to five. The children were randomly assigned either to their regular preschool or to one of three experimental groups. The experimental groups met 40 minutes a day, five days a week, for eight weeks. The music group listened to music and made music. Another group received direct training in focusing their attention and observing details. The two other groups had regular Head Start classroom activities: one of these groups was large with a student/teacher ratio of 18:2, and one had the same student/teacher ratio (5:2) as the music and attention groups. On two outcomes, all of the groups with a small student/teacher ratio showed significant improvements from pre- to post-test: language skills, and non-verbal IQ, including the object assembly test which assesses spatial cognition. Only in the music and attention groups did children also improve significantly in numeracy. The most reasonable conclusion from these findings is that young children (at least those from low SES backgrounds) derive cognitive benefits from small student/teacher ratios. Whether these outcomes are secondary benefits of improved attention cannot be concluded from this study as there was no direct measure of attentional skill. This study does not show that music training in itself improves IQ since music training was not disentangled from the effects of any kind of training with a small student/teacher ratio.

Moreno, Marques, Santos, Santos, Castro and Besson (2009) followed two groups of 8-year-olds over 9 months. One group received 6 months of music training and the other received 6 months of painting training. The music group did not improve significantly more than the painting group in IQ.

Moreno, Bialystok, Barac, Schellenberg, Cepeda and Ghau (2011) showed that after 20 days of interactive computerised music training given to 4-6 year old children (compared to 20 days of interactive computerised visual arts training, each randomly assigned), children in the music but not the visual arts group improved significantly on verbal IQ as measured by the vocabulary subtest of the Wechsler Preschool and Primary Scale of Intelligence III (WPPSI-III) (Wechsler, 2002). The music group also improved on an executive function task assessing level of control and attention – abilities clearly related to IQ. In addition, there was a positive correlation between performance on the changes in functional brain plasticity related to executive function.

Table 3.5. **Five experimental studies examining effects of music education on IQ**

Study	Positive effect	No effect or inconsistent effects
Moreno et al. (2009)		X
Moreno et al. (2011)	X	
Neville (2008)	X	
Nering (2002)	X	
Schellenberg (2004)	X	

In conclusion, the results of studies examining whether music education enhances children's IQs are posive. Children who take music lessons on top of other forms of schooling at least in Western society have higher IQs than those who do not. However, this advantage is not seen at the adult level.

When adults with and without music training are compared in terms of IQ, there is no advantage for musicians (Bialystock and DePape, 2009; Brandler and Rammsayer, 2003; Helmbold, Rammsayer, and Altenmüller, 2005; Schellenberg and Moreno, 2010).

Schellenberg (2010) attempts to reconcile the findings of music education boosting IQ with the finding that adult musicians do not have higher IQs than other professionals. He suggests that high-functioning children are more likely than other children to take music lessons, but do not necessarily go on to become adult musicians. He goes on to explain the causal finding in Schellenberg (2004) by arguing that music lessons are school like activities and these kinds of activities cause modest improvements in intelligence. But other kinds of school like activities (such as studying an academic discipline) have the same boosting effects, which is why adult musicians do not have higher IQs than other kinds of professionals.

Music education, reading, and the reading-relevant skill of phonological awareness

Why should music education have an impact on reading and the reading-relevant skill of phonological awareness (awareness of the phonemic components of words)? Music education develops auditory (listening) skills that could strengthen the

auditory perception of speech sounds and thereby stimulate early reading progress. Another possible connection between music training and reading is that music education involves reading musical notations and symbols. This might reinforce the understanding of reading text or develop skills that are involved in both types of reading. Reading and music both have to do with chronological sequences or phrases, so that music training might again help develop a better awareness of time that transfers to text comprehension.

The auditory cortex does not fully mature until full into adolescence (Ponton et al., 2000; Shahin et al., 2004). Musical training in early childhood speeds this trajectory: 4-5 year olds studying music have neural responses (called Event Related Potentials, or ERP) that are two to three years more advanced than those of children not studying music when exposed to the timbre of the instrument they are learning (Shahin et al., 2004). It is now established that shared brain areas are involved in the processing of music and speech (Jäncke, 2008; Patel, 2008). Thus researchers have begun to examine the relationship between music education and the kind of auditory perception and processing skills important for both speech perception and reading.

Adult musicians

Kraus and her colleagues argue that active engagement with music training helps to develop good listening skills including speech listening (Chandrasekaran, Hornickel, Skoe, Nicol, and Kraus, 2009; Chandrasekaran and Kraus, 2010; Kraus and Chandrasekaran, 2010). Musicians perform better when asked to detect speech in noisy environments. Compared to non-musicians, when listening to speech, adult musicians show a greater correspondence between the pitch cues in the speech and the neural brain stem response (Parbery-Clark, Skoe, and Kraus, 2009; Musacchia, Sams, Skoe, and Kraus, 2007; Strait, Kraus, Skoe, and Ashley, 2009) as well as superior encoding of linguistic pitch contours (Wong, Skoe, Russo, Dees, and Kraus, 2007). The neural encoding of sound was associated with number of years of music training, suggesting a causal relationship.

In addition, musicians show superior linguistic pitch processing (Schon et al., 2004; Marques et al., 2007), a superior ability to detect prosody from spoken language (Thompson, Schellenberg, and Husain, 2003) and a superior ability to identify a speaker's emotion from that speaker's prosody (Nilsonne and Sundberg, 1985; Thompson, Schellenberg, and Husain, 2004). Musically trained adults are also superior to those without training at imagining and comparing environmental (non-musical) sounds (Aleman, Nieuwenstein, Böcker, and de Haan (2000). Relatedly, Chandrasekaren et al. (2009) showed that children with poor reading ability show deficits in the neural representation of sound. In contrast, Parbery-Clark et al. (2009) showed that musicians have an enhanced neural representation of sound. For a definitive review of the relationship between the brain basis of music and language, see Patel, 2010.

There is thus a new body of neuroscientific research that makes it plausible that music education could lead to better speech perception and reading achievement.

REAP meta-analyses of music education and reading

Butzlaff (2000) meta-analysed 24 correlational studies testing music's effect on reading (see Table 3.6). In all of these studies, reading performance by students with some music experience was compared to reading performance by students without music experience. Ten of the effects were computed from College Board data over ten years comparing verbal SAT test scores of student with and without music courses in high school. The weighted mean effect size *r* was $r = .19$, and the *t*- test of the mean *Zr* was significant at $p < .001$, allowing the conclusion that there is a significant association between music education and reading skill.

Table 3.6. **Twenty-four correlational studies examining the association between music education and reading**

Study	Positive relationship	Mixed, null, or negative relationship
College Board (1989)	X	
College Board (1990)	X	
College Board (1991)	X	
College Board (1992)	X	
College Board (1994)	X	
College Board (1995)	X	
College Board (1996)	X	
College Board (1997)	X	
College Board (1998)	X	
Engdahl (1994)		X
Friedman (1959) (5th graders)		X
Friedman (1959) (6th graders)		X
Groff (1963)		X
Kvet (1985) (District A)		X
Kvet (1985) (District B)		X
Kvet (1985) (District C)		X
Kvet (1985) (District D)		X
Lamar (1989) (1st graders, music specialists)	X	
Lamar (1989) (1st graders, classroom teachers)	X	
Lamar (1989) (4th graders, music specialists)	X	
Lamar (1989) (4th graders, classroom teachers)		X
McCarthy (1992)	X	
Weeden (1971)		X
Weighted mean	X	

Note: The full results are presented in Table 3.A1.1.

Source: Butzlaff (2000).

However, the six experimental studies meta-analysed by Butzlaff tell a different story. As shown in Table 3.7, two of these studies yielded a significant effect, and four yielded no effect. Overall there was a weighted mean effect size of r = .11 (equivalent to d = .22). The t- test of the mean Zr was not significant, however, which means that these findings could not be generalised to new studies on this topic. Thus Butzlaff concluded that no evidence showed yet that music education aids the development of reading, even though higher reading achievement and music experience are indeed correlated.

Table 3.7. **Meta-analysis of six experimental studies examining the effect of music education on reading**

Study	Positive relationship	Mixed, null, or negative relationship
Douglas and Willats (1994)	X	
Fetzer (1994)	X	
Kelly (1981)		X
Olanoff and Kirschner (1969)		X
Roberts (1978)		X
Roskam (1979)		X
Weighted mean		X

Note: The full results are presented in Table 3.A1.2.

Source: Butzlaff (2000).

The six studies included in these meta-analyses were based on very different types of music input (lessons learning an instrument, singing, music terapy) and the reading measures were also widely varied (phonological awareness, letter identification, decoding, comprehension).

If music education has any effect on reading, this effect is far more likely to occur at the level of decoding than higher level comprehension: both decoding of words and music notes involves linking a visual symbol (letters, musical notation) to a sound.

Studies since Butzlaff (2000) are beginning to show that music training may indeed help to improve verbal decoding, and we review these below.

Post-REAP studies of music education, reading phonological awareness

Correlational studies

We found three correlational studies since REAP showing stronger brain responses in response to speech in children with music training compared to those with no training. Besson (2007) showed that children with music training had a

stronger brain response than those without training to pitch patterns in their native language. Jentschke, Koelsch, and Friederici (2005) reported that musically trained children showed a stronger event related potentials (ERP) brain response to both music and language violations than did those without training. And Jentschke and Koelsch (2009) reported that German children who had received music training had a stronger electrical brain response to irregularities of syntax in both language and music than did non-musically trained children. These are listed in Table 3.8.

We found six other correlational studies since REAP examining the relationship between music and reading ability and/or phonological awareness (note measured as behaviour, not as a brain response), also listed in Table 3.8. Two of these however examined music *ability* rather than music training, as indicated.

Anvari, Trainor, Woodside, and Levy (2002) found an association between music perception skills (but not music training) and reading in a sample of 100 4-5-year-olds. Regression analyses indicated that music perception skills predicted reading ability over and above the influence of phonological awareness and other cognitive abilities (math, digit span, and vocabulary). The researchers conclude that music perception involves auditory mechanisms related to reading that are not explained entirely by the auditory mechanisms related to phonological awareness. They suggest that both linguistic auditory mechanisms and more general nonlinguistic general auditory mechanisms are involved in reading.

Barwick, Valentine, West, and Wilding (1989) studied the relationship between music perception skills (again not music training) and reading ability in 50 children in the United Kingdom between ages six and eleven who had reading difficulties. They found a positive relationship between tonal memory and reading ability independent of age and IQ, and a positive relationship between chord analysis and reading ability independent of age.

Lamb and Gregory (1993) assessed the relationship of reading ability on the one hand, and phonemic awareness and perception of pitch and timbre in music. Eighteen 4-5 year olds were studied. A positive correlation was found between awareness of pitch changes in music and reading ability.

Loui, Kroog, Zuk, Winner, and Schlaug (2011) reported a postivie correlation between phonemic awareness skills and pitch perception and pitch production skills in children ages 7 and 9. They speculate that since tone-deafness is a pitch-related impairment, and dyslexia is a deficit of phonemic awareness, then dyslexia and tone-deafness may have a shared neural basis. Perhaps, then, music instruction could help to improve the phonological deficit in dyslexia.

Overy (2003) tested six-year-olds before and after a year of singing-based music lessons for approximately 1 hour per week, usually divided into three 20-minute

sessions. These classroom music lessons had a positive effect on both phonologic and spelling skills, but did not improve reading skills. She also reported that dyslexic children had difficulties with musical timing skills but not with pitch skills.

Wandell, Dougherty, Ben-Shachar, and Deutsch (2008) examined the association between music training and reading fluency and phonological awareness in 49 children between seven and 12 years of age. The amount of musical training the children had in the first year of this three-year study correlated with level of improvement in their reading fluency over the three-year study period. This study formed part of the Dana Foundation's initiative to investigate the relationship between arts and academic and brain outcomes (Asbury and Rich, 2008).

Thompson et al. (2004) found that children with music training detect the emotion in speech prosody better than do those without music training. We do not include this study in the table below since, though relevant to speech perception, this study does not seem relevant to reading skills.

Table 3.8. **Nine correlational studies since REAP examining music and/or reading or reading-related skills**

Study	Positive correlation	No correlation or negative correlation
Anvari, Trainor, Woodside and Levy (2002) (music ability, not music training)	X	
Barwick et al. (1989) (music ability not music training)	X	
Besson (2007) (brain response)	X	
Jentschke and Koelsch (2009)	X	
Jentschke, Koelsch and Friederici (2005)	X	
Lamb and Gregory (1993)	X	
Overy (2003)	X	
Loui, Kroog, Zuk, Winner and Schlaug (2011)	X	
Wandell, Dougherty, Ben-Shachar and Deutsch (2008)	X	

Quasi-experimental studies

Gromko (2005) found that after four months of music classes, kindergarten children outperformed those without music training on a phonological awareness task.

Similarly, Mingat and Suchaut (1996) found that kindergarten children with music education have better auditory and visual discrimination compared to those with no music training, better reading readiness scores at the end of kindergarten,

and much better reading outcomes at the end of grade 1. The two experimental groups receiving 2 and 4 hours of music education a week, respectively, had similar outcomes (see Box 3.2.).

Box 3.2. The effects of music education in kindergarten on reading, maths and music at the end of grade 1

In 1991-92, Mingat and Suchaut (1996) have carried out a longitudinal, quasi-experimental study in France with 900 children from 46 preschools (last year of *école maternelle*, just before grade 1). There was apparently no random selection, but the sample included classes with children from different socio-economic and geographic backgrounds. A first experimental group received a music education programme of 2 hours a week during one year; a second group had the same programme taught 4 hours a week; and the control group was taught the regular curriculum. Children were followed for one year after the experience. They were tested at the beginning and at the end of kindergarten, and one year after the end of the intervention, at the end of grade 1. The researchers hypothesised an improvement of visual-spatial skills and of reading skills at the end of the intervention.

The experiment yielded a large positive effect on musical skills at the end of kindergarten, with the students receiving 4 hours of music education having the best results. At the end of grade 1, during which all groups followed the regular French curriculum, students who had received 4 hours of music in kindergarten still outperformed the two other groups, but to a lesser extent than at the end of kindergarten. The positive difference between the 2-hour experimental group and the control group was not significant. There was thus evidence of a lasting but fading impact of musical ability one year after the experiment.

Students who took part in the experiment outperformed the control group on reading and writing readiness at the end of kindergarten, but not on numbering. This was particularly true for all items involving some type of visual or auditory discrimination (word recognition, phoneme discrimination, discrimination of graphic structures, rhythmic structures). The gap between experimental and control groups at the end of kindergarten only represent 40% of the gap in favour of the experimental groups at the end of grade 1. The positive effects were greater at the end of grade 1 than kindergarten, with slightly larger effects in math than in reading. The authors concluded that music education had a sustained effect as it had developed skills that would become even more important as the teaching of reading and math becomes more formal. The gap amplified towards the last months of grade 1.

Table 3.9. **Two quasi-experimental study studies since REAP examining music and/or reading or reading-related skills**

Study	Positive effect	No effect
Gromko (2005)	X	
Mingat and Suchaut (1996)	X	

Experimental studies

We found one meta-analysis of 30 experimental studies and two additional experimental studies all demonstrating a positive effect of music instruction on word decoding (summarised in Table 3.10.).

Standley (2008) reported a strong positive effect in a metaanalysis of 30 experimental studies examining the effect of music intervention on pre-reading and word decoding skill. Many of the music training programmes included were specifically tailored to support reading acquisition (and thus were not typical music education programmes where children sing and/or learn to play an instrument). Standley reported that "When music activities incorporate specific reading skills matched to theneeds of identified children" the effects are large (d = .44). She also concluded that the impact of music on reading was stronger when music-reading integrated activites were added to a regular music education

Moreno et al. (2009) demonstrated an effect of music training on word decoding skills. This study is described in Box 3.3).

Degé and Schwarzwer (2011) trained German preschool aged children 10 minutes a day for 20 weeks in either music, phonological awareness, or sports. The music training consisted of joint singing, joint drumming, rhythmic and meter exercises, simple notation skills, familiarisation with intervals, and dancing to music. The phonological training consisted of such activities as rhyming, clapping the syllables in a word, guessing the last phoneme of a word spoken by the experimenter. The sports training consisted of exercises to train balance, endurance, coordination, fine-motor abilities, body perception, and relaxation. Children in the music and phonological training group showed significant gains in phonological awareness, but those in the sports group did not. Thus phonological awareness can be enhanced with a music programme, and these findings suggest a shared sound category learning mechanism for language and music at the preschool age.

Table 3.10. **One meta-analysis of 30 experimental studies and two further experimental studies, all since REAP examining music and/or reading or reading-related skills**

Study	Positive effect	No effect
Degé and Schwarzwer (2011)	X	
Moreno et al. (2009)	X	
Standley (2008)	X	

We conclude that a growing body of research demonstrates a causal relationship between musical training and word decoding skills.

Box 3.3. Music training improves auditory perception of speech as well as music

Moreno, Marques, Santos, Santos, Castro and Besson (2009) conducted an experimental study of the effects of music training on 8-year-old Portuguese children. Children were tested at baseline on a wide range of cognitive and neurological measures and then were randomly assigned to either music or painting instruction. Instruction took place twice a week, for 75 minutes a session, for 24 weeks. Four teachers were hired to teach either music or painting and each class consisted of 8-10 children. Music instruction was a combination of Kodaly, Orff, and Wuytack methods and focused on rhythm, melody, harmony, and timbre. Thus, for example, children were taught to improvise melodies, create rhythms in different tempi, classify intervals as going up or down, and recognise different kinds of timbre. Painting instruction included learning about expression through color, color mixing, distinguishing shades of the same hue, use of line for expression, and working with different kinds of textured materials.

Reading skill was tested at baseline and after training. Children were asked to read words aloud that had one to one grapheme to phoneme correspondence (e.g. bota) (called consistent) and those whose pronunciations could not be derived by sounding out the phonemes (called inconsistent).

Auditory perception of music and speech was tested as follows. Children heard a sequence of tones or words. In the tone sequences, the final tone was sometimes increased in frequency. In the word sequences the final word was sometimes increased in pitch. Children were asked to press a button to indicate whether the final tone/word seemed normal or strange.

At post-test, children in the music (but not painting) group improved significantly in reading of the inconsistent words – and in these kinds of words the phoneme to grapheme correspondence was complex. At post-test, children in the music (but not painting) group also improved more in detecting the incongruities in the final tones.

Electro-physiological effects were also found using Event Related Potentials (ERP), a measure that captures electrical activity in response to complex cognitive tasks.

During the speech task, children in the music (but not painting) group showed enhanced amplitude of a positive brain component following weak incongruities and a reduced positivity to strong incongruities. During the music task, children in the music (but not painting) group showed enhanced neural response to the incongruities. These effects were similar to those found in 8-year-olds with four years of music training. These children showed superior discrimination of small pitch variations at the end of short musical phrases, and the amplitude of their ERP response was greater (Magne, Schön and Besson, 2006). These results were also similar to those of Trainor et al. (1999) showing that the amplitude of early and late ERP differs in those with musical expertise: music training fine tunes the auditory system making it more sensitive.

(continues...)

Box 3.3. **Music training improves auditory perception of speech as well as music** (continued)

This study shows that music training improves reading as well as auditory perception of both speech and music. And music training increases the amplitude of ERP components during speech and music processing. Moreno et al. (2009) theorise that music training improves basic auditory analysis such as sound segmentation and blending – phonological skills needed for reading. They note that their findings are consistent with research showing that severity of dyslexia correlates with difficulty in detecting frequency deviations in tones (Baldeweg et al., 1999), that dyslexic children are impaired on the same speech pitch discrimination task used here and had abnormal neural responses, that visual-auditory training linking reading and writing with pitch and tone training improves writing in children with and without dyslexia (Kast et al., 2007), and that music training can remediate phonological awareness skills in dyslexic children (Overy, 2003).

Moreno et al. (2009) account for the finding that music training appears to improve reading and writing skills in both dyslexic and non-dyslexic children by arguing for common pitch processing mechanisms in both music and speech. The increases in amplitude of auditory ERP suggests that the neural networks involved in pitch and frequency processing grow more efficient as a function of music training. It is also possible that music training improves auditory attention.

Music education and non-native language learning

If music instruction improves auditory perception of speech, as reviewed above, then it seems reasonable to suppose that music instruction makes easier the learning of a non-native language. This was not an outcome investigated by REAP.

Adult studies have revealed that musicians are superior to non-musicians at discriminating pitch and detecting pitch violations in a foreign language (Marques, Moreno, Castro and Besson, 2007; Moreno et al., 2009; Schön, Magne and Besson, 2004), and that musical ability correlates with phonological skill in second language learning (Slevc and Miyake, 2006) and with learning of tones in a tonal language (Delogu et al., 2006; Wong and Perrachione, 2007).

Quasi-experimental studies

In a quasi-experimental study, Petitto (2008), whose study formed part of the Dana study on the arts, examined the association between extensive music education in childhood and skill in learning a second language in adulthood. She studied monolingual English speaking students enrolled in introductory Italian or Spanish classes, at the beginning and end of the academic term. Musicians (those who had received early extensive and continued music education) were compared to non-musicians on English language performance, new language performance, cognitive attentional processing, end-of-term self-evaluation, and

class final grade. While the two groups showed no differences in general academic performance or on cognitive attentional assessments, those trained in music showed significantly greater improvement in expressive fluency and competence in their second language compared to non-musicians.

Does music instruction have a similar effect on children learning a foreign language? We found one quasi-experimental study (an unpublished doctoral dissertation) concluding that the answer to this question is yes (Table 3.11).

Lowe (1995) examined the effect of incorporating music into second language learning (French) for second grade children. One group of English speaking children received French and music lessons taught completely separately; the other group received music lessons that were incorporated into the French lessons. The period of instruction lasted for eight weeks. Results showed that those who received the music-French integrated instruction performed better not only on music tests but also on French tests. Integrated music-French instruction enhanced the learning of pronunciation oral speaking, as well as reading and vocabulary.

Music might plausibly serve as a useful vehicle for the teaching of second language or facilitate its learning thanks to an improved auditory perception of speech or of pitch violation in a foreign language. However, experimental research with random assignment is called for to determine whether this hypothesis is correct. Researchers should also examine which aspects of music instruction are particularly useful in fostering second language learning.

Table 3.11. **One quasi-experimental study examining effects of music on non-native language learning**

Study	Positive effect	No effect/inconsistent effects
Lowe (1995)	X	

Music education and maths

It has often been claimed that music training improves math abilities (James, 1993; Krumhansl, 2000; Nisbet, 1991; Shuter, 1968). Discussions about the mathematical properties of music date back to the time of Pythagoras's discoveries about harmonic ratios and continue through the present day. Igor Stravinsky (1971) stated that music is "something like mathematical thinking and mathematical relationships" (p. 34). A recent Google search using the term "music and mathematics" yielded over 43 000 entries; and many contemporary mathematicians as well as musicologists have analysed the mathematical properties of music (e.g. Fauvel, Flood, and Wilson, 2006; Rothstein, 2006). It is well known that musical tones are composed of a fundamental frequency and a series of harmonics, with each harmonic being equivalent to successive integer ratios of the fundamental frequency (e.g. 440 Hz, 880 Hz, 1320 Hz, and 1760 Hz; 1:2, 1:3, 1:4). Musical intervals can be similarly expressed and theories of consonance rely on the concept of rational and irrational numbers (Steinhaus, 1969). Numeric descriptions can also be applied to rhythms, chord progressions, and melodies.

One study has shown that when musicians mentally add and subtract fractions, areas of greatest brain activation do not correspond to areas of greatest brain activation in non-musicians (Schmithorst and Holland (2004), but it is not clear what we can conclude from this finding.

REAP meta-analyses of music education and maths studies

Is there actually an association between music education and performance in mathematics? And if yes, is there any evidence of a causal impact from music education to mathematic achievement?

Correlational studies

Vaughn (2000) meta-analysed 20 correlational studies assessing whether students with music training outperformed those without on mathematics

Table 3.12. **Twenty correlational studies examining the association between music and mathematics**

Study	Positive relationship	Mixed, null, or negative relationship
Anello (1972)	X	
Catterall, Chapleau and Iwanaga (1999)	X	
Ciepluch (1988)	X	
College Board (1998)	X	
College Board (1997)	X	
College Board (1996)	X	
College Board (1995)	X	
College Board (1994)	X	
College Board (1992)	X	
College Board (1991)	X	
College Board (1990)	X	
College Board (1989)	X	
College Board (1988)	X	
Engdahl (1994)	X	
Kvet (1985)		X
Kvet (1985)		X
Kvet (1985)		X
Kvet (1985)		X
McCarthy (1992)	X	
Wheeler and Wheeler (1951)		X
Weighted mean	X	

Note: The full results are presented in Table 3.A1.3

Source: Vaughn (2000).

(listed in Table 19). She reported a weighted mean effect size of r = .14 (equivalent to a d of 28). The t- test of the mean Zr was highly significant, showing that these results could be generalised to new studies. There is thus a clear association between music education and math abilities, but not necessarily a causal link.

Quasi-experimental and experimental studies

Vaughn (2000) went on to meta-analyse six experimental studies (including both quasi-experimental and experimental) assessing whether training in music causally implicated improved mathematics performance (Table 3.13). One of these studies received a great deal of publicity (Graziano, Peterson, and Shaw, 1999). This study reported that piano keyboard training along with computer-based spatial training led to greater improvements in mathematics for children than when spatial training was combined with computer-based English language training, suggesting that keyboard instruction fosters math learning.

Table 3.13. **Six experimental studies examining the association between music and mathematics**

Study	Positive relationship	Mixed, null, or negative relationship
Costa-Giomi (1997)	X	
Friedman (1959)		X
Graziano, Peterson and Shaw (1999)	X	
Neufeld (1986)		X
Neufeld (1986)		X
Weeden (1971)		X
Weighted mean		X

Note: The full results are presented in Table 3.A1.4.

Source: Vaughn (2000).

The six experimental studies meta-analysed by Vaughn (2000) yielded a mean weighted effect size of r = .16 (equivalent to d = .34). The t- test of the mean Zr was nearly significant (considering the .05 level as a cut-off) at p = .06. While these results suggest a positive impact of music education on mathematic ability, no firm conclusions can be drawn from this meta-analysis since the finding was based on only six experiments. Moreover, of these six results, only two yielded medium sized effects (r = 31, .20, equivalent to d = .65, .41), one yielded a small to medium sized effect (r = .17, equivalent to d = .35), and the remaining three were below .10, the level considered to be small (one of which was actually negative). The difference in the magnitude of the effect sizes calls for firther experimental studies assessing this relationship. It is of course possible that music has a stronger effect on some math subskills (e.g. fractions) than on others (e.g. calculus), and future research should not examine math as a composite outcome but should examine subskills, based on hypothesised relationships to music instruction.

Post-REAP studies of music education and mathematics

We identified nine correlational, on quasi-experimental and no experimental studies since REAP investigating the relationship between music and maths, described below and summarised in Tables 3.14 and 3.15.

Bahr and Christensen (2000) assessed musical and mathematical ability in 85 ten-year-olds. They found a significant correlation but only for mathematical skills they argue bear a structural relationship to musical skills, and not for those mathematical skills that do not bear such a relationship. The kinds of skills that were argued to overlap were not specified.

Cheek and Smith (1999) assessed 113 eight graders in terms of their maths scores on the Iowa Tests of Basic Skills. They compared the scores of those students who had taken private music lessons (36 participants) versus those who had not (77 participants). Students who had studied music performed significantly better than those who had not. Those who had taken keyboard lessons performed better than those who had studied other kinds of instruments. Among the students who had taken only lessons at school, there was no difference between those who had taken more than two years of lessons and those who had taken less than two years of lessons.

Gouzouasis, Guhn, and Kishor (2007) found that high school students studying music perform better on standardised maths tests.

In three studies which formed part of the Dana Foundation's initiative to investigate the relationship between arts, academic and brain outcomes (Asbury and Rich, 2008), Spelke (2008) reported an association between music education and one form of mathematics understanding – geometric representation and reasoning (featured in Box 3.4). In all three studies, children with prior music training performed better than those without such training on tasks involving geometric representation and reasoning, but not on other kinds of number tasks.

While these six correlational studies reported an association between music and some form of maths achievement, two other correlational studies reported no association (Cox and Stephens, 2006 Forgeard et al., 2008). And Wang and McCaskill (1989) assessed musical ability (rather than musical training) along with mathematical ability in 95 11-year-olds: they found no correlation between musical and mathematical ability.

Two quasi-experimental studies find some effect of music education in kindergarten on mathematical notions of young children (Table 3.15). Lee and Kim (2006) found a positive effect of activities integrating mathematics and music on both the musical ability and the mathematical concepts of pre-schoolers (see Box 3.5). While Mingat and Suchaut (1996) find no positive effect of one year of music education in kindergarten on the numbering of French children at the end of kindergarten, they find a significant difference in math scores at the end of grade 1 between students that were part of their experiment and the control group. The difference is particularly strong when it comes to order numbers increasingly and to associate numbers written in figures and in writing (see Box 3.2).

Studies should distinguish the kinds of maths abilities that might be trained by music. Doing so might help to clarify the inconsistencies in the

findings of existing studies. Studies should also make distinctions among kinds of music training. For example, it is possible that training in writing a fugue, a canon, or doing some freer counterpoint or harmony, has an impact on maths skills – assuming that students do it the labourious rather than the musically intuitive way. Perhaps even working on composing musical intervals would strengthen maths skills? But of course, composing and music theory is typically not included in the kind of music education offered in our school.

Moreover, most recent post-REAP studies are correlational; more experimental studies are needed to establish whether there is a causal link between music education and maths skills.

What could we expect from these experimental studies? A study by Beecham, Reeve, and Wilson (2009) would lead us to hypothesise that experimental studies will not demonstrate that music training improves maths. They examined representation of pitch and number and found that while people represent both number and pitch spatially, they do not use the same kind of spatial representation for both domains. People were asked to make judgments about numbers (with Spatial-Numerical Association of Response Codes (SNARC) and the Spatial Musical Association of Response Codes (SMARC)). If responses to high notes and large numbers are faster when responding using a response key on the right rather than the left, we can conclude that numbers/pitches are represented on a horizontal axis with larger numbers/higher pitches to the right of smaller numbers/lower pitches. How people responded to the SNARC proved unrelated to how they responded to the SMARC. This finding of domain-specific representational systems for music and number provides evidence that people do not use the same kind of spatial representation for music and numbers. If there is no shared spatial representation of music and numbers, there is less reason to expect that training in music would boost performance in arithmetic. However, it would still be possible to find that music training improves some maths abilities or reasoning putting a small emphasis on numbers.

Table 3.14. **Nine post-REAP correlational studies examining associations between music education and mathematical skills**

Study	Positive association	No association
Bahr and Christensen (2000) (musical ability, not music education)	X	
Cheek and Smith (1999)	X	
Cox and Stephens (2006)		X
Forgeard et al. (2008)		X
Gouzousis et al. (2007)	X	
Spelke (2008) Study 1	X	
Spelke (2008) Study 2	X	
Spelke (2008) Study 3	X	
Wang and McCaskill (1989) (musical ability, not music education)		X

Table 3.15. **Two quasi-experimental studies on music education and maths skills**

Study	Positive effect	No effect
Mingat and Suchaut (1996)	X	
Lee and Kim (2006)	X	

Box 3.4. Music education and geometric reasoning

Spelke (2008) conducted three correlational studies showing a relationship between music education and the perception of geometric relations. Three geometric reasoning tasks were administered in all of these studies.

On a geometric invariants test developed by Dehaene, Izard, Pica and Spelke (2006) participants looked at sets of six geometric figures and had to decide which one of these lacked a geometric property (such as symmetry) shared by the others.

On a number line task participants had to link number and space by marking where on a number line a given number would fall.

On a map test assessed the ability to represent geometric properties of an environment onto a map. On this task, children were shown a map with three forms in triangular arrangement. Participants were facing away from an actual spatial array with three containers in similar triangular patterns twelve times larger than the map, and at a different orientation. The experimenter pointed to one of the forms on the map and asked the child to put an object in the corresponding container in the environment.

Other kinds of number tasks not involving geometric reasoning were administered: these assessed the ability to represent small exact numbers by keeping track of two moving dots; the ability to represent large approximate numbers by comparing two arrays of dots in terms of magnitude; and the ability to link precise number words to their reference by estimating number of dots in an array.

In a first study, Spelke tested participants from 5 to 17 years of age with moderate levels of prior music training, and compared these to a group with moderate levels of sports training. No effects of music training on geometric reasoning could be seen.

In a second study, participants (ages 8-13) with a history of more intense music instruction were enrolled and compared to those with no prior music training. Children with music training performed better than those without on all but one of the measures of sensitivity to geometry, though only on one of these measures did the difference between groups reach significance: on the test assessing sensitivity to Euclidean geometric relationships. This effect occurred after controlling for age and verbal IQ (the groups did not differ by SES). Finally, amount of music training predicted performance on the map tasks.

In a third study, 13-18 year olds majoring in music in a high school for the arts were compared to those majoring in non-music arts disciplines. Music majors outperformed the others on five subtests of the geometry test. And music (as well as dance) majors outperformed the other groups on the number line test.

Box 3.5. The effects of integrated math and music education on musical and mathematical skills

Lee and Kim (2006) study the effect of integrated music and mathematics activities in kindergarten among 4-5 year old children in kindergarten in the Chungbuk provincial area in Korea. There were two (non-randomly selected) groups of 20 children in 2 private kindergarten exposed to activities about musical composition and about mathematical concepts activities were composition musical concepts and mathematical concepts. The experimental group was exposed to the integrated math-music activities while the control group was exposed to general non integrated activities. These activities were carried out twice a week for 40 minutes a day during 10 weeks.

First, the experimental group showed significantly greater scores and growth in its test scores than the comparative group in mathematical concepts. The level of understanding of mathematical concepts was tested at the beginning and the end of the intervention with the learning readiness tests for young children originally developed by KEDI (Korea Educational Development Institute). In the sub-factor analysis of the mathematical concepts, the experimental group showed significant positive differences in the areas of classification, number, and space/time concepts (and no significant difference in measurement).

Second, the authors also tested the effect of their intervention on the growth in musical abilities between the two groups. The experimental group showed significantly higher growth (and greater scores) than the comparative group. Their musical ability was measured with the Recording Skill Development in Music originally created by Loten and Walley. In the sub-factor analysis of their musical ability, the experimental group showed significant differences in growth in the areas of listening, rhythm expression, singing and operation of instruments (and no significant difference in musical creativity).

This quasi-experimental study is based on a very small sample and its results cannot easily be generalised. It is interesting in several ways: its assumption is not so much that music education transfers into maths skills but that a special kind of integrated pedagogy can accelerate math and music learning; it tests both outcomes in mathematics and in music, while many studies only test maths outcomes; finally, it tests musical creativity rather than generic creativity.

The REAP meta-analyses of music and maths suggest that there may indeed be a causal link between some forms of music instruction and some forms of mathematics outcomes. Six recent, post-REAP correlational studies show a positive relationship between music training and some form of mathematical reasoning. But more research on this question is needed before we can be sure about the results: from the correlational studies, we cannot conclude that the associations found are an effect of music training rather than evidence of self-selection into music by individuals with math skills; while positive, the existing experimental studies where not numerous enough to allow firm conclusions. More experimental studies are called for.

In addition, we need studies that continue to assess separately the effects of music on geometry, which is spatial, and other non-spatial forms of mathematics.

Indeed, some recent research makes us hypothesise that music education is unlikely to have an impact on some maths domains such as arithmetics. Should this be proven, it could still have an impact on geometry, so different types of mathematic outcomes need to be distinguished.

Music education and visual-spatial skills

Visual-spatial skills refer to the ability to manipulate mentally figures in 2 and 3 dimensions, as in mental rotation. This is an important skill in mathematics, but also, more broadly, in professions such as engineering, surgery and archaeology. Hetland (2000) distinguishes two non-mutually exclusive kinds of reasons why music education could enhance visual-spatial skills: neural connection theories and near transfer theories. If musical and spatial processing centres in the brain are proximal or overlapping, and hence linked, one might hypothesise that the development of certain spatial and musical skills are related, and that music involves some mental manipulation of non-physical objects. Near-transfer explanations are based on the idea that visual-spatial skills are involved in music so that their development by music education could transfer to other, non-musical forms of these skills. Reading notation, visualising relationships between keys when playing a keyboard instrument, memorising musical patterns, improvisation, or representing the location of sound in space all require visual-spatial skills that could possibly transfer to other subjects than music. What does the empirical evidence say on this possible transfer?

REAP meta-analyses of music education and visual-spatial skills studies

Quasi-experimental and experimental studies

Hetland (2000) conducted three meta-analyses of quasi-experimental and experimental studies combined examining the effect of music training on children's spatial skills (with a total of 29 studies included across these three meta-analyses, listed in Table 3.16.). The studies included children between the ages of 3-12. Music instruction consisted of one or more of the following: singing, musical games, notation learning, improvising or composing, moving to music, playing instruments. The instruments used in the studies were combinations of voice, piano, xylophones, snare drum, and classroom rhythm instruments (triangles, tambourines, rhythm sticks, finger cymbals, hand-chimes, and bells).

Meta-analysis 1. Hetland's (2000) first meta-analysis included 15 studies (701 subjects) that used spatial-temporal tasks as outcomes (defined as tasks that require mental manipulation over time) such as the Object Assembly subtest from the Wechsler Preschool and Primary Scale of Intelligence-Revised or Wechsler Intelligence Scale for Children-III (both standardised, normed, reliable and valid measures of intelligence), in which one must put together a jig-saw puzzle without seeing a model of the completed image.

The average effect size was large (r = .37, d = .79), and the results were highly generalizable (t- test of the mean Zr was 7.50, $p < .0001$). There was relatively little variation in effect size among the studies included, leading Hetland to conclude that the results from this analysis were robust.

Effect sizes were somewhat larger in studies with individual rather than group lessons, and in studies in which children learned standard notation (rather than either no notation or preparatory types of notation such as Kodaly hand signs). However, large effects were obtained in both group and individual formats (group lessons r = .32, individual lessons r = .48) and with and without standard notation (no notation: r = .36, standard notation: r = .39).

Not all studies showed a positive effect of music learning on spatial reasoning, however. One of the most well known studies reported that music instruction boosted spatial reasoning for the first two years of instruction, but that after three years there was no difference in spatial scores between those with and without music instruction (Costa-Giomi, 1999). This study is featured in Box 10.

Meta-analysis 2. Hetland's (2000) second meta-analysis (5 studies, 694 subjects) included studies with Raven's Matrices as the outcome measure, a measure of non-verbal reasoning that is not considered a "spatio-temporal" measure. The average effect for studies using these nonspatial-temporal measures analysis (r = .08, d = .16) was much lower than the average effect of the spatial-temporal measures analysis reported above. The effect was not generalizable to new studies because the t- test of the mean Zr was not significant. Hetland concluded that the effect of music instruction was specific to spatial-temporal and not non-verbal tasks generally, such as Raven's, that rely more on general logic.

Meta-analysis 3. Hetland's (2000) third meta-analysis included nine studies (655 subjects) that employed a range of spatial measures not readily classifiable as either spatial-temporal or nonspatial-temporal. Some studies used both spatial-temporal and nonspatial-temporal measures (i.e., several used more than one spatial subtest from the WPPSI-*R* and only reported a global score), some used tests that may be spatial-temporal but that are difficult to classify (e.g. Children's Embedded Figures Test, or "drawings and words presented in lacunary and ambiguous form" Zulauf, 1993/1994, p. 114). One study used a task that relies mainly on spatial memory - the Bead Memory task from the Stanford Binet, which assesses the ability to reconstruct a visual sequence.

The average effect found in this analysis (r = .26, d = .55) was lower than the effect in the spatial-temporal analysis, but it was still of moderate size. In addition, it was generalizable to new studies because the t- test of mean Zr was significant. Hetland concluded therefore that music instruction may not enhance only spatial-temporal skill but may enhance spatial skill more broadly. She cautioned, however, that further research was needed since the outcome measures were quite diverse.

Table 3.16. **Twenty-nine quasi-experimental and experimental studies included in three meta-analyses of the effects of music education on visual-spatial skill**

Study	Positive relationship	Mixed, null, or negative relationship
Studies in Meta-Analysis 1	X	
Costa-Giomi (1999)*	X	
Flohr, Miller and Persellin (1998) *		X
Flohr (1998) *		X
Flohr (1999) (raw data) *		X
Graziano et al. (1999)		X
Gromko/Poorman (1998)		X
Hurwitz et al. (1975)		X
Mallory/Philbrick (1995)	X	
Persellin (1999)		X
Rauscher (1999) *	X	
Rauscher (1999) *	X	
Rauscher et al. (1994)	X	
Rauscher et al. (1997)	X	
Rauscher/Zupan (1999)		X
Taetle (1999)	X	
Studies in Meta-Analysis 2		X
Hurwitz et al. (1975)	X	
Lazco (1985)		X
Lazco (1985)		X
Zulauf(1993/94)		X
Zulauf (1993/94)		X
Studies in Meta-Analysis 3	X	
Billhartz et al. (2000)	X	
Flohr et al. (1999) *		X
Gromko/Poorman (1998)		X
Hurwitz, et al. (1975)	X	
Parente and O'Malley (1975)	X	
Rauscher et al. (1997)		X
Taetle (1999)		X
Zulauf (1993/94)	X	
Zulauf (1993/94)		X

Note: The experimental studies are asterisked. The full results are presented in Table 3.A1.5.

Source: Hetland (2000).

Hetland (2000) concluded that there is a solid, generalizable finding that, for children aged 3-12, music instruction enhances performance on a specific type of

spatial task classified as "spatial-temporal." And this enhancement may extend more broadly to some nonspatial-temporal forms of reasoning, although not to Raven's matrices tasks (as shown in the second analysis).

Hetland (2000) cautions because the spatial tests were conducted within a few weeks of the end of the music instruction, we do not know how long any enhancing effect lasts. And because the only extant longitudinal study extending beyond two years currently showed students without music instruction catching up to those with piano instruction during the third year of instruction (Costa-Giomi, 1999, see Box 3.6), we do not know if music instruction is effective in fostering spatial reasoning after the first two years of instruction.

Perhaps even more important, Hetland (2000) points out, is the question of whether the effects of music instruction on spatial tests translate to better performance in school. To reap the benefits of any enhancement of spatial reasoning resulting from music instruction, schools would need to insure that instruction emphasises spatial approaches to learning.

Box 3.6. **A longitudinal study shows no effects on cognitive and spatial skills after three years of piano instruction**

Costa-Giomi (1999) conducted an experimental study exploring the effects of piano instruction on cognitive development. Children who had never before engaged in music lessons were randomly assigned to either the music (67 children), in which children engaged in three years of piano or keyboard lessons, or the control group (50 children), who received no lessons.

There were no differences between the groups in cognitive, musical, or motor abilities, and no differences in self-esteem, academic achievement, or motivation to study music at the beginning of the study.

The music treatment group improved in general cognitive and spatial abilities after one and two years of training, but the overall improvements were small. However, after three years of training, there were no significant differences between the treatment and control groups.

Post-REAP studies of music education and visual-spatial skill

Correlational studies

The REAP meta-analyses of music and visual spatial skill did not include correlational studies. A number of recent correlational studies since REAP have reported that adult musicians outperform adults with no music training on visual-spatial tests (Brochard, Dufour, and Despres, 2004; Patson, Corballis, Hogg, and Tippett, 2006; Sluming, Barrick, Howard, Cezayirli, Mayes, and Roberts, 2002; Sluming, Brooks, Howard, Downes, and Roberts, 2007; Stoesz, Jakobson, Kilgour, and

Lewycky, 2007). A similar finding was reported for children between 9-14 years of age (Hassler, Birbaumer, and Feil, 1985, 1987). They found a strong link between musical talent and spatial visualisation.

We found one correlational study post-REAP examining the correlation between musical and spatial ability (Table 3.17). Wang and McCaskill (1989) assessed musical ability (not musical training) along with spatial ability in 95 11-year-olds and found a significant correlation between musical and spatial ability.

Table 3.17. **One post-REAP correlational study examining association between music education and visual-spatial skills**

Study	Positive association	No association
Wang and McCaskill (1989)	X	

Note: The study assesses musical ability rather than musical training.

Quasi-experimental and experimental studies

In a quasi-experimental study that was not included in REAP, Mingat and Suchet (1996) find no statistically significant difference in visual-spatial structuration between kindergarten students having received 2 or 4 hours of music education and the control group at the end of the experiment (see Box 3.2.).

We found only one experimental study since REAP testing whether music training improves visual-spatial skill in children (summarised in Table 3.18).

Bilhartz, Bruhn, and Olson (2000) randomly assigned 4-5 year olds to a music lessons or a no music lessons group for seven weeks. Children were tested before and after the seven weeks on a variety of subtests from the Stanford-Binet IQ test. Children in the music group outperformed those in the control group on only one subtest - the Bead memory test, a visual-spatial test. Note that the finding that the music group did not improve on all IQ subtests conflicts with Schellenberg's (2004) finding that music training improves full scale IQ (see section on music education and intelligence quotient above).

We found one other study since REAP testing the effect of music training on visual-spatial skills (Zafranas, 2004) but since this study did not include a control group, we do not discuss it here.

Table 3.18. **Two studies since REAP examining effect of music education on visual-spatial skill**

Study	Positive association	Negative or no association
Bilhartz, Bruhn and Olson (2000)*	X	
Mingat and Suchaut (1996)		X

Note: The asterisked study is a true experimental study.

In summary, evidence from the REAP meta-analyses shows a positive effect of music training on visual-spatial reasoning. However, the one long-term longitudinal study included in REAP failed to show any advantage in visual-spatial skills from music training after three years. This study should cause us to be cautious about assuming that music training has long term positive visual-spatial outcomes. Since we found only one experimental study since REAP on this question, more research is called for.

Music education and attention

Learning a musical instrument requires concentration. Thus we might ask whether learning in music improves the ability to focus one's attention and concentrate, a benefit that might then account for any improvements in school performance. Music activity involves memorising patterns of tones, notations, and motor sequences. And it requires careful listening and long periods of attention. Thus it is possible that music trains general memory and attentional skills. A finding that adult musicians show superior executive functioning, which included attentional skills, suggests that perhaps music training actual trains attentional skills (Bialystok and DePaper, 2009). And one experimental study with random assignment did show that older adults (ages 60-85) who study piano for six months improve in attention and concentration relative to a control group (Bugos, Perlstein *et al.*, 2007). However, this effect disappeared three months after they discontinued the lessons. What is the evidence for music training improving attention in childhood?

Correlational studies

We found two correlational studies examining the relationship between music lessons and a brain outcome related to attention, summarised in Table 3.19, and one correlational study examining the relationship between music lessons and a behavioural measure of auditory attention.

Fujioka et al. (2006) found that violin training affected a brain outcome known to be associated with attention. This study is described in Box 3.7 Shahin et al. (2008) found that a kind of neural response seen in children who have had at least one year of music lessons is associated with the executive functions of attention and memory.

In Finland, Huotilainen (2010) is currently studying the relationship between music and auditory attention, among other skills. Her study is a correlational one comparing children between the ages of 9 and 13 who are and are not involved with music. The two groups were matched carefully according to the number of activities they were involved in, as well as according to their socio-economic status and quality of school they attend. Children involved in music performed significantly faster and made fewer errors on neuropsychological test batteries. Some of the tasks on which music-involved children excelled involve paying auditory attention in the presence of distracting sounds (e.g. counting numbers in noise and recognising words in noise).

The music-involved children also excelled at naming objects and switching rules in naming objects. Huotilainen explained these findings by speculating that playing and singing music trains the skill of focused auditory attention which then transfers to non-musical tasks and allows the child to stay focused on an auditory task despite other auditory distractions.

Table 3.19. **Three correlational studies examining relationship between music and attention**

Study	Positive correlation	No correlation
Fujioka et al. (2006) (brain outcome)	X	
Huotilainen (2010) (behavioural outcome)	X	
Shahin et al. (2008) (brain outcome)	X	

Quasi-experimental studies

We found three quasi-experimental studies testing the effect of music training on attention (Table 3.20).

Scott (1992) found that preschoolers receiving music lessons performed better than those receiving creative movement lessons on an attention task requiring vigilance.

In the German study described earlier, Bastian (2000, 2008) found no greater gains in ability to concentrate among children who had received extensive music education vs. those who had received none.

In the Petitto (2008) discussed earlier in the section on non-native language learning, no benefits of music on attention were found.

Table 3.20. **Three studies examining effects of music on attention**

Study	Positive effect	No effect/inconsistent effects
Bastian (2000, 2008)		X
Petitto (2008)		X
Scott (1992)	X	

Experimental studies

We found no experimental studies examining whether music training improves attention in preschool children.

In conclusion, a few empirical studies suggest that music training might be associated with improved attention or related brain outcomes, but there is as yet

no strong experimental research allowing the conclusion that music education enhances attentional skills. Children with better attentional skills might as well choose to study more music.

Box 3.7. Violin training enhances attentional response in the brain

Fujioka et al. (2006) studied 4-6 year olds receiving violin training compared to those not receiving music instruction. Children were tested four times a year using magneto-encephalography (MEG). They found that a magnetic component, the N250m, known to be associated with attention, was enhanced in musically trained (but not untrained) children in response to violin tones.

The researchers could not rule out the possibility of preexisting differences (prior to onset of music training) and thus could not conclude that the music training was what caused the different brain response.

This finding is consistent with Shahin et al. (2008) who showed that a neural response (the N2 Event Related Potentials component), which is associated with auditory attention and memory, matures earlier when children take music lessons.

Music education and memory

Does music education improve memory? Music instruction has been shown to be associated with strengths in verbal memory in several correlational studies (for a review see Schellenberg, 2005, 2006a).

Compared to non-musicians, musicians show superior memory for verbal memory (Brandler and Rammsayer 2003; Chan, Ho, and Cheung, 2008; Jakobson, Cuddy, and Kilgour, 2003; Jakobson, Lewycky, Kilgour, and Stoesz, 2008; Kilgour, Jakobson, and Cuddy, 2000; Piro and Ortiz, 2009; Tierney, Bergeson-Dana, and Pisoni, 2008). For example, Franklin et al.'s (2008) study examined individuals, enrolled in a graduate or undergraduate music programme, who had begun instrumental training before age 10 and who had had at least nine years of training. These students were compared to those who had not played an instrument for longer than one year. The musicians had superior long term memory, and a superior verbal working memory span. However, because this was not an experimental study, we cannot determine whether individuals with strong long term verbal memory are drawn to and stick with the study of piano, or whether instrumental training fosters the growth of verbal memory (e.g. via the use of verbal rehearsal strategies, or both). It has been suggested by Jakobson et al. (2003) that a relationship between the study of music and the strengthening of verbal memory could be due to a shared mechanism for processing temporal order in the auditory domain. Perhaps music study strengthens this skill and thereby strengthens verbal memory (though this would have to mean strengthening memory for orally presented verbal information).

While the above studies show a relationship between music training and verbal but not visual memory, two correlational studies reported that music is associated with strengths in both kinds of memory. Lee Lu and Ko (2007) reported that musicians performed better than non-musicians on a digit span and a non-word span test.

Schellenberg (2008) has critiqued the above studies by arguing that the groups are often not matched in overall IQ, with the music groups having higher IQs or higher educational levels. Thus, differences in verbal memory ability may be a function of IQ and/or educational attainment rather than music training.

What is the evidence for music improving memory in childhood?

Correlational studies

We found one correlational study examining the relationship between music lessons and memory.

Ho, Cheung, and Chan (2003) showed, in Study 1 that music training is associated with strengths in verbal (auditory) memory summarised in Table 3.21. This study is described in Box 3.8.

Table 3.21. **One correlational study examining relation between music training and verbal memory**

Study	Positive relation	No relation
Ho, Cheung and Chan (2003), Study 1	X	

Quasi-experimental studies

We found one quasi-experimental study testing the effect of music lessons on memory. Ho, Cheung, and Chan (2003) followed up their first correlational study with a quasi-experimental one in which they report that children who persist in music training show gains in verbal memory, while those who discontinue music lessons do not show such gains (summarised in Table 3.22). This study is also described in Box 3.8.

Table 3.22. **One quasi-experimental study examining effects of music training on verbal memory**

Study	Positive effect	No effect or inconsistent effects
Ho, Cheung and Chan (2003), Study 2	X	

There is as yet no clear experimental evidence that music training improves memory.

Box 3.8. **Superior verbal memory: A result of music training or IQ?**

Ho, Cheung and Chan (2003) showed in a correlational study that children receiving music lessons score higher than those not receiving lessons on verbal but not visual memory. Ninety boys between the ages of six to 15 attending school in Hong Kong were studied. Half of these boys had chosen to get musical training, and played in the band and orchestra of their school, and also had received classical music lessons in either violin or flute for at least one hour a week. These boys had been studying music for one to five years. The control group attended the same school but had no musical training. The two groups were matched in age, education level, SES as measured by family education and income, and full scale IQ. Children were given a verbal memory test assessing memory for orally presented words, as well as a visual memory test and an IQ test. Children in the music group scored significantly higher on the verbal (oral) memory test, but not on the visual memory test or on the IQ test.

This finding conflicts with Schellenberg's (2004) demonstration that music training increases children's IQ.

Schellenberg (2008) has critiqued Ho et al. (2003) by noting that there was a difference in IQ between the groups (in favor of the musicians) of about 1/3 of a standard deviation, and that again, IQ can explain any verbal memory superiority in the music groups. He points out (Schellenberg, 2010), personal communication) that "when one is trying to 'prove' the null hypothesis of no difference between groups, it's impossible conceptually and it's very unconvincing if the difference is "almost" significant. It's only convincing if the sample size is large and the observed difference goes in the opposite direction, or if the p-value is very high, which suggests that the effect, if it exists, is likely to be minuscule in the population. In Ho et al., the addition of a few more participants would likely have pushed the p-value for the full scale IQ score down into significance, and the results of the paper would be consistent with what I've been saying for the past few years: smart kids are more likely than other kids to take music lessons and to perform well on virtually any test they take."

In a follow up quasi-experimental study to determine direction of causality, Ho, Cheung and Chan (2003) compared three groups of children: those just beginning music training, those from the first study who continued their music training, and those from the first study who discontinued music training after three months. The same tests were administered. Verbal memory scores of the beginners were lower than those for the other two groups at baseline but after one year of music training, all three groups were equivalent, due to the beginners improving in verbal memory over the course of a year of training. Both groups studying music improved in verbal memory of the year, but the children who discontinued music training did not improve.

It is possible that children with higher IQ seek out music training, and that higher IQ correlate with better memory (and attention and mathematics performance, etc.). Randomised design experiments are still called for to determine direction of causality.

Experimental studies

We found no experimental studies testing the effect of music training on memory.

There is as yet no clear experimental evidence that music training improves memory.

Concluding thoughts about music education and cognitive functioning

In this chapter we have reviewed numerous studies arguing for a link between music training and a specific area of cognitive functioning. The research on music and cognitive transfer is promising and we can come to the following conclusions thus far. Music lessons improve children's academic performance and their IQ, and they improve phonological awareness and word decoding.

We can understand the relationship between music training and phonological awareness since both involve listening skills. Since phonological awareness is related to word decoding, we can also understand why music training might facilitate word decoding skills in young children.

How can we understand the effect of music lessons on IQ and academic performance? The research involving children taking out of school music lessons has always involved children receiving classical music training. Classical music training involves many school-like activities: one-on-one lessons with an adult, daily practice, memorisation, and the reading of notation (as well as public performance in the form of recitals). We hypothesise here that if children took lessons in other art forms that involved the same combination of school like activities then these other art forms would also be associated with higher IQ and academic performance.

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ANNEX 3.A1

Supplementary tables

Table 3.A1.1. **Twenty-four correlational studies examining the association between music education and reading**

Study	N	R	Z(p)* (*<.001)
College Board (1988)	648,144	.16	125.76 (p < .0001)
College Board (1989)	587,331	.16	125.98 (p < .0001)
College Board (1990)	548,849	.17	127.07 (p < .0001)
College Board (1991)	551,253	.18	136.28 (p < .0001)
College Board (1992)	545,746	.19	138.42 (p < .0001)
College Board (1994)	546,812	.21	151.96 (p < .0001)
College Board (1995)	561,125	.21	159.29 (p < .0001)
College Board (1996)	568,072	.22	164.75 (p < .0001)
College Board (1997)	581,642	.22	167.50 (p < .0001)
College Board (1998)	592,308	.22	167.98 (p < .0001)
Engdahl (1994)	598	-.02	.26 (p = .50)
Friedman (1959) (5th graders)	152	-.19	-2.05 (p = .02)
Friedman (1959) (6th graders)	102	.16	1.29 (p = .09)
Groff (1963)	460	.02	.35 (p = .36)
Kvet (1985) (District A)	17	-.08	-.68 (p = .75)
Kvet (1985) (District B)	42	-.05	-.61 (p = .72)
Kvet (1985) (District C)	71	.65	.65 (p = .26)
Kvet (1985) (District D)	45	.68	.68 (p = .25)
Lamar (1989) (1st graders, music specialists)	35	.44	2.41 (p = .008)
Lamar (1989) (1st graders, classroom teachers)	35	.37	1.90 (p = .03)
Lamar (1989) (4th graders, music specialists)	35	.65	4.08 (p < .0001)
Lamar (1989) (4th graders, classroom teachers)	35	.26	1.12 (p = .13)
McCarthy (1992)	957	.10	3.09 (p = .001)
Weeden (1971)	47	-.06	-.49 (p = .69)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.

Source: Butzlaff (2000).

Table 3.A1.2. **Meta-analysis of six experimental studies examining the effect of music on reading**

Study	N	R	Z(p)
Douglas and Willats (1994)	12	.64	2.0 (p = .02)
Fetzer (1994)	30	.57	3.07 (p = .001)
Kelly (1981)	42	.06	-.51 (p < .70)
Olanoff and Kirschner (1969)	46	.00	00 (p = .50)
Roberts (1978)	33	.00	00 (p = .50)
Roskam (1979)	24	-.34	1.28 (p = .10)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.

Source: Butzlaff (2000).

Table 3.A1.3. **Twenty correlational studies examining the association between music and mathematics**

Study	N	R	Z(p)* (*<.05)
Anello (1972)	326	.16	2.81*
Catterall, Chapleau and Iwanaga (1999)	1476	.17	6.62*
Ciepluch (1988)	80	.37	3.33*
College Board (1998)	362,853	.18	105.81*
College Board (1997)	354,886	.21	122.52*
College Board (1996)	349,032	.18	103.50*
College Board (1995)	346,737	.18	105.05*
College Board (1994)	343,270	.15	85.13*
College Board (1992)	356,258	.12	71.03*
College Board (1991)	361,998	.11	68.17*
College Board (1990)	361,272	.11	63.27*
College Board (1989)	385,943	.10	61.13*
College Board (1988)	437,206	.08	54.25*
Engdahl (1994)	598	.11	2.59*
Kvet (1985)	34	.27	1.60 (p = .05)
Kvet (1985)	84	.15	1.34 (p = .09)
Kvet (1985)	142	.08	.91 (p = .18)
Kvet (1985)	90	.14	1.33 (p = .09)
McCarthy (1992)	1061	.10	3.28*
Wheeler and Wheeler (1951)	1969	-0.05	-2.39*

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.

Source: Vaughn (2000).

Table 3.A1.4. **Six experimental studies examining the association between music and mathematics**

Study	N	R	Z(p)* (*<.05)
Costa-Giomi (1997)	128	.20	2.24*
Friedman (1959)	28	.09	.46 (p = .32)
Graziano, Peterson and Shaw (1999)	55	.31	2.32*
Neufeld (1986)	40	.04	.25 (p = .40)
Neufeld (1986)	40	-.04	-.25 (p = .40)
Weeden (1971)	66	.17	1.40 (p = .08)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.

Source: Vaughn (2000).

Table 3.A1.5. Twenty-nine quasi-experimental and experimental studies included in three meta-analyses of the effects of music education on visual-spatial skill

Study	N	R	Z(p)
Studies in Meta-Analysis 1			
Costa-Giomi (1999)*	81	.34	2.90 (p = .002)
Flohr, Miller and Persellin (1998) *	19	.39	1.29 (p = .10)
Flohr (1998) *	22	.42	1.62 (p = .05)
Flohr (1999) (raw data) *	20	.02	-1.59 (p = .94)
Graziano et al. (1999)	53	.25	1.84 (p = .07)
Gromko/Poorman (1998)	30	.24	1.31 (p = .20)
Hurwitz et al. (1975)	40	.23	1.45 (p = .15)
Mallory/Philbrick (1995)	44	.52	3.39 (p = .003)
Persellin (1999)	12	.33	1.15 (p = .29)
Rauscher (1999) *	66	.41	3.35 (p = .0006)
Rauscher (1999) *	87	.59	5.49 (p = <.0001)
Rauscher et al. (1994)	33	.68	4.19 (p = <.0001)
Rauscher et al. (1997)	78	.37	3.25 (p = .001)
Rauscher/Zupan (1999)	48	.20	1.41 (p = 17)
Taetle (1999)	68	.34	2.81 (p = .004)
Studies in Meta-Analysis 2			
Hurwitz et al. (1975)	40	.31	1.97 (p = .05)
Lazco (1985)	154	.10	1.19 (p = .23)
Lazco (1985)	147	.06	.67 (p = .50)
Zulauf(1993/94)	174	-.0002	-.002 (p = 1.00)
Zulauf (1993/94)	179	-.07	-.89(p = .38)
Studies in Meta-Analysis 3			
Billhartz et al. (2000)	66	.25	2.05 (p = .04)
Flohr et al. (1999) *	20	.33	1.02 (p = .15)
Gromko/Poorman (1998)	30	.32	1.76 (p = .08)
Hurwitz, et al. (1975)	40	.31	1.99 (p = .05)
Parente and O'Malley (1975)	24	.45	2.21 (p = .03)
Rauscher et al. (1997)	54	.07	.54 (p = .59)
Taetle (1999)	68	.32	2.61 (p = .09)
Zulauf (1993/94)	174	.18	2.32 (p = .02)
Zulauf (1993/94)	179	.10	1.31 (p = .19)

Note: The experimental studies are asterisked. N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2.

Source: Hetland (2000).

Chapter 4

Cognitive outcomes of visual arts education

This chapter discusses the habits of mind that are potentially trained in strong visual arts classes, and then reviews the research on the effects of visual arts learning on cognitive outcomes: general academic achievement, reading, geometric/spatial reasoning, and observational skills. The one area where transfer has been shown – and only from one study – relates to visual observation skills, and this is one of the habits of mind that visual arts teachers often emphasise. The other area which we believe is promising is the relationship between visual arts education and geometry – since spatial reasoning is used in both visual arts and geometry. Thus far, though, only correlational links have been found, even if one ongoing study is now examining the effects of visual arts on geometry with a quasi-experimental design.

Visual arts are a key component of arts education taught in school, and visual skills developed by visual arts classes can plausibly be used in non-arts settings. Some level of visual appreciation and drawing skills is part of everyday life, as we process text, advertisement, or choose products. Visual skills are an important dimension of professions such as design, marketing, advertising, photo journalism etc. Similarly, some professions such as surgery, geology, radiology, mathematics (particularly geometry), chemistry, and architecture require sharp visual skills that might be trained through visual arts classes.

Is there any evidence that skills developed in visual arts education can have a positive impact on other areas such as reading, writing, geometry or science? Before undertaking any impact assessment, transfer research would benefit from an analysis of the kinds of cognitive skills trained in a particular art form prior to developing hypotheses about what skills might transfer. Such an analysis was carried out by Hetland, Winner, Veenema and Sheridan (2013) on visual arts learning. This study identified six potentially generalizable, broad habits of mind that teachers of visual arts at the high school level stressed (in addition to technique and to learning about the art world). The schools studied were not typical, but were ones in which students majored in an art form, and the classes were taught by practicing artists who were excellent teachers. Thus the kind of teaching observed was most likely the very best kind of visual arts training, a kind not available for most students. The habits of mind stressed in the excellent visual arts classes observed are however ones that all teachers can model. These habits are described in Box 4.1.

Three of these habits can make us reasonably hypothesise an impact of visual arts education on science and writing at least. Visual arts classes try to develop the ability to mentally envision forms and to observe closely, two skills that could transfer to the study of science and possibly geometry. Expressing one's vision is another important dimension of visual arts training, and one could expect this skill to transfer to writing and, possibly, in text understanding. While these hypotheses rely on near transfer theories, one could also imagine that the visual perception skills developed in visual arts education (for example pattern recognition, attention to detail) can be deployed in other areas such as reading, science or mathematics if the brain processes involved in visual spatial skills in these subjects are related to those involved in visual arts. A final possible reason is motivational: the topic of motivation will be addressed in Chapter 8.

This chapter reviews the available evidence that visual arts education enhances academic achievement, general academic achievement, reading, geometric/spatial reasoning, and observational skills.

Visual arts education and general academic achievement

Does visual arts education develop certain skills that are useful in other subjects and translate into better general academic achievement, whatever the reason? We located relatively few studies investigating this question.

REAP analyses of visual arts education and general academic achievement

Vaughn and Winner (2000) compared the SAT scores of students who did and did not take visual arts classes in high school as part of the Reviewing Education and the Arts Project (REAP). (The SAT is the exam taken for admission to US colleges and universities.) Students taking visual arts classes (studio art, design, but also art history) have average higher verbal and maths SAT scores than those taking no arts

Box 4.1. **Studio habits of mind stressed by visual arts teachers**

If you ask someone what students learn in visual arts classes, you are likely to hear that they learn how to paint, or draw, or throw a pot. Of course students learn arts techniques in arts classes. But what else do they learn? Are there any kinds of general thinking dispositions that are instilled as students study arts techniques?

Before any non-trivial study of transfer from arts learning to other areas of cognition can be undertaken, researchers must take a serious look at the kinds of thinking skills being taught in the "parent domain" of the art form in question. Only then does it make sense to ask whether one or more of these skills might transfer to learning in another domain of cognition outside of the arts.

In order to determine the habits of mind that emerge from serious visual art study, Hetland, Winner, Veenema and Sheridan (2013) undertook a qualitative, ethnographic study of "serious" visual arts classrooms. They observed and videotaped 38 visual arts classes from the Walnut Hill School for the Arts and the Boston Arts Academy, and interviewed the teachers after each class to find out what they intended to teach and why. They selected these schools because they wanted to start with the best kinds of arts teaching. These are schools for students with interest and talent in an art form, where students spend at least 3 hours a day working in their chosen art form, and where teachers are practicing artists.

After coding videos of teaching (two independent coders achieved high inter-rater reliability), the researchers found four potentially generalizable habits of mind and two potentially generalizable working styles being taught at the same time as students were learning the craft of painting and drawing.

Four kinds of potentially generalizable cognitive skills

Envision (Mental imagery)

Students are constantly asked to *envision what they cannot observe directly* with their eyes. Sometimes students were asked to generate a work of art from imagination rather than from observation. Sometimes they were asked to imagine possibilities in their works. Sometimes they were asked to imagine forms in their drawings that could not be seen because they were partially occluded. And sometimes they were asked to detect the underlying structure of a form they were drawing and then envision how that structure could be shown in their work.

A reasonable transfer hypothesis: if art students in fact become better at envisioning in art class, they may transfer this skill to the study of science.

Express (Personal voice)

Students are taught to go beyond craft to *convey a personal vision* in their work. As one of our drawing teachers said, "…art is beyond technique…I think a drawing that is done honestly and directly always expresses feeling." Students who learn to convey a personal vision in their art may possibly have become better writers.

A reasonable transfer hypothesis: art students who become better at conveying a personal vision (going beyond technique) may bring this skill to writing.

Observe (Noticing)

"Looking is the real stuff about drawing," one of our teachers told us. The skill of careful observation is taught all the time in visual arts classes and is not restricted to drawing classes where students draw from the model. Students are taught to *look more closely than they ordinarily do* and to see with new eyes.

(continues…)

Box 4.1. **Studio habits of mind stressed by visual arts teachers** (continued)

A reasonable transfer hypothesis: art students who learn to look more closely at the world and at works of art may bring these improved observational skills to science class.

Reflect (Meta-cognition/critical judgment)

Students are asked to become reflective about their art making and this reflection took two forms.

Question and Explain. Teachers often ask students to step back and focus on an aspect of their work or working process. Teachers' open-ended questions prompt students to reflect and explain, whether aloud or even silently to themselves. Students are thus stimulated to *develop meta-cognitive awareness* about their work and working process.

Evaluate. Students in art classes get continual training in evaluating their own and others' work. Teachers frequently evaluate student work informally as they move around the room while students are working, as well as more formally in critique sessions. Students are also asked to make evaluations themselves – they are asked to talk about what works and what does not work in their own pieces and in ones by their peers. Thus students are trained to *make critical judgments and to justify these judgments*.

A reasonable transfer hypothesis: art students who become meta-cognitive about their working process/products in art may show more meta-cognitive awareness of their working process/products in other areas of the curriculum.

Two kinds of potentially broadly generalizable working styles

Engage and persist (A kind of motivational skill)

Teachers in visual arts classes present their students with projects that engage them, and they teach their students to stick to a task for a sustained period of time. Thus they are teaching their students to *focus and develop inner-directedness*. As one of the teachers said, she teaches them to learn "how to work through frustration."

A reasonable transfer hypothesis: art students who learn to stick to art projects in a disciplined manner over long periods of time may become more focused and persistent in other areas of the school curriculum.

Stretch and explore (Another way of talking about creativity)

Students are asked to try new things and thereby to extend beyond what they have done before – to explore and take risks. As one painting teacher said, "You ask kids to play, and then in one-on-one conversation you name what they've stumbled on."

A reasonable transfer hypothesis: art students who become comfortable with making mistakes and being playful may be willing to take creative risks in other areas of the curriculum.

Transfer cannot be assumed. These skills must first be clearly taught and learned in the visual arts. These skills may or may not be used by students outside of the context in which they were learned. If skills do transfer, they may only do so when teachers explicitly teach for transfer. The study of transfer of learning from one domain to another has a long and vexed history, and one should never assume that a skill that "sounds" general is in fact generalised. Only careful research can tease apart those skills which generalise from those which do not, and the circumstances under which transfer occurs.

(and about the same as those taking classes in other arts forms). The differences range from 25 to 40 SAT points depending on the type of class and the type of outcome: there is more difference in verbal than mathematic skills, and for studio art than for art history. T-tests comparing mean verbal SAT scores over ten years for students with and without visual arts classes proved highly significant.

While there is a positive link between visual arts education and higher general academic achievement, no causal conclusions about the effects of visual arts classes on SAT scores can be drawn since these analyses are based on correlational data. High performers in school may just study more visual arts education than lower performers. In addition, as with all of the SAT data from the College Board, however, students' socio-economic status (SES) was not able to be controlled.

Post-REAP quasi-experimental studies of visual arts education and general academic achievement

We located three quasi-experimental studies that have sometimes been cited as demonstrating a positive effect of visual arts education on composite verbal/maths test scores, summarised in Table 4.1. These studies were all evaluations of Housen's (2002) visual arts curriculum called Visual Thinking Strategies (VTS). In this curriculum, students are asked to make observations about works of art and to support their observations with evidence. They are asked to think about three questions as they look at art works: What's going on here? What do you see that makes you say that? What more can you find?

In a first study, Housen (2002) compared children in classes receiving VTS compared to control classes not receiving this curriculum. The children were 2nd and 4th graders as the study began, and they were followed for five years. There was no finding that standardised achievement scores rose for children receiving VTS. However, when the researchers examined whether children used visual thinking strategies when observing both art and non-art objects, they did find that for 8th graders receiving VTS, these scores improved. Thus, this study demonstrates that a programme teaching visual thinking strategies can lead children to use such strategies in new contexts. However, despite what is implied in a commentary by the researchers (Burchenal, Housen, Rawlinson and Yenawine, 2008), this study tells us nothing about whether VTS leads to improvement in standardised achievement tests.

In a second study examining the effects of VTS, Curva, Milton, Wood, Palmer, Nahmias, Radcliffe, Ogartie and Youngblood (2005) compared elementary school children who did and did not receive VTS instruction. The executive summary concludes with the following statement: "this evaluation study shows that integrating art in the curriculum… clearly contributes to students' critical thinking and measurable academic achievement as well. In fact, it would not be surprising to find that such curricular 'enhancements' may be the best test preparation the schools can provide." This is however not demonstrated in the report. To show that art contributes to academic achievement, one must compare the test scores of the arts

group to those of the control group to see whether the art group's scores rose more. But the test scores are not reported in the study; and neither was such an analysis. Moreover, even if the art group's scores rose more, one could only claim that art is the best test preparation after comparing art to other (perhaps more direct) types of test preparation. There was a significant correlation reported in this study for the VTS group between test scores and the skills taught (visual literacy and critical thinking), but it does not follow that visual literacy caused the test scores to rise.

In a third study, researchers examine the effects of VTS on student reasoning about art in the classroom, in the museum, and on standardised tests (Adams, Foutz, Luke and Stein, 2007). Adams et al. (2007) saw growth in strategies for visual thinking in the first two contexts (classroom and museum) but could find no link with higher standardised test scores: "when standardised test scores from the 2004-5 MCAS [Massachusetts Comprehensive Assessment System] and the 2005-6 SAT-9 were analysed, there were no differences between treatment and control students" (p. iii).

Table 4.1. **Three quasi-experimental studies assessing effects of visual thinking strategies curriculum on general academic skills**

Study	Positive effect	Negative or inconsistent effects
Housen (2002)		X
Curva, Milton, Wood, Palmer, Nahmias, Radcliffe, Ogartie and Youngblood (2005)		X
Adams, Foutz, Luke and Stein (2007)		X

Thus, although the authors conclude differently, none of the three studies of the Visual Thinking Strategies curriculum show that this programme causes rises in scores on the kind of tests that children now take in school. The conclusions that have been drawn from these studies are not warranted given the evidence.

In conclusion, like for music or multi-arts, students taking visual arts classes have higher general academic achievement than those taking none. But this is a correlational result that does not allow us to infer the direction of causality. There is as yet no evidence that visual arts education improves general academic skills.

Visual arts education and reading

Can studying the visual arts help remedial readers improve their reading? This is the assumption guiding several programmes developed in New York City, such as the Guggenheim Museum's Learning to Read through the Arts, Reading Improvement Through the Arts, and Children's Art Carnival. In these programmes, children with reading difficulties are given experience in the visual arts integrated with reading and writing. These programmes generally report that remedial readers improve their

reading scores quite considerably and go on to conclude that this improvement is due to the arts experience students received. Unfortunately, these programmes have failed to compare the effects of an arts-reading integrated programme with the effects of an arts-alone programme. Therefore we cannot know whether the reading improvement that undoubtedly did occur was a function of art experience, art experience integrated with reading, or simply from the extra reading experience and instruction. In what follows, we review studies that test more clearly whether visual arts education improves reading.

REAP meta-analyses of visual arts education and reading

Burger and Winner (2000) examined two groups of studies: those that compared an arts-only instruction to a control group receiving no special arts instruction (nine studies); and those that compared an art-reading integration treatment to a control group receiving reading only (four studies). The first group allowed us to see whether instruction in visual art by itself teaches skills that transfer to reading skills; the second group allowed us to test whether reading integrated with art is more effective than reading instruction alone.

Table 4.2. **Seven quasi-experimental and two experimental studies included assessing effects of stand-alone visual art instruction on reading**

Study	Positive relationship	Mixed, null, or negative relationship
Dewberry (1977)		X
Diamond (1969)		X
Johnson (1976)*		X
Mills (1972)*	X	
Schulte (1983)		X
Schulte (1983)		X
Schulte (1983)		X
Spangler (1974)	X	
Wootton (1968)	X	
Weighted mean		X

Note: The full results are presented in Table 4.A1.1. The two asterisked studies are true experimental studies.

Source: Burger and Winner (2000).

Quasi-experimental and experimental studies

A meta-analysis of a body of both quasi-experimental and experimental studies testing the effects on reading of art instruction alone (studies listed in Table 4.2) yielded a small weighted mean effect size ($r = 0.12$, equivalent to $d = .24$) which could not be generalised to new studies on this topic, as shown by a nonsignificant t- test of the mean $Zr = .53$.

A second meta-analysis examined the four studies (both quasi- and true experimental studies were combined) shown in Table 4.3 testing the effects of art-reading integrated instruction. This analysis yielded a weighted mean effect size of $r = .22$ (equivalent to a d of between .4 and .5), and again this result could not be generalised to new studies (the t- test of the mean Zr was not significant). Moreover, this effect was entirely due to reading readiness outcomes, and these are visual outcomes. There was no effect for reading achievement outcomes.

Table 4.3. **Three quasi-experimental and one experimental studies assessing effects of reading instruction integrated with visual arts**

Study	Positive relationship	Mixed, null, or negative relationship
Catchings (1981)		X
Lesgold, et al (1975)*		X
Shaw (1974)	X	
Wootton (1968)	X	
Weighted mean		X

Note: The full results are presented in Table 4.A1.2. The asterisked study is a true experimental study.

Source: Burger and Winner (2000).

Burger and Winner's (2000) meta-analysis found no support for the claim that the visual arts enhance reading skills or even that reading integrated with visual arts works better than reading instruction alone. Programmes that help remedial readers improve their reading through a reading-arts integrated programme are likely to work well because of the extra intensive reading training that the children receive, independently of the fact that this training is fused with drawing.

Post-REAP studies of visual arts education and reading

We identified only one study post-REAP examining the relationship between visual arts and reading (Table 4.4). New York City's Guggenheim museum developed a programme called Teaching Literacy Through the Arts in which the visual arts were integrated into the curriculum of public elementary school classrooms. While students in this programme improved significantly more than a comparison group in the sophistication and complexity of language that they used to discuss works of art, they did not improve more on a verbal standardised test requiring reading (Korn, 2007).

Thus far there is no evidence to support the hypothesis that the visual arts can be used to improve verbal literacy. Moreover, there is no theoretical reason to support such a hypothesis since linguistic and visual-spatial skills are not correlated with one another (e.g. Gardner, 1983).

Table 4.4. **One quasi-experimental study since reap examining effect of visual arts education on reading**

Study	Positive association	No association
Korn (2007)		X

Visual arts education and geometric/spatial reasoning

Both visual arts and geometric reasoning require spatial visualisation, and the skill of spatial visualisation is stressed in visual arts classes. As shown in Box 4.1, students in the classes analysed by Hetland, Winner, Veenema and Sheridan (2013), students were often asked to envision what they could observe directly with their eyes. They were asked to generate a work of art from imagination rather than from observation. They were asked to imagine how their work might look if they made certain kinds of verbally described changes (e.g. how would this look if you moved this shape over to the left?). And they were asked to imagine the invisible underlying structure of a form they were drawing and then envision how that structure could be shown in their work. Given this kind of spatial reasoning training in visual arts classes, it is reasonable to hypothesise that if students do gain spatial reasoning skills in visual arts classes, these skills might spill over into geometry classes, where spatial reasoning is also important.

Is there any evidence that visual art students excel in spatial reasoning and geometric thinking, and if so is there any evidence that their superiority is a function of their art training rather than an inborn trait that drew them to study the visual arts?

Adult artists

There is evidence from correlational studies that adult artists and art students excel in a wide range of visual-spatial abilities (e.g. Chan, 2008; Chan et al., 2009; Morrison and Wallace, 2001; Pérez-Fabello and Campos, 2007; Winner and Casey, 1993). What about with children?

Correlational studies

We found two correlational studies investigating whether visual arts learning is associated with improved geometric and/or spatial reasoning in children and adolescents (Table 4.5).

Walker, Winner, Hetland, Simmons and Goldsmith (2010) reported that college students majoring in studio arts significantly outperform students majoring in the more academic discipline of psychology (see Box 4.2).

Spelke (2008) showed that visual arts majors in high school perform better than theatre as well as writing majors on a spatial measure of geometric reasoning (Box 4.3).

Table 4.5. **Two correlational studies examining relationship between visual arts learning and visual spatial skills**

Study	Positive association	Negative/inconsistent/ no association
Spelke (2008)	X	
Walker, Winner, Hetland, Simmons and Goldsmith (2010)	X	

Box 4.2. Visual arts majors outperform psychology majors on a test of geometric reasoning

The ability to visualise what cannot be seen directly plays an important role in mathematics and science. Virtually every STEM (Science, Technology, Engineering, and Mathematics) discipline calls upon visual or spatial thinking: chemists envision molecular structures and their interactions; geologists use field observations to envision structures that cannot be seen; engineers use visual feedback from computer models as they develop and test designs; topologists and geometers investigate mathematical relationships under various transformations. Educational organisations in mathematics and science also emphasise the importance of visual representation and reasoning capacities and stress the essential role of being able to represent and interpret mathematical ideas and problems in visual forms, including graphs, sketches, and diagrams.

Visualisation seems to be a fundamental habit of the artistic mind. Artists do not just magically "see" in their mind's eye, but deliberately and systematically analyse shape and space into familiar simple forms, construction lines, angles, and size ratios (Kozbelt, 1991). This process is essential for depicting three-dimensional objects on a two-dimensional surface. Visualisation is also of value when creating three-dimensional objects, which often must be "pictured" as a whole before they are built. Hetland, Winner, Veenema and Sheridan's (2013) ethnographic study of intensive high school arts programmes (featured in Box 4.1) found that "envisioning" (visualisation) is one of eight habits of mind that are taught in visual arts studio classes. Visualisation (envisioning) involves the formation of images (often mental) which can then guide actions and problem solving and can even lead to problem finding. The art teachers they studied provided their students with continual practice in imagining space, line, color, and shape, regularly asking their students such questions as, "What would this look like if you extended this line?", "What is the underlying structure of this composition?", "Where would the shadow fall if the light were coming from that window?" Such questions prompt students to envision what is not there. Visual art students also study skeletal and muscular anatomy to help them envision the underlying structure of the human figure and the forces at work within various poses.

Given that both art and geometry entail visualisation and mental manipulation of images, and that one of the habits of mind stressed by visual art teachers is the habit of envisioning what one cannot see (Hetland et al., 2013), Walker, Winner, Hetland, Simmons and Goldsmith (2010) investigated whether individuals with training in the visual arts show superior performance on geometric reasoning tasks. Two groups of undergraduates, one majoring in studio art, the other majoring in psychology, were given a set of geometric reasoning items designed to assess the ability to mentally manipulate geometric shapes in two- and three-dimensional space.

(continues...)

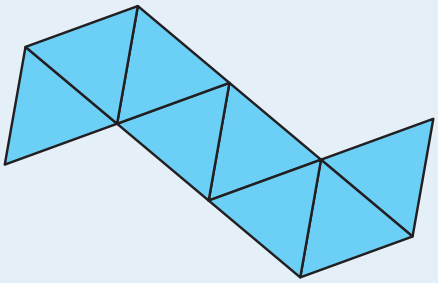
Box 4.2. **Visual arts majors outperform psychology majors on a test of geometric reasoning** (continued)

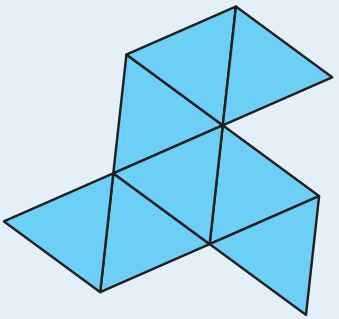
With the help of a group of geometers and mathematics educators, a set of items originally developed by Callahan (1999) was adapted to create a 27-item geometric visualisation/reasoning inventory which was not dependent upon knowledge of formal geometry knowledge such as equations or definitions, but instead focused on geometric thinking. These items required participants to rely upon visual working memory and the ability to engage in various spatial transformations. Participants were not allowed to make drawings to help them solve the problems, because the objective was to assess their capacity to solve the problems using mental visualisation, rather than the manipulation of external representations. Here are three of the items used:

Sample Item 1. Below are pictures of "nets." You can fold them on the solid lines to make 3-dimensional forms. Circle the one(s) that can be folded into a closed form (that is, one that has no holes or openings).

Sample Item 2. Imagine holding a small square card by the diagonal corners and spinning it around the diagonal. What shape would be carved out in the air? Figure out the answer in your head without drawing. Describe your answer in words as best you can.

Sample Item 3. Imagine a triangle that has 3 equal sides. In your mind, mark the sides of this triangle into thirds, and cut off each of the triangle's corners at the marks. Describe the shape you get. Figure out the answer in your head without drawing. Describe your answer in words as best you can.



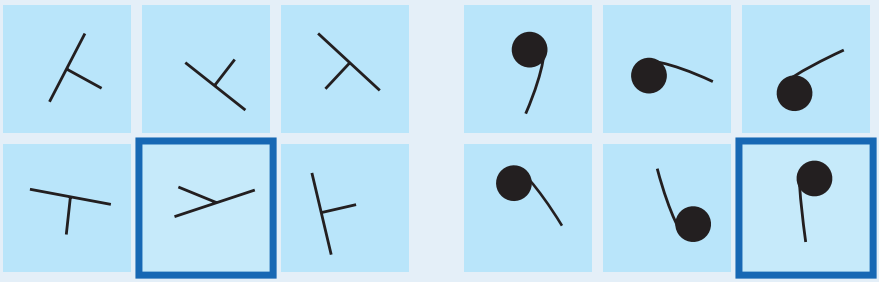


Participants were also given a verbal intelligence test. Both training in the arts and verbal intelligence were strong predictors of geometric reasoning, but training in the arts was a significant predictor even when the effects of verbal intelligence were removed. These correlational findings lend support to the hypothesis that training in the visual arts may improve geometric reasoning via the learned cognitive skill of visualisation.

Box 4.3. **High school visual arts majors outperform theatre and writing majors in test of geometric reasoning**

Spelke (2008) used visual arts students in her control group when she investigated whether music training fostered geometric reasoning skills (as described in Box 3.4) The kinds of measures on which the visual arts students excelled included recognition of geometric invariance. She used a task developed by Dehaene, Izard, Pica and Spelke (2006) in which children were shown six geometric figures that differed in size and orientation.

Five of the figures shared one geometric invariant property not possessed by the sixth figure, and their task was to find the figure that was different. Two sample items are shown below with the correct answer outlined. In the images on the left, the item that does not fit in does not have a right angle; in the images on the right, the item that does not fit in has the stem on the left of the ball. The music students outperformed theatre and writing majors in geometric thinking, and dance and visual arts majors did so as well.



Quasi-experimental and experimental studies

Correlational studies cannot tell us whether spatially strong students seek out the visual arts or whether training in visual arts strengthens visual spatial skills. Is the superiority of art student on spatial and geometric tests due to training, or is this superiority a preexisting condition? We located one meta-analysis of quasi-experimental studies and one ongoing quasi-experimental study investigating the relationship between visual arts education and visual spatial skills (Table 4.6).

A meta-analysis by Haanstra (1996) of 30 primarily quasi-experimental studies testing the claim that training in the visual arts improves visual spatial ability found no effects of arts training on visual-spatial ability except for children between the ages of 4-6. This result is surprising given the apparently close connection between the kind of thinking required in the visual arts and the kind of thinking assessed by spatial and geometric reasoning tests, and further research on this question is therefore warranted.

Winner, Goldsmith, Hetland, Hoyle and Brooks (2013) conducted a longitudinal study to examine changes in geometric reasoning and in performance on standardised spatial reasoning measures after one and two years of visual arts

training. While the visual arts group improved more than a control theatre group, the results were difficult to interpret because improvements in drawing did not correlate with improvements in geometric reasoning.

Table 4.6. **One meta-analysis of 30 studies and one further quasi-experimental study examining effect of visual arts education on visual spatial skills**

Study	Positive association	Negative/inconsistent/ no association
Haanstra (1996) (meta-analysis of 30 studies)		X
Winner, Goldsmith, Hetland, Hoyle and Brooks (2013)	X	

In summary, there is correlational evidence for a relationship between visual arts ability and geometry reasoning. What is not yet known is whether this relationship is due to visual arts training, or to pre-existing spatial ability. Experimental studies are needed to determine if children without selection for or interest in the visual arts can be trained to improve their geometric reasoning skills via training in the visual arts. If this can be shown, it will be important to determine what kind of visual arts training has this effect (e.g. observational drawing training? compositional exercises? etc.).

We note that we conclude from merely correlational studies that there may indeed be a relationship between visual arts and geometry. In other cases in this report we have come to less optimistic conclusions based on correlational findings. This is because it is important to have a theoretical reason to expect transfer. In the case of visual arts and geometry, we know that both involve spatial reasoning. But for example when we read of a correlation between taking arts courses and SAT performance, it is not clear to us what the underlying similarity might be between arts learning and multiple choice verbal and mathematical questions. This makes us skeptical that transfer will ultimately be demonstrated.

Visual arts education and observational skills

As shown by Hetland et al. (2013), visual arts education puts a strong emphasis in the development of observational skills. Students in the classes they analysed were taught to look closely at the model, at their own drawings, and at the drawings of others. At the end of every class, for example, there was a class critique where all of the drawings were tacked up on the bulletin board and students look at each one and talked about what they saw. Students also spent time looking through a view-finder (a rectangular cardboard frame) and noticing how things looked when partially cut-off by the frame. Looking through a viewfinder is a way of getting students to see things as patterns and shapes rather than as objects on which they can impose their schemas. Thus when one looks at part of a chair through a viewfinder one is

more likely to see (and thus draw) it accurately than when one looks at the whole chair directly. One can reasonably hypothesise that as students gain observational skills in visual arts classes, these skills may spill over into other areas such as biology, where observational skills are central.

Adult studies

Ainsworth, Prain and Tytler (2011) argue drawing should be used as a tool to help children understand scientific concepts, and they refer to this as "drawing to learn." Of course this is not drawing as art, and it is not art education.

We found one experimental study with adults testing the hypothesis that observational skills learned through the activity of looking at paintings leads to greater medical observational skill (Table 4.7). Dolev, Friedlaender and Braverman (2001) randomly assigned one group of medical students to training in careful observation of paintings and another to a control group. Those trained to look closely at art later outperformed those in the control group when given photos of people with medical disorders and asked to describe what they observed. Thus, training in looking at paintings can improve the kind of observational skills considered valuable in medicine. We see this as a case of near transfer where the same kinds of skills learned in an art form are used in another area.

Table 4.7. **One experimental studies examining effect of training in looking at paintings on medical observational skill**

Study	Positive association	Negative, inconsistent or no association
Dolev, Friedlaender and Braverman (2001)	X	

We found one quasi-experimental study with children testing the same kind of hypothesis (Table 4.8).

This was a study showing positive gains in observational skill after arts training, but that arts training focussed entirely on training in looking at pictures. When children were trained to look closely at works of art and reason about what they see, they gained skill in an observational science activity. Tishman, MacGillivray and Palmer (1999) studied 162 9- and 10-year-olds exposed to a Visual Thinking Curriculum in which they were taught to look closely at works of art and talk about what they saw. After seven to eight 40 minute sessions over the course of a year, children were shown a picture of a fossil record of two intersecting sets of animal footprints and were asked the same questions they had learned to answer about works of art: What's going on in this picture? What do you see that makes you say that? Children who received the Visual Thinking Curriculum achieved higher scores on the footprints task than did

those who did not. They used less circular reasoning and were more aware of the fact that their interpretations were subjective. Thus children in the art group had acquired looking and reasoning skills from looking at works of art and were able to deploy these when given a scientific image to analyse.

Table 4.8. **One quasi-experimental study examining the effect of visual arts learning on observational skills**

Study	Positive association	Negative, inconsistent or no association
Tishman, MacGillivray and Palmer (1999)	X	

This is again a case of near transfer: the skills involved in the art domain are very close to the skills tested in the science domain: in both cases, the critical skill is that of looking closely and reasoning about what is seen. Close visual observation is probably a skill that could be learned in non-arts domains (e.g. biology, chemistry) but this study does demonstrates that observational acuity can be trained by looking at art images, and that this skill then transfers to biological images.

We can conclude that experimental studies have shown that training to look closely at works of visual art improves observational skills when studying scientific and medical images. However, this finding is based on only two studies.

Summary and conclusion

In this chapter we have reviewed the research on transfer of learning from the visual arts. We began by summarising the kinds of broad habits of mind taught in strong visual arts classes. Most of the studies we reviewed did not examine skills related to these habits of mind – yet this is where one is most likely to find transfer, and this argument holds for transfer from any art form. The one area where transfer has been shown relates to visual observation skills, and this is one of the habits of mind trained directly by the visual arts. The other area which we believe is promising is the relationship between visual arts education and geometry – since spatial reasoning is used in both visual arts and geometry. Thus far, only correlational links have been found, though one quasi-experimental study reported that visual arts students improved more than non-visual arts students in geometry – results difficult to interpret since the hypothesised mechanism of growth in drawing predicting growth in geometry was not supported.

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Annex 4.A1

Supplementary tables

Table 4.A1.1. **Nine quasi-experimental and experimental studies assessing effects of stand-alone visual art instruction on reading**

Study	N	R	Z(p)
Dewberry (1977)	22	-.22	-1.02 (p = .85)
Diamond (1969)	88	.10	.91 (p = .18)
Johnson (1976)*	42	.00	0.00 (p = .50)
Mills (1972)*	52	.54	3.92 (p = <.0001)
Schulte (1983)	34	-.30	-1.73 (p = .96)
Schulte (1983)	40	-.29	-1.84 (p = .97)
Schulte (1983)	39	.18	1.09 (p = .14)
Spangler (1974)	85	.21	1.91 (p = .03)
Wootton (1968)	93	.21	2.00 (p = .02)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2. Only the two asterisked studies were true experimental studies

Source: Burger and Winner (2000).

Table 4.A1.2. **Three quasi-experimental studies and one experimental study assessing effects of reading instruction integrated with visual arts**

Study	N	R	Z(p)
Catchings (1981)	111	.15	1.60 (p = .06)
Lesgold et al. (1975)*	30	.00	0.00 (p = .50)
Shaw (1974)	43	.51	3.34 (p = .0004)
Wootton (1968)	93	.23	2.24 (p = .01)

Chapter 5

Cognitive outcomes of theatre education

This chapter reviews the research on the effects of theatre education on cognitive outcomes: general academic achievement and verbal skills. There is clear causal evidence that training in classroom drama improves a wide range of verbal abilities, including reading and story comprehension.

Theatre training involves memorisation of verbal scripts and performance of these scripts. Many researchers have examined whether acting on stage, or informally acting out stories in the classrooms, strengthens verbal skills or other kinds of academic skills, and whether acting out texts deepens students understanding of these texts. Research on the impact of theatre education on other academic skills has focussed on verbal skills. While the development of verbal skills could lead to an improvement in other subjects such as mathematics or science, just because better reading, writing or text understanding helps in any subject, no obvious theoretical reason leads to think that theatre education will improve arithmetic or geometric skills, or scientific skills. It would seem that the kinds of habits of mind to be learned by training in theatre are skill in understanding one's own and others' minds, skill in regulating one's emotions, and a tendency towards empathy, but these are not cognitive outcomes, and we address these in the chapter on social outcomes.

This chapter reviews studies searching an impact of theatre education on general academic achievement and verbal outcomes such as reading, vocabulary and text understanding.

Theatre education and general academic achievement

Theatre education could arguably raise general academic achievement through two main mechanisms: the development of attitudes and habits of mind that spill over all academic subjects; and an improvement in reading and understanding that can be applied to other disciplines and to taking tests.

REAP analyses of theatre education and general academic achievement

Vaughn and Winner (2000) compared the SAT scores of students who did and did not take theatre classes in high school as part of the Reviewing Education and the Arts Project (REAP). (The SAT is the exam taken for admission to US colleges and universities.) Like for other arts forms, students with theatre classes had better SAT verbal and maths scores than students with no arts classes (but rather similar to students taking other arts forms). The difference in verbal SAT between students with theatre education and no arts is bigger than for any other art form (over 64 and 53 points for acting and drama appreciation, respectively) and about the same for maths SAT scores. Students taking acting classes have better verbal and maths scores than those trained in drama appreciation. *T*-tests comparing mean verbal SAT scores over 10 years for students who took theatre classes vs. those who took no arts classes proved highly significant. No causal conclusions about the effects of music classes on SAT scores can be drawn since these analyses are based on correlational data.

Post-REAP quasi-experimental studies of theatre education and general academic achievement

We found three quasi-experimental studies post-REAP that examined the effect of theatre on general academic skills (Table 5.1). In two studies results were mixed and inconclusive; one study showed a positive effect.

Fleming, Merrell and Tymms (2004) conducted a quasi-experimental study with elementary school children taking drama classes that were integrated with writing. Children were assessed after one and two years of the intervention and compared to children in matched control schools (Fleming, Merrell and Tymms, 2004) on a range of academic outcomes. Children in the drama group improved in maths skills but did not improve in verbal skills or on a non-verbal ability test assessing pattern recognition. No explanation or theory was provided for why theatre might be related to improved maths skills, and it would seem difficult to generate a plausible hypothesis for such a finding, especially as verbal skills did not improve and thus could not be the mediator of the improvement. Thus we believe this finding calls out for replication.

Rousseau, Benoit, Gauthier, Lacroix, Alain, Rojas, Moran and Bourassa (2007) studied immigrant and refugee students at a high school in Montreal enrolled in drama classes in which they learned to act out their personal stories. These students were compared to a control group not receiving this kind of intervention. No overall improvements in academic outcomes were found: males but not females

in the experimental group improved in French and maths. These results appear inconsistent and difficult to use to support the hypothesis that drama intervention improves academic skills. However, they point to the importance of gender and social dimensions in the effect of arts education, assuming that the reason for the effect is mainly motivational.

A third study, from Turkey, compared science understanding outcomes when 12-13 year old students were taught "creative drama-based" instruction in science vs. traditional instruction in science (Cokadar and Yilmaz, 2010). Classes (but not students) were randomly assigned to drama-integration vs. control classes and both classes were taught by the same science teacher. Students received a total of eight class hours of science over the course of three weeks (three 45-minute classes per week). The same topics were taught in both groups: ecosystems and matter cycles. In the creative drama group, students were asked to represent scientific concepts through movement. In the control group, lessons were delivered via lecture and discussion. The creative drama group showed greater gains in scientific concept understanding than did the traditional group. Groups did not differ in terms of attitudes towards science. The researchers suggest that the benefit of creative drama-based instruction comes from the fact that it is less passive than traditional learning, and may also be more enjoyable. We have included this study in this section of the report since the kind of science understanding assessed here involved understanding of verbally presented material.

Table 5.1. **Three quasi-experimental studies examining theatre education and general academic skills**

Study	Positive results	Negative/ inconclusive results
Fleming, Merrell and Tymms (2004)		X
Rousseau et al. (2007)		X
Cokadar and Yilmaz (2010)	X	

We conclude that there is no clear evidence yet to support the claim that training in theatre improves general academic skills. There is an association between theatre classes and higher academic scores, but it is not necessarily caused by theatre education: it is as plausible that students with higher academic achievement are more likely to study theatre than are students with low academic achievement.

Theatre education and verbal skills

The most well-researched arts to academics transfer literature focuses on the effects of "classroom drama" on verbal skills. Classroom drama refers to using acting techniques within the regular classroom curriculum (rather than the actual production of plays).

Kardash and Wright (1986) meta-analysed 16 studies of classroom drama and found positive relationships between drama and reading, oral language development, self-esteem, moral reasoning and various drama skills (with an average effect size of $r = .32$, equivalent to $d = .67$).

A second meta-analysis was conducted by Conard (1992) on the effect of classroom drama on verbal achievement, self-concept, and creativity. This analysis combined 20 studies, six of which were included in Kardash and Wright's analysis. Again a positive effect was found, with an average effect size of $r = .23$ (equivalent to $d = .48$).

Neither of the two previous meta-analyses teased apart specific components of classroom drama that might influence academic achievement. Nor did these previous studies separate the different kinds of outcomes that were affected and so were not able to determine which area or areas of academic achievement were more strongly related to classroom drama.

REAP meta-analyses of quasi-experimental and experimental studies of the effects of theatre education on verbal skills

Podlozny (2000) meta-analysed 80 quasi-experimental and experimental studies (combined) assessing the effect of classroom drama on verbal achievement (listed in Table 5.2). No difference was found, in results, between the quasi- and the true-experimental studies. The studies tested and compared the effect of classroom drama on seven distinct verbal outcomes: story understanding (oral measures); story understanding (written measures); reading achievement; reading readiness; oral language development; vocabulary; and writing. Podlozny classified studies in terms of whether they directly tested material students had actually enacted in their drama sessions (direct) or whether tests were of entirely new material (transfer). This distinction was made to determine whether enacting a story simply helped children better read, understand, and recall a particular story that they had acted out, or whether the experience of acting out a story helped children's verbal skills more generally.

In 17 studies with oral recall outcomes, the drama group heard and enacted the stories and the control group heard but did not act out the stories. Students were then tested orally on story understanding and recall.

In 14 studies with written recall outcomes, the drama group read and then enacted the stories while the control group read, then discussed, and were drilled on vocabulary from the stories. Children took written tests on story understanding and recall. They were tested only on stories that had been taught.

In 20 studies with reading achievement outcomes, the drama group typically read a story or play and enacted it while the control group simply continued with their regular reading classes. Both groups were then given a standardised reading

comprehension test. Thus in this body of studies children were always tested on new material. Hence, any effect demonstrates transfer of reading comprehension skills to new material.

In 18 studies with reading readiness outcomes, the drama group heard a story and acted it out, while the control group either heard the same story and discussed but did not enact it, re-enacted themes from field trips or other experiences (and hence did not hear the story), or engaged in cut and paste and categorising activities (here they neither heard the story nor engaged in any enactment). This body of studies again only tested children on new material.

In 20 studies with oral language developmental outcomes, students in the drama group typically engaged in creative dramatics (storytelling, role-playing, puppetry) as well as discussion while the control group watched filmstrips and engaged in arts other than drama. Later the oral language of all children was assessed, sometimes when talking about new material, other times when talking about the stories that they had enacted.

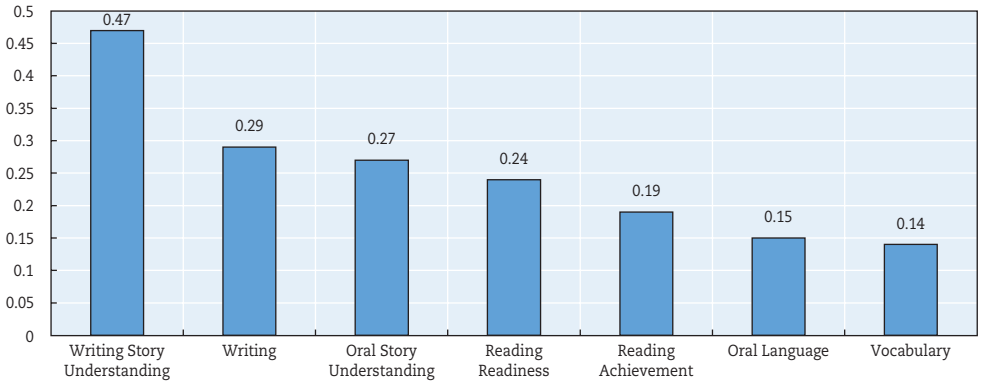
In 10 vocabulary studies, children in the drama group engaged in creative drama activities, including role play, pantomime, movement, and improvised dialogue, while the control group had no special treatment. Later all children were given a vocabulary test, sometimes with words from the stories that had been taught and other times with new words. In eight studies with writing skills outcomes, writing samples were assessed for skills such as audience awareness, story structure (beginning, middle, and end), organisation, and elaboration. Typically children in the drama group first participated in a discussion about writing, and then engaged in improvisation, pantomime, and movement, developed story ideas, improvised story scenes, and drafted stories. The control group also participated in a discussion about writing, but then they simply continued with their regular language arts programme before drafting their stories. Stories were analysed according to a narrative writing scale. In some of the studies, children wrote stories related to themes they had enacted. In others, they wrote stories on new material.

Classroom drama had a strong positive causal effect on six of the seven verbal outcomes examined (Figure 5.1). The largest effect size was for story understanding as measured by written tests, where a mean weighted effect size of r = .47 was found (equivalent to a d between 1.0 and 1.1), and the t- test of the mean Zr was highly significant, showing that this finding can be generalised to new studies on this question. Thus, when children act out stories rather than simply read them to themselves, their understanding of the story is stronger.

Studies assessing the effect of drama on oral language also yielded a strong mean weighted effect size (r = .15, equivalent to a d between .3 and .4), followed by story understanding as measured orally, reading readiness, writing, and reading achievement (r = .27, .24, 29, .19, respectively, equivalent to ds of .56, .5, .6, .4, respectively). All of these effects were robust: t- tests of their mean Zrs indicate that the results generalise to future studies, and none of the confidence intervals

spanned zero. Vocabulary was also enhanced (mean weighted *r* = .14, equivalent *d* between .2 and .3), but unlike the other six effect sizes, this one was not statistically significant: the *t*- test of the mean *Zr* was not significant, and the 95% confidence interval for the mean effect size found spanned zero.

Figure 5.1. **Strengthening verbal skills through theatre education: A clear link**



StatLink http://dx.doi.org/10.1787/888932833048

Note: All results are statistically significant, except for "vocabulary".

Source: Podlozny (2000).

While Podlozny's (2000) seven analyses demonstrated higher effect sizes for material studied directly, the analyses also showed that drama helps learners understand *new* texts not enacted. This is the most surprising finding of these meta-analyses. As mentioned in the introduction, the transfer of skills from one domain to another is generally not thought to be automatic: it needs to be taught (Salomon and Perkins, 1989). In the field of classroom drama, however, transfer appears to be naturally designed into the curriculum, even if teachers are not labeling it as such. If teachers of classroom drama did more to teach explicitly for transfer, these effects might be even stronger.

Given the strength of the REAP meta-analysis of classroom drama and verbal outcomes, we conclude that there is clear causal evidence that training in classroom drama improves verbal abilities, despite the failure of two of the three post-REAP studies included above in the section on theatre and general academic skills. An additional post-REAP study conducted in several European countries found a positive impact of theatre and drama education on verbal skills, as measured by students' self-reports and their teachers' reports, in line with the REAP findings (DICE, 2010) (see Box 9.3).

Table 5.2. **Theatre education and story understanding: Oral measures**

Study	Positive relationship	Mixed, null, or negative relationship
Aoki (1977)	X	
Dansky (1975/1980)	X	
Galda (1983)		X
Marbach and Yawkey (1980)		X
Milner (1982)	X	
Page (1983)		X
Parks and Rose (1997)	X	
Pellegrini (1984a)	X	
Pellegrini and Galda (1982)	X	
Rappoport (1989)	X	
Saltz, Dixon and Johnson (1977)		X
Weidner (1993)		X
Williamson and Silvern (1990)	X	
Williamson and Silvern (1992)	X	
Wright and Young (1986)		X
Yawkey (1980a)	X	
Yawkey and Yawkey (1979)		X

Note: The full results are presented in Table 5.A1.1.

Source: Podlozny (2000).

Table 5.3. **Theatre education and story understanding: Written measures**

Study	Positive relationship	Mixed, null, or negative relationship
Byerly (1994)		X
Dupont (1992)	X	
Goodman (1991)		X
Gray (1987)	X	
Henderson and Shanker (1978)	X	
Page (1983)		X
Pellegrini (1984a)	X	
Pellegrini and Galda (1982)	X	
Ranger (1995)	X	
Rosen and Koziol (1990)		X
Silvern, Williamson and Waters (1983)		X
Smith (1993)		X
Steinly (1989)	X	
Williamson and Silvern (1992)		X

Note: The full results are presented in Table 5.A1.2.

Source: Podlozny (2000).

Table 5.4. Theatre education and reading achievement

Study	Positive relationship	Mixed, null, or negative relationship
Allen (1968)	X	
Aoki (1977)		X
Bennett (1982)		X
Blacharski (1985)	X	
Burke (1980)		X
Carlton (1963)	X	
Carlton and Moore (1966)	X	
Dupont (1992)		X
Gourgey, Bosseau and Delgado (1985)	X	
Jackson (1991)		X
Karafelis (1986)		X
Millin (1996)	X	
Myerson (1981a)		X
Myerson (1981b)		X
Pappas (1979)		X
Parks and Rose (1997)	X	
Pate (1977)	X	
Rappoport (1989)		X
Smith (1993)		X
Vogel (1975)		X

Note: The full results are presented in Table 5.A1.3.

Source: Podlozny (2000).

Table 5.5. Theatre education and oral language

Study	Positive relationship	Mixed, null, or negative relationship
Cullinan, Jaggar, Strickland (1974)		X
Dansky (1975/1980)		X
de la Cruz (1996)	X	
Dunn (1977)		X
Faires (1976)		X
Haley (1978)	X	
Levy, Wolfgang and Koorland (1992)		X
Lovinger (1974)	X	
Lunz (1974)	X	
McDonald (1993)		X
Millin (1996)		X
Niedermeyer and Oliver (1972)		X
Norton (1973)	X	
Parks and Rose (1997)		X
Snyder-Greco (1983)	X	
Stewig and McKee (1980)	X	
Stewig and Young (1978)	X	
Vitz (1984)	X	
Yawkey and Yawkey (1979)		X
Youngers (1977)		X

Note: The full results are presented in Table 5.A1.4.

Source: Podlozny (2000).

Table 5.6. Theatre education and vocabulary

Study	Positive relationship	Mixed, null, or negative relationship
Allen (1968)		X
Bennett (1982)		X
Gourgey, Bosseau and Delgado (1985)	X	
Page (1983)		X
Page (1983)		X
Pappas (1979)		X
Pate (1977)	X	
Smith (1993)		X
Smith, Dalgleish and Herzmark (1981)		X
Tucker (1971)	X	

Note: The full results are presented in Table 5.A1.5.

Source: Podlozny (2000).

Table 5.7. Theatre education and writting achievement

Study	Positive relationship	Mixed, null, or negative relationship
Carson (1991)	X	
Dunnagan (1990)		X
Knudson (1970)		X
Moore and Caldwell (1990)	X	
Moore and Caldwell (1993)	X	
Roubicek (1983)	X	
Wagner (1986)	X	
Wagner (1986)	X	

Note: The full results are presented in Table 5.A1.6.

Source: Podlozny (2000).

Table 5.8. Theatre education and reading readiness

Study	Positive relationship	Mixed, null, or negative relationship
Adamson (1981)	X	
Blank (1953)	X	
Brown (1990)	X	
Christie (1983)		X
Christie and Enz (1992)		X
Dever (1993)		X
Hensel (1973)	X	
Lawrence (1985)		X
Levy, Schaefer and Phelps (1986)		X
Milner (1982)		X
Saltz and Johnson (1977)	X	
Saltz, Dixon and Johnson (1974)		X
Smith and Syddall (1978)		X
Smith Dalgleish and Herzmark (1981)		X
Strickland (1973)	X	
Tucker (1971)		X
Wright and Young (1986)		X
Yawkey (1980b)	X	

Note: The full results are presented in Table 5.A1.7.

Source: Podlozny (2000).

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Annex 5.A1

Supplementary tables

Table 5.A1.1. **Theatre education and story understanding: Oral measures**

Study	N	R	Z (p)
Aoki (1977)	20	.39	.2.44* (p = .007)
Dansky (1975/1980)	36	.46	.2.76* (p = .003)
Galda (1983)	36	.00	.00 (p = .50)
Marbach and Yawkey (1980)	60	.07	.55 (p = .29)
Milner (1982)	56	.32	2.39* (p = .008)
Page (1983)	16	.11	.44 (p = .33)
Parks and Rose (1997)	179	.19	2.53* (p = .006)
Pellegrini (1984a)	192	.66	9.17* (p < .0001)
Pellegrini and Galda (1982)	108	.48	5.03* (p < .0001)
Rappoport (1989)	71	. 07	2.27* (p = .02)
Saltz, Dixon and Johnson (1977)	54	.12	.90 (p = .18)
Weidner (1993)	30	.25	1.38 (p = .08)
Williamson and Silvern (1990)	75	.19	1.68* (p = .046)
Williamson and Silvern (1992)	120	.23	2.56* (p = .005)
Wright and Young (1986)	240	.10	1.58 (p = .057)
Yawkey (1980a)	240	.18	2.77* (p = .003)
Yawkey and Yawkey (1979)	160	.13	1.64 (p = .05)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < .05. See Box 1.2

Source: Podlozny (2000).

Table 5.A1.2. Theatre education and story understanding: Written measures

Study	N	R	Z (p)
Byerly (1994)	26	.27	1.39 (p = .08)
Dupont (1992)	51	.77	4.48* (p < .0001)
Goodman (1991)	102	.17	1.24 (p = .11)
Gray (1987)	21	.67	3.09* (p = .001)
Henderson and Shanker (1978)	28	.96	5.07* (p < .0001)
Page (1983)	16	.10	.40 (p = .34)
Pellegrini (1984a)	192	.68	9.36* (p < .0001)
Pellegrini and Galda (1982)	108	.74	7.64* (p < .0001)
Ranger (1995)	50	.52	3.68* (p < .0001)
Rosen and Koziol (1990)	101	.13	1.34 (p = .09)
Silvern, Williamson, Waters (1983)	102	.16	1.58 (p = .057)
Smith (1993)	97	.00	.00 (p = .50)
Steinly (1989)	39	.60	3.72* (p < .0001)
Williamson and Silvern (1992)	120	.11	1.22 (p = .11)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < .05. See Box 1.2

Source: Podlozny (2000).

Table 5.A1.3. Theatre education and reading achievement

Study	N	R	Z (p)
Allen (1968)	40	.12	.76* (p = .022)
Aoki (1977)	20	.11	.68 (p=.24)
Bennett (1982)	56	–.15	–.92 (p = .18)
Blacharski (1985)	15	.53	3.97* (p < .0001)
Burke (1980)	246	.07	.96 (p = .17)
Carlton (1963)	24	.56	3.52* (p < .0002)
Carlton and Moore (1966)	240	.48	3.02* (p = .001)
Dupont (1992)	51	.21	1.49 (p = .07)
Gourgey, Bosseau and Delgado (1985)	141	.27	4.08* (p < .0001)
Jackson (1991)	34	.27	1.60 (p = .05)
Karafelis (1986)	77	.13	1.14 (p = .13)
Millin (1996)	27	.52	4.02* (p < .0001)
Myerson (1981a)	39	-.01	-.07 (p = .47)
Myerson (1981b)	42	.05	1.12 (p = .13)
Pappas (1979)	237	.02.	.37 (p = .36)
Parks and Rose (1997)	179	19	2.55* (p = .005)
Pate (1977)	160	.25	3.11* (p = .0009)
Rappoport (1989)	71	.11	.92 (p = .18)
Smith (1993)	97	.00	.00 (p = .50)
Vogel (1975)	46	.00	.00 (p = .50)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < .05. See Box 1.2

Source: Podlozny (2000).

Table 5.A1.4. **Theatre education and oral language**

Study	N	R	Z (p)
Cullinan, Jaggar, Strickland (1974)	249	–.04	–.30 (p = .38)
Dansky (1975/1980)	36	.25	1.49 (p = .07)
de la Cruz (1996)	35	.44	2.61* (p = .004)
Dunn (1977)	144	.05	.61 (p = .27)
Faires (1976)	16	–.03	–.13 (p = .45)
Haley (1978)	79	.35	2.51* (p = .006)
Levy, Wolfgang and Koorland (1992)	3	.44	.76 (p = .22)
Lovinger (1974)	38	.51	3.14* (p = .0008)
Lunz (1974)	39	.51	3.19* (p = .0007)
McDonald (1993)	32	.18	.99 (p = .16)
Millin (1996)	27	.31	1.63 (p = .05)
Niedermeyer and Oliver (1972)	196	.07	1.18 (p = .12)
Norton (1973)	94	.28	2.76* (p = .003)
Parks and Rose (1997)	179	.11	1.43 (p = .08)
Snyder-Greco (1983)	17	.58	2.39* (p = .008)
Stewig and McKee (1980)	21	.73	3.36* (p < .0005)
Stewig and Young (1978)	20	.43	1.93* (p = .03)
Vitz (1984)	32	.41	2.30* (p = .01)
Yawkey and Yawkey (1979)	160	.00	.00 (p = .50)
Youngers (1977)	259	.05	.77 (p = .22)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < .05. See Box 1.2

Source: Podlozny (2000).

Table 5.A1.5. **Theatre education and vocabulary**

Study	N	R	Z (p)
Allen (1968)	40	.04	.24 (p = .40)
Bennett (1982)	56	–.06	–.49 (p = .31)
Gourgey, Bosseau and Delgado (1985)	141	.37	5.55* (p < .0001)
Page (1983)	16	.05	.20 (p = .42)
Page (1983)	19	.09	.38 (p = .35)
Pappas (1979)	237	.02	.29 (p = .39)
Pate (1977)	160	.21	2.59* (p = .004)
Smith (1993)	97	–.20	–1.91* (p = .03)
Smith, Dalgleish and Herzmark (1981)	65	–.19	–1.07 (p = .14)
Tucker (1971)	132	.27	3.11* (p = .009)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < .05. See Box 1.2

Source: Podlozny (2000).

Table 5.A1.6. **Theatre education and writting achievement**

Study	N	R	Z (p)
Carson (1991)	16	.51	2.03* (p = .02)
Dunnagan (1990)	47	–.23	–1.27 (p = .10)
Knudson (1970)	80	.17	1.54 (p = .06)
Moore and Caldwell (1990)	41	.40	2.57* (p = .005)
Moore and Caldwell (1993)	63	.31	2.48* (p = .006)
Roubicek (1983)	39	.59	5.23* (p < .0001)
Wagner (1986)	154	.30	3.78* (p < .0001)
Wagner (1986)	154	.19	2.32 (p = .01)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2

Source: Podlozny (2000).

Table 5.A1.7. **Theatre education and reading readiness**

Study	N	R	Z (p)
Adamson (1981)	40	.47	2.95* (p = .0001)
Blank (1953)	38	.66	4.06* (p < .001)
Brown (1990)	120	.49	5.32* (p < .001)
Christie (1983)	17	.07	.30 (p = .38)
Christie and Enz (1992)	32	.10	.54 (p = .29)
Dever (1993)	5	–.01	–.01 (p = .49)
Hensel (1973)	58	.46	3.55* (p < .002)
Lawrence (1985)	336	–.02	–.25 (p = .40)
Levy, Schaefer and Phelps (1986)	28	.16	1.17 (p = .12)
Milner (1982)	56	.15	.87 (p = .19)
Saltz and Johnson (1977)	34	.37	2.18* (p = .01)
Saltz, Dixon and Johnson (1974)	56	.21	1.60 (p = .05)
Smith and Syddall (1978)	14	–.03	–.12 (p = .55)
Smith Dalgleish and Herzmark (1981)	31	.13	.74 (p = .23)
Strickland (1973)	94	.59	5.69* (p < .0001)
Tucker (1971)	132	.11	1.28 (p = .10)
Wright and Young (1986)	240	.11	1.64 (p = .05)
Yawkey (1980b)	96	.22	2.16* (p = .02)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2

Source: Podlozny (2000).

Chapter 6

Cognitive outcomes of dance education

This chapter reviews the research on the effects of dance education on cognitive outcomes: general academic achievement, reading, and visual-spatial skills. There is a small amount of evidence that dance education enhances visual-spatial skills. But research has yet to examine whether these spatial strengths allow dancers to perform better than non-dancers in academic areas in which spatial reasoning is important, such as geometry or physics.

The most impressive dance programme for children that we know of is the US National Dance Institute (NDI), founded by Jacques d'Amboise in 1967, while he was a principal dancer at the New York City Ballet. Amboise believes that dance has the power to engage children fully and motivate them to become excellent. The 1984 Public Broadcasting Service documentary file, *He Makes Me Feel Like Dancin'*, shows d'Amboise's brilliant work with young children. In the words of educator Howard Gardner, "in one hour, teaching a jig to a motley crew of students of all ages, Jacques d'Amboise lays bare the essence of all good education: discipline, effort, beauty, struggle, joy. In the process, he opens up a universe of possibilities for all who participate and reveals why an education in the arts must be the birthright of every human being."[1]

Over two million students in New York City have participated in this programme. Classes are free, they are led by professional dancers in out of school, and the majority of children who participate come from low income families. Thirty schools a year participate in the in-school programme. From these programmes, children

with motivation and talent are selected to receive advanced dance instruction after school, a programme which leads to a professional performance at the end of the year. Many programmes based on the NDI approach have now grown up around the United States. Similar examples can also be found in other countries, as documented by movies such as *Rythm is it!* (following students that prepare a dance performance on Stravinsky's *Le Sacre du Printemps*, choreographed by Royston Maldoom and accompanied by the Berliner Philharmoniker) and *Dancing Dreams* (following teenage students preparing a Pina Bausch choreography, *Kontakthof*, with two of her dancers).

An evaluation of the National Dance Institute was conducted by Horowitz (2003), examining the effects of this programme on children, schools, and teachers. He demonstrated that the programme required full engagement and focus, and that students succeeded in teaching complex sequential dance skills, and that the students developed skills in movement, dance, stagecraft, and performance. The children learned to make eye contact with an audience, project enthusiasm, and work together with the other dancers.

This should in our view be sufficient to prove that this is a programme of great educational value. Whether the kind of discipline and focus learned in dance classes transfers to other areas (cognitive, social, brain, etc.) was not assessed.

In this chapter we review studies examining the cognitive transfer outcomes of dance education: they focus on general academic achievement, reading, and visual-spatial skills. One of the programmes assessed was the National Dance Institute. None of the other studies assessed dance programmes as ambitious and intensive as the National Dance Institute programme. As for other forms of arts education, possible indirect explanations for transfer lies in enhanced motivation that extends to other school activities and in habits of mind developed by dance education such as enhanced attention or discipline then applied to other academic subjects. Given that dance is a visual-spatial form of activity, it is reasonable to hypothesise that dance education may develop visual-spatial skills that can then be deployed in other subject areas that call for spatial reasoning. Still, there are many kinds of spatial reasoning, and the kind of spatial imaging involved in dance might be quite different from the kinds used in visualising molecules in a science class, for example. This issue remains to be resolved through research.

Dance education and general academic achievement

REAP analyses of dance education and general academic achievement

Correlational studies

Vaughn and Winner (2000) compared the SAT scores of students who did and did not take dance classes in high school as part of the Reviewing Education and the Arts Project (REAP). (The SAT is the exam taken for admission to US colleges and

universities.). As for other art forms, students who took dance classes had higher SAT verbal and maths scores than those with no or fewer arts classes. T-tests comparing mean verbal SAT scores over 10 years for students with and without dance classes proved highly significant. No causal conclusions about the effects of dance classes on SAT scores can be drawn since these analyses are based on correlational data.

Post-REAP studies of dance education and general academic achievement

Correlational studies

We found two correlational studies since REAP examining the relationship between dance and general academic skills, summarised in Table 6.1.

In a correlational study, Compton (2008) found that students in schools with dance programmes had no test score advantage over students in schools without dance programmes. In another correlational study, Carter (2005) reported that students in magnet high schools with dance programmes who elected to study dance had higher grade point averages than students not studying dance.

Table 6.1. **Two correlational studies since REAP assessing dance education and general academic achievement**

Study	Positive results	Negative or null results
Carter (2005)	X	
Compton (2008)		X

Quasi-experimental studies

We found two quasi-experimental studies since REAP testing the hypothesis that training in dance improves academic skills, summarised in Table 6.2.

In a quasi-experimental study, Dumais (2006) found that children involved in dance classes had higher maths test score gains than those not involved in dance. However, in another quasi-experimental study, Von Rossberg-Gempton (1998) found that children involved in dance made no greater cognitive gains than children taking a physical education class.

Table 6.2. **Two quasi-experimental studies since REAP assessing the effects of dance education on some form of academic achievement**

Study	Positive results	Negative or null results
Dumais (2006)		X
Von Rossberg-Gempton (1998)	X	

Thus far the evidence does not support the hypothesis that dance education improves general academic skills.

Dance education and reading

In this section we review studies assessing the impact or relation of dance education and reading. While the link between reading and dance might not appear self-evident, some programmes aim to teach reading through dance.

REAP meta-analysis of dance education and reading

Quasi-experimental and experimental studies

Keinanen, Hetland and Winner (2000) identified two quasi- and two true experimental studies examining the relationship between dance instruction and reading skills and combined them into one meta-analysis (studies listed in Table 6.3). None of these studies were published (three were doctoral dissertations; one was a technical report). Students in kindergarten and elementary school classes who had received dance instruction were compared to those who had not received such instruction on standardised measures of reading. As can be seen in Table 6.A1.1, one study reported a negative effect size, one reported an effect size near zero, and two reported positive small to moderate effects.

Table 6.3. **Four quasi-experimental and experimental studies on the effects of dance on reading**

Study	Positive relationship	Mixed, null, or negative relationship
Heausler (1987)*		X
Rose (1999)	X	
Seham (1997)		X
Twillie (1980)*		X
Weighted mean		X

Note: The full results are presented in Table 6.A1.1. The experimental studies are asterisked.

Source: Keinanen, Hetland and Winner (2000).

The meta-analysis yielded a weighted mean effect size of .21 (equivalent to a *d* between .4 and .5). The *t*-test of the mean *Zr* was not significant, and thus this effect could not be generalised to new studies on this topic. Thus this study concluded that there is no evidence that dance is an effective means of teaching reading.

Let us take a closer look at the kind of dance instruction assessed in these studies. Three of the studies assessed dance programmes in which the dance instruction was explicitly tailored to teach an academic skill. Of these three studies, only one

had a positive effect size (Rose, 1999). This study assessed the Whirlwind programme designed to teach reading through dance. As an example of how dance was used to teach reading, consider the following: students were asked to make their bodies into the shapes of letters of the alphabet. Not surprisingly, these students scored higher than controls on decoding words. We can conclude that this programme is effective in teaching decoding of words. But dancers might cringe at the idea that what students were doing was really dance.

The other study in this meta-analysis that yielded a positive effect was an analysis of academic outcomes following participation in Amboise's National Dance Institute (Seham, 1997). The dance instruction in this study was genuine dance, and was not tailored to support an academic outcome. Seham found that children in this programme improved more than a control group not only in reading but on a variety of other cognitive tests.

How can we account for these findings: did the dance instruction actually teach cognitive skills that were measured on standardised tests? Did the dance instruction lead to greater attention which then led to improved test performance? A strong piece of evidence in favour of a general motivational explanation is that children in the dance programme showed improved outcomes on all of the verbal and quantitative subtests of a standardised achievement test compared to the control group. Ideally this study should have compared children in the dance group to children in another kind of exciting new programme in order to disentangle the possible motivational effects of dance from those of participation in any new kind of programme.

We found no studies since REAP examining the relationship between dance education and reading.

Thus far the evidence does not support the hypothesis that dance training improves reading.

Dance education and visual-spatial skill

REAP meta-analyses of dance education and visual-spatial skill

Keinanen et al. (2000) found one experimental and three quasi-experimental studies assessing the effect of dance instruction on nonverbal performance IQ scales (which some believe assess skills that involve spatial reasoning) and on nonverbal paper and pencil spatial reasoning tests (shown in Table 6.4). The mean weighted effect size yielded was r = .17 (equivalent to d = .35), and the *t*- test of the mean *Zr* was significant, showing that we can generalise these findings to new studies. We can conclude that dance does enhance visual-spatial skills. This finding constitutes a case of near transfer and is not surprising since dance itself is a visual-spatial form of activity. However, this finding is based on very few studies.

Table 6.4. **Quasi-experimental and experimental studies on dance education and visual-spatial skill**

Study	Positive relationship	Mixed, null, or negative relationship
Bilsky-Cohen and Melnik (1974)*		X
Kim (1998)	X	
Von Rossberg-Gempton (1998)		X
Von Rossberg-Gempton (1998)		X
Weighted mean	X	

Note: The full results are presented in Table 6.A1.2. The experimental study is asterisked.

Source: Keinanen, Hetland and Winner (2000).

We found no studies since REAP assessing the effect of dance on visual spatial skills.

The small amount of evidence that exists does indeed support the hypothesis that dance training enhances visual-spatial skills. This has been demonstrated using the outcome of performance on visual-spatial tests. No research has yet examined whether these spatial strengths then allow dancers to perform better than non-dancers in subject areas in which spatial reasoning is important.

Dance education, problem solving and critical thinking

One experimental study in Korea assessed whether dance education applying a problem-based pedagogy had an impact on critical thinking dispositions, as measured by the California Critical Thinking Disposition Inventory test, and on self-efficacy in problem solving (Park, 2007). Seventy-eight students were randomly assigned to two groups in a Seoul school: the experimental group received a problem-based instruction in creative dance for 8 weeks while the control group attended traditional physical education classes. The study found positive effects of the problem-based dance pedagogy on critical thinking skills such as truth seeking, open mindedness, analytical skills and inquisitiveness. Self-efficacy in (generic) problem-solving was also improved. Another quasi-experimental Korean study found that self-directed dance pedagogy also improved self-efficacy in problem-solving; the control group received traditional dance instruction (Kim, 2007).

These two studies show an impact on self-efficacy in problem solving, but not in problem solving itself – even though self-efficacy and outcomes in a field are generally correlated. The positive effects on critical thinking are also likely related to the problem-based pedagogy rather than to dance education itself. A comparison of the experimental group with a problem-based pedagogy in physical education would have allowed us to ascribe the results to dance education itself, but we cannot make any general conclusion yet.

The result nevertheless highlights the importance of pedagogy in skill development. It is indeed plausible that a dance class with an explicit focus on problem-based learning manages to improve students› skills in posing, finding and solving problems.

Notes

1. See National Dance Institute website: *www.nationaldance.org/about_founder.htm*.

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Annex 6.A1

Supplementary tables

Table 6.A1.1. **Four quasi-experimental and experimental studies on the effects of dance on reading**

Study	N	R	Z(p)
Heausler (1987)*	132	0.03	0.38 (p = .35)
Rose (1999)	281	0.34	5.64 (p < .0001)
Seham (1997)	79	0.16	1.45 (p=.07)
Twillie (1980)*	35	-.013	-.76 (p = .22) (Z in opposite of predicted direction)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2. The experimental studies are asterisked.

Source: Keinanen, Hetland and Winner (2000).

Table 6.A1.2. **Quasi-experimental and experimental studies on the effects of dance education on visual-spatial skills**

Study	N	R	Z(p)
Bilsky-Cohen and Melnik (1974)*	62	0.07	.55 (p = .29)
Kim (1998)	78	0.20	1.78 (p = .04)
Von Rossberg-Gempton (1998)	16	0.12	.47 (p = .32)
Von Rossberg-Gempton (1998)	32	0.29	1.63 (p = .05)

Note: N: number of observations; R: effect size; Z(p): statistical significance. See Box 1.2. The experimental study is asterisked.

Source: Keinanen, Hetland and Winner (2000).

Chapter 7

Creativity outcomes of arts education

In this chapter we review the effects of arts education on creativity, examining separately the effects of multi-arts education as well as music, visual arts, theatre, and dance. Despite the common assumption that arts education teaches creativity, we found little evidence for this hypothesis in the area of multi-arts and visual arts education. We did, however, find some support for this hypothesis in the area of theatre and dance. We suggest that the lack of support for this hypothesis may be due to the limited way in which creativity is measured, to the small number of studies, and to the fact that not all arts teaching pushes students to think creatively.

The arts are commonly associated with creativity. Artists are our prime social role models for creativity and innovation. Even practiced in an amateur capacity, the arts are typically seen as activities like play, where one can express one's imagination, express one's self, and be "creative." These assumptions generally inspire educational programmes based on the arts, with the hope that students' creativity will be enhanced and possibly transfer to other academic subjects.

Why should arts education engender creativity? One hypothesis grows out of Hetland, Winner, Veenema and Sheridan's (2013) analysis of visual arts teaching. As described in Box 4.1, they found that visual arts teachers continually asked student to take risks, experiment, try new things, and thus to extend themselves beyond what they had done before. This was coded by Hetland et al. as asking students to "stretch and explore." If this kind of discourse is common in all kinds of arts classes,

we might expect arts classes to train students to be more creative, at least in the domain of the art form in question. Whether this habit then transfers to other areas is an open question.

We distinguish sharply here between "little-c" and Big-C" creativity. Big-C creativity refers to the kinds of major innovations that revolutionise a domain: e.g. Einstein's theory of relativity, Darwin's theory of natural selection, Picasso and Braques' invention of cubism, Martha Graham's invention of modern dance (Csikszentmihalyi, 1996). These are innovations that leave a domain forever changed. Little-c creativity refers to the activity of discovering how to solve a problem on one's own (even if the solution is already known by others) or solving problems in unusual ways. This kind of behaviour requires thinking in new ways, but does not lead to big changes in a domain. No child can be Big-C creative: one must first master a domain before one can change it (Gardner, 1993; Winner, 1996).

When psychologists and educators attempt to quantify creativity, they most typically use the Torrance Tests of Creativity developed by Paul Torrance in 1966. These tests, consisting of both a verbal and a figural (visual) measure of creative thinking, assess four aspects of "divergent" thinking: fluency, flexibility, originality, and elaboration. Sample tasks on the verbal form include imagining how to improve a stuffed toy animal so that it would be more fun to play with; imagining what would happen if something improbable occurred, such as people gaining the ability to move themselves from location to location by winking; or coming up with unusual ways to use a common object such as a brick. The figural form includes drawing and giving a title to the drawing, and naming an unusual looking design by answering the question "What might this be?".

These tests are "domain-general" in that they are meant to assess a general factor of creativity, rather than level of creativity in a specific area such as music or mathematics or visual arts, etc. Thus some have questioned the predictive validity of these tests (e.g. Baer, 1993). However, Millar (2002) demonstrated that children who scored high on these tests were more likely than those who scored low to enter creative professions as adults – they become entrepreneurs, inventors, authors, software developers, and were more likely to get awards for creativity, or to become involved in the arts. It is most likely that these creative adults were little-c rather than Big-C creative.

Plucker (1999) reanalysed Torrance's data using structural equation modeling and demonstrated that about half of the variance in adult creative achievement could be explained by Torrance's divergent thinking test scores – which was more than three times the variance explained by IQ. Creative achievement was again most likely not Big-C creativity (as this kind of creativity is so rare). Creative achievement was measured by number of publicly recognised creative achievements such as inventions, published articles, creativity awards, as well as by judges' ratings of the level of creativity of participants self-listed three most creative achievements.

Plucker's (1999) finding suggests that despite all of the criticism of domain-general paper and pencil tests of creativity, such tests actually do predict later creative achievement.

While IQ scores have been rising about ten points with each generation (probably due to our increasingly urban and enriched environments), it was recently reported that creativity test scores in the United States, which had been steadily rising until 1990, are now falling (Kim, 2010)[1]. This analysis was based on almost 300 000 Torrance scores of both children and adults. Apparently the scores of American children in kindergarten through 6th grade (which means from about ages 5 to 11) have been declining the most steeply.

A very different measure of creativity was developed by Getzels and Csikszentmihalyi (1976) in a study of adult visual arts students. The authors argued that true creativity does not consist in solving a known problem, but often calls for finding a new problem to solve. This was a domain-specific measure of visual arts creativity and it was termed a measure of "problem finding" rather than problem solving. Visual arts students were given a wide variety of objects and were told to make a drawing that incorporated any of the objects they wished. Problem findings was measured in a number of ways, including time spent exploring the objects, and time spent experimenting with a drawing on paper before reaching "closure" on the drawing. We know of no attempts to develop problem finding measures of creativity in other arts domains.

The renewed focus of schools on preparation for standardised tests is criticised for not being the way to enhance creativity (e.g. Looney, 2009). Many arts educators have bemoaned the fact that by cutting out the arts from school curricula we deprive children of one excellent route to becoming more creative. And of course creativity is considered an important outcome – both for educational reasons as well as for economic development.

But is there an established link between any form of arts education and performance on standardised tests of creative thinking? Does studying the arts lead to enhanced critical and creative thinking either within arts class or outside of the arts?

No studies have yet examined whether creativity in the arts is enhanced in arts classes, though surely strong arts teachers do teach their students to work and think creatively in the art form they are being taught. The study by Hetland et al. (2013) analysing the studio habits of mind stressed by visual arts teachers (see Box 7.1) does report that teachers pushed students to "stretch and explore," to go beyond their usual limits and try new things. Thus teachers were pushing their students to be creative. But note that no measure creativity in art was given to these students. All that we can conclude from this study is that teachers tried to get students to work creatively in the visual arts; we cannot conclude from this study that creative behaviours were actually learned. However, it seems highly likely that in strong arts classes with excellent teachers, students do learn to work creatively in the art form.

A number of studies have investigated the relationship between arts education and creativity using paper and pencil creativity tests such as the Torrance test. As shown below, many report positive associations. We found studies examining creativity and multi-arts instruction, visual arts, theatre, and dance, but none examining this specific question with respect to music instruction.

Multi-arts education and creativity

REAP meta-analyses of multi-arts education and creativity

The claim that multi-arts instruction boosts creativity seems more plausible than the claim that such instruction boosts verbal and mathematical test scores, since the arts are an arena where students can really be encouraged to be creative.

Correlational studies

One of the reports of the Reviewing Education and the Arts Project (REAP) meta-analysed ten correlational studies assessing the claim that arts instruction boosts creativity (Moga, Burger, Hetland and Winner, 2000) (listed in Table 7.1). All of these studies used as their outcome measures standard paper and pencil creativity tests, and compared the creativity test scores of students who took arts courses vs. those who did not. The weighted mean effect size was r = .28 (equivalent to a d of about .6), and the *t*- test of the mean Zr was significant, showing that this effect could be generalised to new studies.

Table 7.1. **Ten correlational studies on the relationship between multi-arts education and creativity outcomes**

Study	Positive relationship	Mixed, null, or negative relationship
Burgart (1961)	X	
Burton, Horowitz, and Abeles (2000)	X	
Hamann, Bourassa, and Aderman (1991)	X	
Howell (1990)		X
Even (1963)		X
Skipper (1969)		X
Skipper (1969)		X
Dillard (1982)	X	
Even (1963)		X
Luftig (1993)	X	
Weighted mean		X

Note: The full results are presented in Table 7.A1.1.

Source: Moga *et al.* (2000).

Quasi-experimental or experimental studies

Moga et al. (2000) meta-analysed three studies with verbal creativity outcomes. These studies were either quasi- or true experimental studies (the report did not distinguish these two kinds of studies). Table 7.2 lists the three studies identified with verbal creativity outcomes. Here a weighted mean effect size was $r = .003$, and the *t*- test of the mean *Zr* for this tiny effect was not significant.

Table 7.2. **Three quasi-experimental or experimental studies on the effects of multi-arts education on verbal creativity outcomes**

Study	Positive relationship	Mixed, null, or negative relationship
Even (1963)		X
Skipper (1969) (females)		X
Skipper (1969) (males)		X
Weighted mean		X

Note: The full results are presented in Table 7.A1.2.

Source: Moga *et al.* (2000).

Moga et al. (2000) also meta-analysed three studies with figural creativity outcomes (and again the report did not distinguish between quasi- and true-expeirmental studies. Table 7.3 lists the three studies identified with figural creativity outcomes. A weighted mean effect size of $r = .15$ was found, but the *t*- test of the mean *Zr* was not significant, so that we cannot generalise this finding to new studies.

Table 7.3. **Three quasi-experimental or experimental studies on the effects of multi-arts education on figural creativity outcomes**

Study	Positive relationship	Mixed, null, or negative relationship
Dillard (1982)	X	
Even (1963)		X
Luftig (1993)	X	
Weighted mean		X

Note: The full results are presented in table 7.A1.3.

Source: Moga *et al.* (2000).

Box 7.1. Multi-arts education and creativity: Is it the arts or the innovative teachers?

Among the studies assessing the relationship between arts and creative thinking is a study by Burton, Horowiz and Abeles (2000). They studied 2 406 students in the 4th, 5th, and 8th grades who were either given an arts integrated curriculum or the arts taught as separate subjects by arts specialists. Some schools were classified as arts rich while others were considered arts poor, as defined by the quantity of arts programming. Children in the top quartile of high arts exposure schools were compared to those in the lower quartile of arts exposure. High arts children scored higher on the Torrance Test of Figural Creativity (although no statistics were reported).

This study is difficult to interpret because the teachers in the arts rich schools were also more innovative (as measured by teacher self-ratings). If the teachers in the arts rich schools were really more innovative (and it is hard to tell based on self-reports), then it is possible that teacher innovation is the factor that led to greater creativity.

We found one quasi-experimental and two experimental studies since REAP investigating the effects of multi-arts education on creativity (Tables 7.4 and 7.5).

Byun (2004) studied the impact of the Arts Educational Program with Picture Books (AEPPB) on creativity among 111 5-6 year old children from similar socio-economic backgrounds living in the Seoul and Kyonki provincial areas in Korea. While the control group received the usual programme, the 61 young children in the experimental groups had three types of instructional activities with picture books: after the collective study of the book with the teacher, children were asked to either draw or paint a picture related to the story, express their feelings about the story with musical instruments (tambourine, castagnettes, etc.), or invent the continuation of the story, before sharing their thoughts about their production and its relationship to the story. In this 10-week experiment, creativity in language, fine arts and body expression was measured with the Korean Comprehensive Creativity Test for Young Children (K-CCTYC) and creativity in music was measured with the Measures in Creativity in Sound and Music (MCSM) test. While the two groups showed no difference on both tests at the beginning of the intervention, the experimental group exhibited statistically significant higher scores in all forms of creativity after participating in the programme.

Garaigordobil and Pérez (2002) assessed the effects of the Ikertze arts programme on verbal and figural creativity with 6-7 year old children (first grade). The intervention involved 89 experimental and 46 control students who were randomly assigned in their groups. The experimental groups followed the Ikertze arts programme that implements a coordinated pedagogy based on the parallel exploration of related concepts in visual art, music, and drama. For example, as emptiness and fullness will be explored in visual art, there will be work on sound and silence in music and on stillness and movement in drama. The control group, which did not differ in its characteristics or prior exposure to arts education from the experimental group, followed the traditional curriculum in arts education (which covers the three art

forms of the intervention). The authors found a positive effect of the multi-arts programme on verbal and figural creativity, as measured by the Torrance Tests of Creative Thinking and the *Test de Abreacción para Evaluar la Creatividad* by De la Torre. In a diferent paper based on the same intervention, Garaigordobil and Pérez (2001) also find positive effects of their intervention on motor creativity (measured by another Torrance creativity test).

While one multi-arts programme with a specific pedagogy has a proven positive impact on creativity, this does not allow us to conclude that any multi-arts education will have this effect. It makes it clear though that arts education taught in certain ways can boost some aspects of creativity.

Table 7.4. **One quasi-experimental study on multi-arts education and creativity (kindergarten)**

Study	Positive results	Negative results
Byun (2004)	X	

Table 7.5. **Two experimental studies on multi-arts education and creativity**

Study	Positive results	Negative results
Garaigordobil and Pérez (2001)	X	
Garaigordobil and Pérez (2002)	X	

Although there is a robust correlation between multi-arts education and general creativity, and a number of positive findings, there is not enough evidence thus far to support the hypothesis that multi-arts education raises children's performance on paper and pencil creativity tests. Experimental studies have so far failed to produce findings that can be generalised. And even when studies did report a positive effect, no evidence was reported that the students used their increased creativity skills anywhere but on these measures of creativity.

Future research should investigate whether creativity in specific academic disciplines is actually affected by participation in art education programmes. Future research should also examine more qualitative creative thinking outcomes, such as the ability to find new problems (Getzels and Csikszentmihalyi, 1976), or the tendency to be curious and ask unusual questions.

The REAP investigators did not investigate creativity outcomes for specific art forms. Studies assessing creativity outcomes for specific art forms are reviewed below.

Music education and creativity

We were not able to find any studies examining specifically whether music education improves children's domain-generic creativity. In a quasi-experimental study about the effects of integrated mathematics and music activities in

kindergarten, Lee and Kim (2006) find no effect of their pedagogy on musical creativity (measured by the Recording Skill Development in Music test), but this may be due to the maths focus of the pedagogy (see Chapter 3, Box 3.5). We did also identify one study comparing musicians to non-musicians on divergent thinking: it demonstrates enhanced divergent thinking in musicians (Gibson, Foley and Park, 2009).

Visual arts education and creativity

Adult studies

In a correlational study, Morrison (2001) found that psychology students' self-reported involvement in the visual arts was related to performance on a visual creativity task in which one must create a new shape from a given shape. Involvement in the visual arts predicted more innovative (divergent) solutions to this problem. What is known about visual arts education and creativity in children?

Quasi-experimental studies

We identified two quasi-experimental studies assessing the relationship between visual arts education and creativity, summarised in Table 7.6.

Korn (2010) assessed a programme at New York's Guggenheim Museum called Learning Through Art (LTA) in which students created visual arts projects. Teaching artists often focused on problem solving skills, and they taught students to think intentionally and make deliberate choices. We consider the outcome of problem solving to be similar enough to creativity (since they were looking for innovative solutions to problems) to include this study here. The goal of the study was to determine whether LTA had a positive effect on students' problem solving skills. The study examined 418 fifth grade students from six schools: three schools received the LTA programme and three did not. One of the outcome measures assessed problem solving strategies on an artistic task: students were asked to design a miniature chair in 15 minutes using at least three different materials given to them in a bag (e.g. felt, glue, paper, scissors, etc.). Students were observed as they worked and were interviewed after completion on the process they used to solve this task. On three qualitative measures, LTA students performed better than control students: LTA children made more intentional choices; they felt less frustrated when they encountered obstacles; and they were more likely to name other materials that they might have used that were not available when they were explicitly asked what other materials they might have used. However, LTA students also scored lower than control students on the extent to which they tested the properties of the materials they were using (a measure of experimentation). In other areas (imagining, other forms of experimentation, recognising resources, and connecting their ends and aims), no differences between groups were found.

Catterall and Peppler (2007) compared two groups of third graders in inner city schools – those receiving high quality visual arts instruction over the course of

20 and 30 weeks and those at the same school not receiving any special visual arts instruction. Children in the arts groups rated themselves significantly higher than those not in the arts on one of these measures – originality. Originality was measured by questions asking them how good they thought they would be at inventing new kinds of toys. Since the measures were self-ratings, we cannot be very confident that students actually became more original – but only that they believed they had.

Table 7.6. **Two studies assessing relationship between learning in visual arts and creativity**

Study	Positive findings	Negative/inconclusive findings
Korn (2010)		X
Catterall and Peppler (2007)	X	

Evidence showing that visual arts education boosts creativity is weak. Out of three studies, two reported positive effects. But both of these were based on self-report.

Theatre education and creativity

Correlational studies

We found one correlational study examining the relationship between theatre education and creativity, listed in Table 7.7. Yeh (2008) reported that involvement in drama is associated with higher levels of creativity in preschoolers. Groups of preschoolers who had previously received either a high, medium or low amount of drama instruction were measured on the Preschoolers Creativity Test. Results showed that the group of preschoolers with the most drama training scored highest on creativity, followed by the group with a medium amount of training, with the preschoolers with the least drama training scoring the lowest.

Table 7.7. **One correlational study assessing relationship between learning in theatre and creativity**

Study	Positive findings	Negative/inconclusive findings
Yeh (2008)	X	

Experimental studies

We identified two experimental studies assessing the relationship between theatre/drama education and creativity/problem solving, summarised in Table 7.8.

In an experimental study, Warger and Kleman (1986) examined the effects of theatre on the creativity scores of four kinds of 6-10 years olds. These children were either institutionalised behaviour disordered, non-institutionalised non-behaviour disordered children, institutionalised non-handicapped children, and non-institutionalised non-handicapped children. In each group, children were randomly assigned to 30-45 minutes per day of creative dramatics for two weeks, or to a control group that received no creative dramatics training. The drama group for all four subgroups outscored the control group on Torrance's tests of fluidity, originality, and imagination.

In a second experimental study, Hui (2006) reported that drama training improved creativity, expressive communication, and creative drawing. One-hundred twenty six children in grades 1 and 4 were randomly selected to receive drama lessons. Sixty-nine children were randomly selected to create the control treatment – other instruction, such as sports. All participants completed the Wallach-Kogan creativity tests, tests for creative thinking-drawing production, and a story-telling test created and scored by the experimenters. Children in the drama project generated more creative responses, tended to provide more creative drawings, were more expressive, and provided more interesting stories than those who were not in the project.

Table 7.8. **Two experimental studies assessing relationship between learning in theatre and creativity**

Study	Positive findings	Negative/inconclusive findings
Warger and Kleman (1986)	X	
Hui (2006)	X	

Thus far there are two experimental studies that all provide evidence to support the hypothesis that learning in theatre (or creative dramatics) boosts creativity scores in children.

We do not know why theatre training should have stronger effects on creativity than visual arts training. However, one possibility is that theatre training boosts performance on verbal creativity tests due to the strong effect that theatre training has on verbal skills, reviewed earlier.

Dance education and creativity

Adult dancers

We identified one correlational study assessing the relationship between dance education and creativity/problem solving in adults. Brennan (1982) found no relationship between dance creativity in college student dancers and Guilford's

measures of creativity. Sixty-one graduate and undergraduate dance majors were assessed on their creativity in dance, and on their creativity in general using Guilford's Plot titles, Alternative uses, Making Objects and For Sketches tasks. No correlations were found between the measures of creativity in dance and the measures of creativity in general. This finding suggests that domain-general measures of creativity may not be a good measure of creativity in a specific art form.

Quasi-experimental studies

We identified two quasi-experimental studies assessing the relationship between dance education and creativity/problem solving (see Table 7.9). These studies assessed dance taught as a separate discipline rather than integrated into the academic curriculum.

Kim (1998) compared the effects of 15 sessions of creative vs. traditional dance instruction over 8 weeks on creative thinking in 7th grade girls. This quasi-experimental study was included in Keinenan et al's (2000) REAP meta-analysis, but the outcome used in the meta-analyses was non-verbal reasoning. Here we examine the findings of this study with respect to creativity. Creative thinking was measured by the figural forms of the Torrance Test of Creative Thinking. Students in the creative but not traditional dance programme gained significantly in creative thinking. In contrast, no effects of creative dance instruction were found on a test of non-verbal reasoning (the Raven's Standard Progressive Matrices). This study demonstrates that one form of dance instruction, creative dance, may selectively strengthen creative thinking while not affecting more logical, less creative forms of reasoning.

Minton (2000) compared the effects of one semester of dance training vs. no training on 15 year olds' creative thinking, again measured by the figural forms of the Torrance Test of Creative Thinking. Scores of those receiving dance instruction grew significantly stronger over one semester than did scores of those receiving no training.

Table 7.9. **Two quasi-experimental studies assessing effects of dance education on creativity**

Study	Positive findings	Negative/inconclusive findings
Kim (1998)	X	
Minton (2000)	X	

Experimental studies

We identified two expeimental studies assessing the relationship between dance education and creativity/problem solving (see Table 7.10). These studies also assessed dance taught as a separate discipline rather than integrated into the academic curriculum.

Caf et al. (1997) found that dance classes help hypoactive children develop creative thinking. Sixteen children between the ages of 7-10, all of whom had been diagnosed with learning disabilities and hypoactivity, were randomly assigned to either dance training or no training. Those receiving dance training gained significantly more in creative thinking again as measured by the figural forms of the Torrance Test of Creative Thinking, but not in body image or hypoactive behaviour (as measured by teachers).

Reber and Sherrill (1981) showed that dance can be used to teach creative skills to deaf students. Twenty hearing-impaired children were tested on the Torrance figural creativity measures. Half were then assigned to 10 weeks of dance training, and half to no training. The students receiving dance instruction improved on all three tests of creative thinking over and above those not in dance classes.

Table 7.10. **Two quasi-experimental studies assessing effects of dance education on creativity**

Study	Positive findings	Negative/inconclusive findings
Caf (1997)	X	
Reber (1981)	X	

Thus far there are two quasi-experimental and two experimental studies that all provide evidence to support the hypothesis that learning in dance boosts creativity scores in children.

Creativity outcomes: Conclusions

The claim that arts education nurtures children's creativity seems self-evident. After all, the arts are inherently creative activities. Surprisingly, however, we found little evidence for this hypothesis in the area of multi-arts and visual arts education, though we found studies supporting this hypothesis in the area of theatre and dance.

One explanation for the lack of overwhelmingly clear findings that arts education boosts creativity is that the measures used are typically paper and pencil tests of creativity. Perhaps these are poor measures. In addition, there is no reason to think that arts education will make children more creative unless the arts are taught in a way that really pushes children to explore and invent. It is likely that many arts classes ask children to do rather routine things – sing in a group, make Christmas decorations for the school hallway, etc. It is also possible that, like in other disciplines, one needs to reach a certain level of proficiency or mastery before being able to have a more inventive approach to the practiced art, and even more so before such creativity can transfer to other disciplines or practices. However, creativity may be highly domain specific, in which case we would not see transfer of creativity from an art form even to another art form, much less to an academic subject.

Notes

1. *www.newsweek.com/2010/07/10/the-creativity-crisis.html*.

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Annex 7.A1

Supplementary tables

Table 7.A1.1. **Ten correlational studies on the relationship between multi-arts education and creativity outcomes**

Study	N	R	Z(p)
Burgart (1961)	100	.43	4.25*
Burton, Horowitz, and Abeles (2000)	1202	.29	10.20*
Hamann, Bourassa, and Aderman (1991)	76	.27	2.34 (p=.01)
Howell (1990)	135	.09	1.03 (p=.15)
Even (1963)	37	.16	0.95 (p=.17)
Skipper (1969)	157	-.05	-0.68 (p=.25)
Skipper (1969)	55	.05	0.33 (p=.37)
Dillard (1982)	97	.30	2.95 (p=.002)
Even (1963)	37	.15	0.90 (p=.18)
Luftig (1993)	412	.12	2.33 (p=.01)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < 0.001. See Box 1.2

Source: Moga et al. (2000).

Table 7.A1.2. **Three quasi-experimental or experimental studies on the effects of multi-arts education on verbal creativity outcomes**

Study	N	R	Z(p)
Even (1963)	37	.16	0.95 (p=.17)
Skipper (1969) (females)	157	-.05	-.068 (p=.25)
Skipper (1969) (males)	55	.05	0.33 (p=.37)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < 0.001. See Box 1.2

Source: Moga et al. (2000).

Table 7.A1.3. **Three quasi-experimental or experimental studies on multi-arts education on the effects of figural creativity outcomes**

Study	N	R	Z(p)
Dillard (1982)	97	.30	2.95 (p=.002)
Even (1963)	37	.15	0.90 (p=.18)
Luftig (1993)	412	.12	2.33 (p=.01)

Note: N: number of observations; R: effect size; Z(p): statistical significance; *: significant at p < 0.001. See Box 1.2

Source: Moga et al. (2000).

Chapter 8

Motivational outcomes of arts education

In this chapter we review the effects of arts education on academic motivation. The notion that arts education strengthens students' academic motivation is a common assumption. We review studies showing that when students are in arts classes they show high motivation, and showing that students who study the arts tend to have higher academic aspirations than those who do not. However, these are correlational findings and we cannot conclude from these that the arts training causes academic aspirations to rise. It is equally possible that students with high aspirations choose to study the arts. Experimental research on this question is needed.

Educators are always in search of the means to make students *want* to learn. The motivation to learn is key. Without the desire to learn, students will not try to learn. This has become even more important in a society driven by innovation in which "creative destruction" requires people to engage in different forms of lifelong learning. Persistence, resilience and energy are increasingly acknowledged as important behavioural skills that relate to people's subsequent success (Tough, 2012). One possible indirect mechanism that could underlie any causal relationship between arts education and academic achievement might be improved academic motivation due to the engaging nature of the arts. Students who study the arts may become excited by learning for the first time, and might as

a result become more curious, engaged, and motivated in their academic classes. Of course this hypothesis depends on students actually becoming excited and engaged in arts classes; then this excitement would need to spill over into other kinds of classes.

Hetland, Winner, Veenema and Sheridan (2013) analysed the discourse of visual arts teachers (described in Box 4.1) and reported that these teachers were continually pushing their students to stick to tasks for sustained periods of time. They coded this kind of teacher discourse as asking students to "engage and persist." If this kind of discourse is common in arts classes, then one might expect students to learn to focus and develop inner directedness as a function of studying the arts – and this kind of skill is certainly related to academic motivation.

What is the state of the evidence regarding the hypothesis that learning in the arts leads to improved motivation to work hard in school and to become engaged in academic learning?

Multi-arts education and academic motivation

REAP meta-analyses of multi-arts education and academic motivation studies

Winner and Cooper (2000) located a number of correlational studies yielding 23 results comparing students high and low on arts education on one of the following outcomes related to academic motivation: academic self-concept, attendance, aspiration, and engagement (as summarised in Table 8.1). These concepts are related to motivation as follows: a high academic self-concept is likely to be either a precondition or a consequence of academic motivation; school attendance, high aspirations for what one can become, and engagement in school are all part of being academically motivated.

In a typical correlational study, students involved in arts were compared to students not involved in arts on one of these motivational outcomes. In the few quasi-experimental studies we found, a comparison was made on an outcome pre- and post- the introduction of the arts in the school. None of the studies were experimental and thus no causal conclusions can be drawn. One of these studies is described below in Box 8.1.

A meta-analysis could not be performed on these studies because most of the studies did not provide sufficient quantitative information to make this possible. As shown in Table 8.1, twenty-one of the 23 studies identified yielded positive

associations; two reported no association, one for the outcome of attendance, and one for dropping out of college. Thus the strong majority of studies examining the correlation between arts education and these indirect academic effects are positive. None of the studies also examined academic outcomes, unfortunately, and these motivational outcomes have not yet been demonstrated to be causally associated with academic improvement.

Box 8.1. Does arts education help prevent high school dropout? No evidence yet

Does participation in the arts lead to lower high school dropout rates? Mahoney and Cairns (1997) followed 392 students from 7th to 12th grade and interviewed them yearly about extra-curricular activities. Students were classified as having had any vs. no involvement in arts, sports, or vocational extracurricular activity. They were also monitored for early school dropout, defined as failure to complete the 11th grade.

Sixty-one students (16%) were early school dropouts. These students had participated in significantly fewer extracurricular activities at all grades than the rest of the students. At the middle school level, it was only athletic participation that differentiated drop outs from non-dropouts: Those who did not drop out had been significantly more involved in athletics than those who dropped out. Thus participation in the arts was unrelated to dropout at the middle school level.

At the high school level, 27% of those with no involvement in the arts dropped out, while only 7% of those with some level of involvement dropped out. However this difference only approached statistical significance ($p = .08$). Involvement in the athletic and vocational domains were both statistically significantly related to lower dropout rates at the high school level.

The number of students involved in some extra-curricular activity who were at risk for dropout was small, and the difference between the results for the arts vs. other extra-curricular activities in predicting dropout were caused by just one student involved in the arts dropping out, and none in the other groups dropping out.

The authors wisely conclude that school dropout is associated with multiple causes and they do not make any claims about single causes. They also note that their results are entirely correlational. We cannot determine whether participation in extracurricular activities protects against dropout or whether it appeals to students who are less likely to drop out to begin with.

Table 8.1. **Correlational studies assessing relationship between arts and motivational indicators of academic achievement**

Study	Motivational indicator	Positive relation	No relation	Confounds/ limitations	Outlet
Burton, Horowitz and Abeles (2000)	Academic Self-Concept	41% of high arts students scored in top quartile of academic self-concept, compared to 18% in low arts groups, no p value reported.			Technical report
Heath (1998a,b)	Academic Self-Concept	High arts students more likely to feel they can do things as well as others than do students in a national sample (89% vs. 76%).		Self-selected sample (i.e., students self-selected into arts) Self-report	Non-peer reviewed journal
Aschbacher and Herman (1991)	Attendance	Arts involved students (in Humanitas curriculum linking social studies, literature, and arts) had higher attendance than control group, p=.07.		Self-selected sample	Technical report
Glissman (1967)	Attendance		9th grade slow learners did not improve attendance when given arts classes, *p*=n.s.		Doctoral dissertation
Fowler (1979b)	Attendance	Attendance rose at Mosswood Mini School, Oakland, Calif, after school incorporated arts.		No data given	Secondary source
Heath (1998a,b)	Attendance	High arts students 3 times more likely to win award for attendance, compared to national sample.		Self-selected sample Self-report	Non-peer reviewed journal
Kantrowitz (1997)	Attendance	Attendance rose at Charles R. Bugg Elementary School after school incorporated arts.		No data given	Secondary source
Murfee (1993)	Attendance	Attendance rose at Guggenheim Elementary School, Chicago, after school incorporated arts.		No data given	Secondary Source
Spike (1991)	Attendance	Attendance rose at Roosevelt Middle School for the Arts, Milwaukee, after school incorporated arts.		No data given	Secondary Source
Aschbacher and Herman (1991)	Aspirations	Humanitas students more likely to plan to attend 4 year college than control group (71% vs. 55%), and less likely to plan to attend 2 year college (17% vs. 25%) or no college (7% vs. 16%), *p*<.05.		Self-selected sample Self-report	Technical report
Heath (1998a,b)	Aspirations	Students in afterschool arts organisations more likely to plan to go to college compared to national sample (86% vs. 65%)		Self-selected sample Self-report	Nonpeer-reviewed journal

Table 8.1. **Correlational studies assessing relationship between arts and motivational indicators of academic achievement** (continued)

Study	Motivational indicator	Positive relation	No relation	Confounds/ limitations	Outlet
Spady (1971)	Aspirations	Boys with high school arts 9.4% more likely to have college aspirations than those without arts.		Self-selected sample. Self-report. Arts group included students involved in student newspaper or yearbook. Any advantage of arts group could be due to members also involved in publications.	Peer-reviewed journal
Catterall (1998)	Engagement	48.9% low arts 8th graders (all SES) reported being bored in school over half or most of the time, compared to 42.2% high arts 8th graders. For lowers SES 8th graders, 46% low arts vs. 41% high arts reported boredom.		Self-selected ample Self-report	Nonpeer-reviewed journal
Catterall (1998)	Engagement	Among average 10th graders, 65.2% of high arts students rarely performed community service, vs. 86% low arts. Among low SES 8th graders, 74.5% high arts rarely/ never served, vs. 83.2% low arts. Among low SES 10th graders, 65.2 % of high arts 10th graders rarely served, vs. 86% low arts.		Self-selected sample Self-report	Nonpeer-reviewed journal
Heath (1998a,b)	Engagement	Students in afterschool arts organisations more likely perform community service than students in a national sample. (30% vs. 6%).		Self-selected sample Self-report Aftter-school arts organisation attended by high arts students all stressed community service.	Nonpeer-reviewed journal
Aschbacher and Herman (1991)	Engagement	Academically at-risk students in Humanitas program less likely to drop out than those not involved, 1% vs. 7%, $p<.05$.		Self-selected sample	Technical report
Center for Music Research, Florida Dept. of Education (1990)	Engagement	30 out of 36 academically at risk students said arts courses affected their decision to stay in school.			Technical report

Table 8.1. **Correlational studies assessing relationship between arts and motivational indicators of academic achievement** (continued)

Study	Motivational indicator	Positive relation	No relation	Confounds/ limitations	Outlet
Mahoney and Cairns (1997)	Engagement	Academically and SES at-risk middle school students more likely to drop out if no involvement in arts (40% vs. 35%, p>.10, n.s.). Academically and SES at-risk high school students more likely to drop out if no involvement in arts (27% vs. 7%, p=.08).		Self-selected sample. Involvement in athletics or vocational training far more predictive of school retention than involvement in arts.	Peer-reviewed journal
Spady (1971)	Engagement		Average students involved in arts in high school 9% less likely to remain in college over a year than students without high school arts. When college aspirations controlled, arts involved students 4.3% less likely to remain in college over a year than students without high school arts.	Self-selected sample	Peer-reviewed journal
Heath (1998a,b)	Engagement	Students in afterschool arts organisations 3 times more likely to win election to class office than students in national sample.		Self-selected sample Self-report	Nonpeer-reviewed journal
Heath (1998a,b)	Engagement	Students in afterschool arts organisations four times more likely participate in a math/science fair compared to a national sample.		Self-selected sample Self-report	Nonpeer-reviewed journal
Heath (1998a,b)	Engagement	Students in afterschool arts organisations more likely to read for pleasure than national sample (57% vs. 35%).		Self-selected sample Self-report	Nonpeer-reviewed journal
Catterall (1998)	Engagement	Among 10th graders, 28.2% high arts students watch 1 hr. or less TV per day vs. 15.5% low arts students, who watch more. Among low SES 10th graders, 16.4% high arts students watch 1 hr or less, vs. 13.3% low arts students.		Self-selected sample Self-report	Nonpeer-reviewed journal

Post REAP studies of arts education and academic motivation: Correlational and quasi-experimental combined

We located 11 findings since REAP (two from the same study) examining the relation between arts education and academic motivation, summarised in Table 8.2. We have combined here studies examining multi-arts education with those examining specific art forms. Six of these studies report positive effects; four report no effects.

Table 8.2. **Twelve correlational and quasi-experimental studies since REAP examining multi-arts learning and academic motivation**

Study	Outcome	Positive relationship	Negative/inconclusive relationship
Barry, Taylor and Walls (1990)	Engagement	X	
Baum and Owen (1997)	Engagement	X	
Csikszentmihalyi, Rathunde and Whalen (1993)	Engagement	X	
Csikszentmihalyi and Schneider (2000)	Engagement	X	
Scott (1992)*	Persistence	X	
Cokadar and Yilmaz (2010)	Attitude		X
Fleming, Merrell and Tymms (2004)*	Attitude		X
Herber, Astleiter and Faulhammer (1999)	Attitude	X	
Kim (2007)*	Attitude	X	
Smithrim and Upitis (2005)*	Attitude		X
Werner (2001)	Attitude		X
Barry, Taylor and Walls (1990)	Dropout	X	
Catterall, Chapleau and Iwanaga (1999)	Dropout	X	

Note: The quasi-experimental studies are asterisked.

Engagement

We found four correlational studies that assessed whether arts education is associated with heightened student engagement in their arts class.

Barry, Taylor and Walls (1990) observed 11 high school students at risk for dropping out while in their arts and their academic classes. They reported the correlational finding that these students were "on-task" in their arts classes 84 percent of the time, but were on-task only 73 percent of the time in their academic classes. This is a very small sample and no statistical test was computed. Thus this study allows no conclusions about whether students are in general more engaged when in arts classes than in academic ones.

Baum and Owen (1997) observed more self regulatory behaviour in classes that integrated the arts (as measured by paying attention, persevering, problem solving, self-initiating, asking question, taking risks, cooperating, using feedback, and being prepared).

Csikszentmihalyi, Rathunde and Whalen (1993) studied adolescents talented in the arts (music or visual art), athletics, and science. They assessed how involved these students felt when in classes in their domain of talent. They reported the following correlational finding: adolescents talented in either music or art felt more open, excited and involved in their arts classes than did talented science students in their science classes.

In another correlational study, Csikszentmihalyi and Schneider (2000) found that students reported higher levels of flow (a form of engagement and optimal experience in which one experiences enjoyment because challenge and skill levels are balanced) when in art than in academic classes.

While the four studies listed above show that students are more engaged in art than non-art classes, none of these studies demonstrates transfer of engagement from the arts to academics. If students are in fact more engaged in arts classes, it remains to be determined whether this engagement becomes a habit of mind that then carries over to academic classes.

Persistence

We found one quasi-experimental study that assessed whether arts education is associated with heightened student persistence. Scott (1992) found that preschoolers receiving music lessons performed better than those receiving creative movement lessons on an attention task requiring vigilance. The musically trained children showed greater persistence as measured by working longer on a block design copying task. This is a small bit of evidence that suggests that music training leads children to work longer on non-musical tasks.

Attitude towards academics

We found three correlational and three quasi-experimental studies examining whether students in an arts integrated class have a more positive attitude toward the academic subject being taught or towards school in general than do students who were introduced to this same subject without arts integration.

Werner (2001) compared attitudes towards maths in elementary school students in a dance-maths integrated class vs. those in a traditional maths class. In the dance-maths class, dance was used specifically to support maths concepts. Students in the dance integrated classes scored somewhat higher in attitudes towards maths than did students in the traditional classes, but the differences were not significant.

In a study conducted in Turkey, Cokadar and Yilmaz (2010) compared 12-13-year-olds' attitudes towards science after receiving science lessons integrated with dance (in which students used movement to understand scientific concepts) vs. science lessons taught alone. Again, no attitudinal benefit was found from integrating science with drama.

Herber, Astleiter and Faulhammer (1999) assessed "need for achievement" in 66 children in Austria between 9 and 13 years who were enrolled in music classes three hours a week outside of school, and compared them to 70 children who were not receiving such lessons. The children in the music group scored significantly higher on need for achievement.

Fleming, Merrell and Tymms (2004) conducted a quasi-experimental study assessing whether the opportunity to take drama classes integrated with writing study improved school attitude in elementary school age children. No beneficial effect on attitude toward school was found.

Smithrim and Upitis (2005) found in a quasi-experimental study that 6th grade students (ages 10-12) involved in a Canadian arts integration programme (Learning Through the Arts) reported being significantly happier coming to school than their peers in the other kinds of schools. This difference was not seen three years earlier when children about to enter Learning Through the Arts were compared to a control group. However, it must be noted that this finding did not occur for boys; nor did it occur for the children in the five other age groups tested.

In another quasi-experimental study, Kim (2007) assessed the impact of two dance pedagogies on academic motivation among high school female students: the experimental group, who was taught with a self-directed dance pedagogy, improved self-reported academic motivation and motivation to continue school more than the control group that received a traditional teacher-directed dance instruction. While the study does not tell us anything about the impact of dance education on academic motivation, it highlights the fact that different pedagogies in arts education have different effects.

School dropout

We found two correlational study assessing the relationship between arts instruction and school dropout.

Taylor and Walls (1990) asked 40 students at risk for high school dropout about why they had decided to stay in school. Of the 22 students who responded that they had considered dropping out of school, six (27%) said they stayed on because they liked the arts or music offerings in their school, and three (14%) said they stayed because they wanted to go on in an arts field. Thus nine out of 22 (41%) said that something about the arts kept them in school. When asked directly whether participation in an arts course affected their decision to remain in school, 30 out of 36 (83%) said yes. When asked how the arts course influenced them, seven (23%) cited possible job opportunities. This study did not actually measure dropout rates but rather asked students who did not drop out about their reasons for remaining. Moreover, it is based on a small, non-representative sample.

Catterall, Chapleau and Iwanaga (1999) reported that high school students involved in the arts were less likely to dropout of school by grade 10 than those not involved in the arts (1.4% vs. 3.7%, respectively). For low socio-economic status (SES) students, the difference was larger: 3.5% of those involved in the arts dropped out, while 6.5% of those not involved in the arts dropped out.

Motivational outcomes: Conclusions

There is a small amount of evidence based on correlational studies suggesting that learning in the arts is associated with higher academic aspirations as well as above average levels of engagement/motivation while students are in the arts classes. Because these are non-experimental studies, we cannot draw causal conclusions. We need experimental studies on this question. These studies should include measures of academic achievement as well as academic motivation in order to test the hypothesis that greater motivation is associated with greater achievement.

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Chapter 9

Social skills outcomes of arts education

In this chapter we review the evidence for the impact of multi-arts education and education in specific art forms on social skills: self-concept and general self-esteem, social behaviour, empathy for others, emotion regulation, and perspective taking (understanding of others). The only evidence thus far that arts education improves some form of social behaviour/social understanding comes from the domain of theatre. There is some quasi-experimental evidence that theatre education improves empathy, perspective taking, and emotion regulation. We can explain such findings by pointing to the fact that theatre education asks children to step into the shoes of others, feel their feelings, and understand their mental states. In addition, theatre education teaches children to express emotions. More research is needed before we can draw firm conclusions about the power of theatre to affect these very important kinds of social skills.

Arts advocates often claim that the arts are important because they "save" children – especially the difficult child who does not thrive in standard academic classrooms, who has low self-esteem, who is at risk for dropping out of school, etc. We hear that the arts gives them purpose, self-esteem, and social competence. We also hear that the arts strengthen children's empathy for others as well as their understanding of others (which we refer to here as perspective taking, and which in the psychological literature is often referred to as having a "theory of mind").

Social skills are important for well-being but also for success in the labour market. They are key skills in innovative societies, which require team work, good communication, including the ability to present its ideas in a persuasive way and to understand and adjust to other people's perspective and emotion. For example, entrepreneurial skills typically include strong social skills as entrepreneurs must convince others to support their projects, mobilise their energies, or understand their needs.

There is as yet no theoretical reason that has been advanced to show why gaining competence in an art form should have greater social benefits on average than gaining competence in an academic subject matter. Do we have any evidence that the arts are uniquely good at promoting social skills?

In this chapter we review what is known about the social outcomes of arts education. We review studies examining the effects of the arts on students' self-concepts, their ability to regulate their emotions, their perspective taking skills, their empathy for others, and their social competence.

Multi-arts education and academic self-concept

Correlational studies

We identified three correlational studies investigating the relationship between multi-arts education and academic self-concept, summarised in Table 9.1.

Table 9.1. **Three correlational studies assessing whether multi-arts education improves self-concept**

Study	Positive findings	Negative or inconclusive findings
Burton, Horotwitz and Abeles (2000)	X	
Catterall (1998)	X	
Catterall, Chapleau and Iwanaga (1999)		X

Burton, Horowitz and Abeles (2000) found that children exposed to the arts (whether integrated or stand-alone) scored higher on some subscales of an academic self-concept test than students not exposed to the arts. Self-concept was measured by questions about how much they value themselves, their abilities, their achievements.

Catterall (1998) found that children in the US National Education Longitudinal Study of 1988 with high arts involvement had a more positive academic self-concept. The study followed longitudinally a representative sample of eighth-graders.

Catterall, Chapleau and Iwanaga (1999) tested students in 12th grade, they reported no difference in academic self- concept in those involved vs. not involved in music or theatre.

There is no strong, clear, or consistent evidence thus far that multi-arts education affects students' academic self-concepts. However, very little research has examined this question.

Music education and social skills outcomes

Music, and in particular collective practice in orchestra or choir, is often seen as a means to develop social skills: this would be derived from being part of a band or collective group, communicating musical emotions, or just playing in public and having opportunities to see one's work applauded and valued. On a more personal level, students could also gain confidence and better master their emotions as they go through the process of learning a musical piece or overcoming stage fright.

The most intensive music education programme we know of was founded in 1975 by musician and economist Jose Antonio Abreu in Venezuela. It is called "El Sistema," or "The System".[1] Funded primarily by the Venezuelan government, this programme is considered to be a social programme – its goal is to transform the lives of children living in poverty. Children spend up to four hours a day, six afternoons a week, studying music; and from the very beginning they learn to play in an orchestra. The orchestra is seen as a way of empowering the community.

El Sistema has now reached 400 000 Venezuelan children, 70% of whom live in poverty, and immerses them in music. One of the graduates of this programme is the brilliant young conductor Gustavo Dudamel, now conducting the Los Angeles Philharmonic. Music educators all over the world are trying to import *El Sistema*'s methods (Box 9.1).[2]

Music education and self-concept

The *El Sistema* music programme described earlier certainly aims to fundamentally alter children's self-concept. We know of no evaluation of this programme or of any similar programme.

Correlational studies

We found one correlational study examining the relationship between self-esteem and music education (Table 9.2). Linch (1994) reported no differences in self-esteem between high school students participating in instrumental music programme and those not participating.

Box 9.1. *El Sistema* viewed by its founder

In his TED talk in 2009, Abreu stated as follows:

"The structure of *El Sistema* is based on a new and flexible managing style adapted to the features of each community and region, and today attends to 300 000 children of the lower and middle class all over Venezuela. It's a program of social rescue and deep cultural transformation designed to the whole Venezuelan society with absolutely no distinctions whatsoever, but emphasising on the vulnerable and endangered social groups".

He went on to describe what his view of the effects of this programme on children:

"The effect of *El Sistema* is felt in three fundamental circles – in the personal/social circle, in the family circle and in the community. In the personal/social circle, the children in the orchestras and choirs develop their intellectual and emotional side. The music becomes a source for developing the dimensions of the human being, thus elevating the spirit and leading man to a full development of his personality. So, the emotional and intellectual profits are huge – the acquisition of leadership, teaching and training principles, the sense of commitment, responsibility, generosity and dedication to others, and the individual contribution to achieve great collective goals. All this leads to the development of self-esteem and confidence… the child's development in the orchestra and the choir provides him with a noble identity and makes him a role model for his family and community. It makes him a better student at school because it inspires in him a sense of responsibility, perseverance and punctuality that will greatly help him at school.

Within the family, the parents' support is unconditional. The child becomes a role model for both his parents, and this is very important for a poor child. Once the child discovers he is important for his family, he begins to seek new ways of improving himself and hopes better for himself and his community. Also, he hopes for social and economic improvements for his own family. All this makes up a constructive and ascending social dynamic. The large majority of our children belong, as I already mentioned, to the most vulnerable strata of the Venezuelan population. That encourages them to embrace new dreams, new goals, and progress in the various opportunities that music has to offer.

Finally, in the circle of the community, the orchestras prove to be the creative spaces of culture and sources of exchange and new meanings. The spontaneity music has excludes it as a luxury item and makes it a patrimony of society. It's what makes a child play a violin at home, while his father works in his carpentry. It's what makes a little girl play the clarinet at home, while her mother does the housework. The idea is that the families join with pride and joy in the activities of the orchestras and the choirs their children belong to. The huge spiritual world that music produces in itself, which also lies within itself, ends up overcoming material poverty. From the minute a child's taught how to play an instrument, he's no longer poor. He becomes a child in progress heading for a professional level, who'll later become a full citizen. Needless to say that music is the number one prevention against prostitution, violence, bad habits, and everything degrading in the life of a child."

Source: http://blog.ted.com/2009/02/_weve_transcrib.php;
www.ted.com/talks/jose_abreu_on_kids_transformed_by_music.html.

Table 9.2. **One correlational study examining relation between music education and self-esteem**

Study	Positive findings	Negative or inconclusive findings
Linch (1994)		X

Experimental studies

We found one experimental study on the effects of music instruction on self-concept, summarised in Table 9.3.

Kennedy (1998) examined the effects of 30 minutes weekly guitar instruction in a group of 45 males aged 8 to 19 who were living in residential homes and juvenile detention centres for at-risk youth. Some had been in trouble with the law. All received the weekly guitar instruction. Two subgroups were also given 30 minutes of various kinds of instruction in how to perform including mental instructions for dealing with performance anxiety and were then allowed to give a solo performance to their peers. One group was given the same kinds of instruction but had no chance to give a solo performance. And one group was given no special performance instruction and instead was shown 30 minutes of performances by others followed by discussion evaluating the performances. Participants were pre-and post-tested in self-esteem using the Rosenberg Self-Esteem Scale. On this test, students indicate the strength of their agreement with statements such as "I feel that I do not have much to be proud of," "On the whole I am satisfied with myself," etc. Students who had been given instruction in music performance and also had experience giving a solo performance improved significantly in self-esteem. Those who did not have a chance to practice giving a solo performance did not improve. This study shows that guitar training coupled with repeated performance experiences can improve self-esteem. However, it seems reasonable to assume that the effects shown here are not specific to guitar instruction but would extend to any kind of training, including non-arts training, where students gain skill and perform publicly.

Table 9.3. **One experimental study assessing effect of music education on self-esteem**

Study	Positive findings	Negative or inconclusive findings
Kennedy (1998)	X	

There is far too little evidence on the question of the effect of music on children's self-concept to draw any conclusions.

We speculate however that any effects from music would be due to an increasing sense of competence and/or the confidence that comes from public performance.

The former could occur from any kind of training in which one gains competence; the latter from any kind of training, arts or otherwise, in which public performances are a part of the instruction.

Music education and empathy

Quasi-experimental studies

While we found no studies of music and empathy, we did find two quasi-experimental studies assessing social outcomes likely related to empathy, summarised in Table 9.4.

In the Bastian (2000, 2008) study described in Chapter 3, in which German children receiving six years of music instruction in school twice a week were compared to those not receiving such instruction, it was reported that those in the music classes had fewer socially isolated pupils. In addition, a social measure was administered in which students were asked to vote on how they felt about other classmates. Children who had received with extended music education cast and received more positive votes than did control children. Bastian concludes that music education improves the social climate in the classroom. While this study did not measure empathy directly, these outcomes are sufficiently related to empathy that we include them here.

Weber, Spychiger and Patry (1993) studied Swiss children receiving intensive music instruction and compared them to a control group. They reported that classes receiving music instruction achieved higher scores in social group cohesiveness (as measured by a sociogram), and that children in the music classes had more positive social interconnectedness and were less competitive. In addition, children who at the beginning of the study were outsiders became increasingly more integrated throughout the three years. And classroom climate in the music group gained in "team spirit" after the second assessment.

Table 9.4. **Two quasi-experimental studies assessing effects of music instruction on empathy-like outcomes**

Study	Positive findings	Negative or inconclusive findings
Bastian (2000, 2008)	X	
Weber, Spychiger and Patry (1993)	X	

Given that we have only two studies on this topic, with neither directly assessing empathy, we conclude that there is insufficient evidence to support the conclusion that music education increases empathy. This is still a question fully open for research.

Visual arts education and social skills outcomes

Visual arts education and self-concept

Quasi-experimental studies

We identified one quasi-experimental study investigating whether learning in the visual arts improves various aspects of self-concept, summarised in Table 9.5.

Third grade students in inner city Los Angeles and St. Louis schools who received high quality visual arts instruction over the course of 20 and 30 weeks (two groups) were compared to third grade students from the same schools that received no training on surveys assessing self concept, self efficacy, and internal vs. external attributions for success (Catterall and Peppler, 2007). The 13-item global self-concept scale used included statements such as "I am able to do things as well as most other people". The seven-item self-efficacy scale included statements such as, "When I make plans, I think I can make them work", "Every time I try to get ahead, someone stops me" and "I have control over my future". The two-item attribution scale contained items including, "Good luck is more important than hard work." On the self-efficacy scale, more students in the art group showed gains than those in the comparison group. Both the art and non-art groups gained on the general self-concept scale and the internal attribution of success scale, with no advantages for the art group.

Table 9.5. **One quasi-experimental study assessing whether learning in visual arts improves self-concept**

Study	Positive findings	Negative or inconclusive findings
Catterall and Peppler (2007)		X

We found only one study investigating whether visual art education improves self-concept, and the study reported mixed effects. Thus we must conclude: no evidence so far.

Visual arts education and emotion regulation

Healthy emotion regulation – the ability to become conscious of one's emotions, and the ability to create, control and use emotions independent of how or when the emotions were activated – is important for positive psychological functioning (Cole, Martin and Dennis, 2004; Gross, 1998, 2002; John and Gross, 2004; Ochsner and Gross, 2005; Saarni, 1999). When emotions are not appropriate we must regulate and change our emotions. To change our emotions, we can engage in

reappraisal – which means changing the way we view a situation in order to change the emotional impact of the situation (Gross, 2002). Or we can engage in expressive suppression, which means preventing the outward expression of an emotion. Although emotion regulation is typically used to decrease negative and increase positive emotions, instrumental emotion regulation can be used to increase or decrease both positive and negative emotions (Gross, 1999).

Adult correlational studies

We identified one correlational study investigating whether learning in the visual arts improves emotion regulation skills in adults, summarised in Table 9.6. This study compared acting to visual arts students (the visual arts students were the control group) and found that those studying visual arts reported greater use of the unhealthy emotion regulation strategy of suppression. See the first study described in Box 9.2 for more details.

Table 9.6. **One correlational study assessing the relationship between visual arts education and emotion regulation**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Goldstein, Tamir and Winner (2012), Study 1		X

Adult quasi-experimental studies

We found one quasi-experimental study comparing the effects of a year of visual arts vs. theatre training on emotion regulation (Table 9.7). Goldstein, Tamir and Winner (2012) used a visual arts group as a control group for a theatre group to test the hypothesis that learning in theatre fosters positive emotion regulation strategies. This study, the second study described in Box 9.2, showed that as hypothesised, one form of healthy emotion regulation improved in adolescents who were given a year of theatre. However, also as hypothesised, visual education had no effect on emotion regulation. Students in the theatre group but not those in the visual arts group showed less suppression of emotion after a year of training. This study is discussed again in the section on theatre.

Table 9.7. **One quasi-experimental study assessing the relationship between visual arts education and emotion regulation**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Goldstein, Tamir and Winner (2012), Study 2		X

There is no evidence that visual arts education improves emotion regulation skills.

Box 9.2. Learning in theatre, but not visual arts, fosters positive emotion regulation: Actors learn to stop suppressing their emotions

In a correlational study, Goldstein, Tamir and Winner (2012) examined whether emotion regulation strategies used by adolescents trained in acting differ from those used by a matched age group with training in other art forms. Actors need to express their emotions and are trained in the overt expression of emotion. They hypothesised that the actors should suppress their emotions less than do individuals involved in other art forms. Participants were ninth graders at one of two Boston-area schools where students can major in an art form. The actor group consisted of 28 adolescents majoring in theatre. The non-actor group consisted of 25 adolescents aged 13-16 majoring in either visual arts or music. All students had had previous training and/or experience with their art form. Participants were part of a larger study investigating the effects of acting training on a variety of outcomes (discussed later in the section on theatre). The acting and non-actor group were matched in SES and age.

Participants completed the Emotion Regulation Questionnaire (Gross and John, 2003), which assesses use of the two emotion regulation strategies of suppression and cognitive reappraisal. Suppression is assessed by agreement with statements such as: "I keep my emotions to myself", "When I am feeling positive emotions, I am careful not to express them", "I control my emotions by not expressing them." Cognitive reappraisal is assessed by agreement with statements such as: "When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about". Participants completed both subscales using a 7 point scale. The acting students but not the visual art students scored significantly lower on suppression (M = 3.12 vs. 3.93). There was no difference between groups in use of the strategy of cognitive reappraisal.

Since this was a correlational study, results could be explained either by a selection factor (individuals who seek out acting are ones with low expressive suppression) or by a training effect (acting training lowers the tendency towards expressive suppression).

To distinguish between these two interpretations, the same researchers conducted a second study, this time quasi-experimental in design. They compared expressive suppression in younger children before and after a year of acting or other arts training. If lower expressive suppression is a function of acting training, one should expect lower expressive suppression scores for the actors but only at Time 2.

Participants were children enrolled in either acting classes or visual arts classes after school and on Saturdays. The actor group consisted of 35 8-10-year-olds enrolled in once a week after school acting classes with 31 completing classes due to attrition. The visual arts classes included 40 children matched in age and SES to the actor group enrolled in once a week after school visual arts classes, with 37 completing classes due to attrition. The children studying theatre participated in one sixty minute class per week taught by professional actors, for three nine-week sessions. Those studying visual arts participated in one ninety-minute class per week, taught by professional artists, for three 10-week sessions. All students received free tuition in classes in exchange for their participation. As with those in Study 1, participants were part of a larger study investigating the effects of acting training on social-cognitive outcomes.

(continues...)

Box 9.2. **Learning in theatre, but not visual arts, fosters positive emotion regulation: Actors learn to stop suppressing their emotions** (continued)

The Coping Strategies Interviews (Saarni, 1997) presented children with five stories chosen randomly for each child from 10 possible stories. In each story, the protagonist undergoes a stressful situation (i.e. her pants rip on the playground for everyone to see and laugh at). The child is then given seven options for what the protagonist could do: support-seeking (i.e. ask the teacher for help), problem-solving/ self-reliance (i.e. pull her sweatshirt down and go find new pants at the lost and found), distancing (i.e. ignoring the laughing and pull her sweatshirt down), internalising (i.e. run home very upset), and externalising (i.e. yell 'Shut up!' at the kids and throw their ball over the fence). To create parallel options with Study 1, we added the options of cognitive reappraisal (think about her pants ripping as a funny joke) and suppression of emotions (hide her face in her hands so no one could see she was blushing) were added for each question. Children were asked to pick the best option for the protagonist, the second best option, and the worst option. Children were tested both before and after 10 months of acting lessons.

Scores for the unhealthy strategy of suppression declined significantly for the acting group between Time 1 and Time 2; scores for the visual arts students did not change. These findings show that lower expressive suppression in actors is due to training in acting. However, no effects were found for emotion regulation in the visual arts group.

Visual arts education and empathy

It has sometimes been suggested that the visual arts enhance empathy with no clear reason why. But we can speculate that as students learn to express their emotions in their visual art, they may also learn to feel the emotions of others in other's art. This kind of practice in feeling emotions may lead to enhanced empathy – but we admit that this reasoning is a stretch.

Quasi-experimental studies

We identified one quasi-experimental study investigating whether learning in the visual arts improves empathy, summarised in Table 9.8. Goldstein and Winner (2012) compared empathy levels in children aged 8-10 and 13-15 both before and after receiving 10 months of visual arts training (this was the control group for their study on the effects of theatre on empathy). The measure used was a standard and widely used self-report empathy scale. Children in the visual arts training did not increase their empathy.

Table 9.8. **One quasi-experimentalstudy assessing whether learning in visual arts improves empathy**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Goldstein and Winner (2012)		X

There is no evidence that visual arts education improves empathy.

Theatre education and social outcomes

In July of 2010, 50 fellows at the World Economic Forum came to New York's Columbia University to learn how theatre could help them become leaders of countries or in business.[3] The programme aims to teach the fellows the techniques that actors use to capture the attention of their audience and to shape their audience's perceptions. The goal was also to get the fellows to use their bodies rather than just words to express themselves. One of the exercises these future leaders were given was to take on the role of an oppressed person or an oppressor and to improvise a dialogue. After the class, one of the fellows said that the exercises "opened a little room in myself to think about the intentions of other people" and to think about their motivations. He went on to say that this was about "understanding ourselves and expressing our thoughts."

There are some new findings suggesting that instruction in theatre may help children and adolescents to regulate their emotions, to develop a more positive self concept, to empathise with others by feeling their pain, and to take others' perspectives. These are the three social-cognitive areas that have been investigated in the area of theatre education. We found no research asking whether training in theatre improves self-expression or the power to influence others, two of the motivations of the Columbia University programme, and these are areas ripe for investigation. However it seems reasonable to expect that training in theatre would improve communication and presentation skills.

The domain of acting can provide a fertile means by which to study these kinds of social-cognitive and emotional skills. But few psychologists have studied the psychological components and consequences of acting. The research that has been conducted on the psychology of acting has focused primarily on the effect of acting on verbal memory and literacy skills (see Noice and Noice, 2006; Podzlony, 2000 for reviews), as reviewed earlier.

There are theoretical reasons to expect that theatre training might improve certain social-cognitive skills. Acting requires students to analyse characters, and hence acting training might help students become more psychologically astute, and more able to understand the minds of others. Acting also requires students to create and control and express their emotions and hence might help students develop better emotion regulation strategies in which they express rather than suppress. And acting requires students to feel the emotions of the characters they enact, and hence might help students to become more empathetic. For a review of the theoretical reasons why acting may affect social-cognitive skills, and for a review of the research conducted in this area, see Goldstein and Winner (2010).

Theatre education and social behaviour

Quasi-experimental and experimental studies

We found no studies assessing whether theatre training helps students to gain a better understanding of themselves (one of the goals of the Columbia University programme). We did however locate five quasi-experimental and experimental studies examining whether involvement in theatre improves positive social behaviour (Table 9.10).

Chandler (1973) tested the effect of role playing on social skills in emotionally disturbed, delinquent adolescent boys. Boys in this study were either given experience in role playing different characters in a videotaped skit, or they were taught referential communication skills (the control group). All of the boys began with low social competence. After ten weeks, those in the role playing but not referential communication group showed lowered levels of delinquent behaviour.

Chandler, Greenspan and Barenboim (1973) gave another group of delinquent boys a similar role playing task in which they created their own videotaped skits and acted out various characters, thereby adopting different perspectives in the same situation. These boys were compared to a group that created videos but did not act in them. These anti-social children were not good at stepping outside of their own vantage point and taking others' perspectives. However, after 12 months, those who had acted out roles in their videos had lower rates of delinquency than those who had made but not acted in videos.

In the experimental study that we described above in the section on music education and IQ, we reported a study by Schellenberg (2004) who used as his control groups children taking drama classes. Children were assessed in level of adaptive social skills – probably as a control measure as the focus of this study was on music's effect on IQ. Students who had a year of drama classes improved significantly more than those who had a year of music lessons in their level of social skills, as reported by their parents.

In an experimental study, Freeman, Sullivan, Fulton and Ray (2003) assessed the effects of 40 minutes per week of drama instruction over 18 weeks. Students were randomly assigned either to a drama instruction group or to a control group. No differences were found between groups in problem behaviour and social skills.

An international, quasi-experimental study found that theatre education improved many social and behavioural outcomes such as communication. This study is described in Box 9.3.

Box 9.3. A quasi-experimental study of theatre education on some of the european commission's key competences for lifelong learning

The DICE (Drama Improves Lisbon Key Competences in Education) project has examined whether theatre (and drama) education has a positive effect on five of the eight key competences defined by the 2006 Recommendation of the European Parliament and of the Council on key competences for lifelong learning (18 December 2006). These five competences are: communication in the mother tongue; learning to learn; interpersonal, intercultural and social competences, civic competence; entrepreneurship; and cultural expression. A preview of the project's findings are summarised in two reports (DICE Consortium, 2010).

The research team has followed about 5 000 students aged between 13 and 16 from 12 countries (Czech Republic, Hungary, Netherlands, Norway, Palestine, Poland, Portugal, Romania, Serbia, Slovenia, Sweden and United Kingdom), who have altogether participated in 111 different types of educational theatre and drama programmes. The project adopted a quasi-experimental design, with two treatment groups (shorter or longer theatre/drama programmes) and a control group, and a pre- and post-assessment of these skills. The current reports do not explain how students were assigned to the different groups, but it was likely not randomised. Although students in the control group (with no theatre education) were meant to be similar to students in the treatment group (with theatre and drama education), the report notes that the research group includes most of the 20% of the students who had regular theatre activities before DICE, which makes it unlikely that a good match between control and treatment groups was achieved.

Students who participated in the theatre and drama programmes improved more than those not in such programmes (as measured by self-report in verbal skills, as well as in communicating (expressing one's views), humour, creativity, school enjoyment, perspective taking, problem solving, stress control, tolerance towards minorities and foreigners, interest in civic participation, and entrepreneurship competences. The students' perceptions were corroborated by their teachers, who also assessed all these competences before and after the intervention and noted more improvement in the groups with theatre education than in the group with no theatre education.

Some of these findings are aligned with other findings reviewed in our report. However, all of these findings rely on self-report measures. This is often the case for outcomes such as self-efficacy or self-concept, but some of these outcomes could have also been measured more objectively (verbal skills, problem solving, creativity, etc.). For this reason, the evidence from this study is suggestive but does not allow strong conclusions.

These studies present an inconsistent picture, but the majority of the studies (all of which are experimental in design) suggest that theatre education can improve social skills, understood as an appropriate behaviour with respect to social norms.

Table 9.10. **Four quasi-experimental and experimental studies assessing whether learning in theatre improves self-concept and social skills**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Chandler (1973)	X	
Chandler, Greenspan and Barenboim (1973)	X	
DICE Consortium (2010)	X	
Schellenberg (2004)*	X	
Freeman, Sullivan, Fulton and Ray (2003)*		X

Note: The experimental studies are asterisked.

Theatre education and self-concept

We found four quasi-experimental and experimental studies assessing the effect of theatre education on self-concept (Table 9.11).

In a quasi-experimental study, Catterall (2007) studied children in an urban middle school in Los Angeles participating in a 24 week after-school drama programme in which they worked together to stage plays, and compared them to a matched group not participating. The research question was whether the drama students improved more than control students in self-esteem and in positive social interactions, including conflict resolution. Drama students gained significantly more than the control group in self-efficacy, as measured by questions such as "I make my own decisions", "I imagine being in control of my own life in the future", "I am patient in getting what I want". They also improved more than the control group in problem resolution skills, as measured by questions such as "I have found new ways to deal with my problems" and "I am good at figuring solutions to my problems".

In an experimental study, Warger and Kleman (1986) assessed the effects of drama education on positive self-concept in typical and atypical populations. They worked with four groups of 6-10 year-olds: typical children, behaviour disordered institutionalised children, behaviour disordered non-institutionalised children, and non-behaviour disordered, institutionalised children (institutionalised so they could be removed from unstable home environments). Each group was randomly assigned to 30-45 minutes per day of creative dramatics for two weeks, or to a control group that received no creative dramatics training. Creative drama refers to activites that involve enacting stories without the goal of creating a formal performance. For the most at risk group (behaviour disordered institutionalised children), drama training was associated with gains in self concept (as measured by the Piers-Harris Children's Self Concept Scale), a scale which assesses, through self-ratings, children's happiness, adjustment, anxiety, feelings about school, etc. The other groups were not differentially affected in self-concept by drama training.

In what we believe to be an experimental study (the methodology was not made explicit), Beales and Zemel (1990) assigned high school students to either a drama or visual arts group. Students in the drama group received 70 hours of in-class

dramatic activity, including role playing and improvisation; the authors provide no description of the art programme. No group differences in self-esteem were found after the programmes. Unfortunately the authors do not report whether students in both groups remained stable or grew in self-esteem. Thus we cannot tell whether neither kind of art class improved self-esteem or whether both improved self-esteem at an equal level.

In the experimental study discussed above in the section on social behaviour, Freeman, Sullivan, Fulton and Ray (2003) also assessed the effects of 40 minutes per week of drama instruction over 18 weeks on self-concept. No effects of theatre education on self-concept were found.

Table 9.11. **Four quasi-experimental and experimental studies assessing whether learning in theatre improves self-concept and social skills**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Catterall (2007)	X	
Warger and Kleman (1986)*		X
Beales and Zemel (1990)*		?
Freeman, Sullivan, Fulton and Ray (2003)*		X

Note: The experimental studies are asterisked.

The three experimental studies on this question reported no effects. We conclude that there is no clear evidence thus far that learning in theatre improves students' self-concept and social skills.

Theatre education and emotion regulation

Actors must have knowledge of and control over their emotions in order to portray a character's emotions on stage. Because actors must not show their own emotions on stage and must either replace or blend their emotions with those of their character, they have to be using emotion regulation strategies.

There are two major contemporary western acting theories. The "Technique" approach teaches actors to display emotions without feeling them. The "Method" approach, which originated with Stanislavski (1950) in Russia, asks actors to feel the emotions of their characters. These two approaches are likely to have very different effects on emotion regulation (and empathy) (Goldstein and Winner, 2010). Although Method actors spend far more time attempting to create emotions in themselves than do Technique actors, both Method and Technique actors must know and understand emotions in a way that non-actors do not have to. However, the strategies used would seem to differ depending on whether one is trained in Technique or Method.

Technique actors must use emotion regulation to mask their personal emotions. Because technique actors do not need to create emotion on stage, personal emotions may arise that are not helpful or congruous with the emotion of the character. Technique actors must be able to let the emotion "pass through them" (Mamet, 1997), to suppress any expression of the emotion, and to regulate themselves so that they can continue acting their character.

Method actors are trained to feel the emotions of the character so that they lose their own emotions and only feel those of the character. That is, the emotions of the character must become indistinguishable from the emotions of the actor. Many Method actors engage in memory exercises in which they recall and re-experience a previously felt emotion in order to bring up the appropriate emotion for a scene (Hagen and Frankel, 1973). This strategy is no different than the kind of emotion regulation technique psychologists refer to as attention deployment, in which one chooses something on which to focus in order to control one's emotions (Gross, 1998).

Several studies have used actors as an "expert" population, assuming that any emotion they create on cue is equivalent to emotions that arise spontaneously. These researchers have asked actors to "create" specific emotions in order to study the facial (Ekman, Levenson and Friesen, 1983), physiological (Futterman, Kemeny, Shapiro and Fahey, 1994), and neurological (Pelletier, Bouthillier, Levesque, Carrier, Breault, Paquette, Mensour, Leroux, Beaudion, Bourgouin and Beauregard, 2003) components of emotional processes.

We were able to locate one study examining the emotional development of adolescents involved in a theatrical show (Larson and Brown 2007). Larson and Brown reported that the adolescents' experiences with emotions in the context of acting helped them learn about regulating and understanding emotions in general. However, there was no control group comparison (and thus this study is not listed in Table 9.12 below), and results were attributed to the group leader's openness about emotions. The researchers did not examine how the process of creating a performance and acting in this performance might have brought about emotional development.

As described above in Box 9.2, Goldstein, Tamir and Winner (2012) conducted one correlational and one quasi-experimental study testing whether learning in theatre is associated with positive emotion regulation. Both of these studies showed a positive association between theatre training and positive emotion regulation, as summarised in Table 9.12.

The DICE study described in Box 9.3 also finds better stress control among theatre education students compared to the control group.

There is quasi-experimental evidence that theatre education fosters positive emotion regulation, but this is based on only otwo studies. Clearly more research is called for.

Table 9.12. **Three studies assessing whether learning in theatre improves emotion regulation**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
DICE Consortium (2010)*	X	
Goldstein, Tamir and Winner (2012), Study 1	X	
Goldstein, Tamir and Winner (2012), Study 2 *	X	

Note: The asterisked studies are quasi-experimental. The "Study 1" is correlational.

Theatre education and empathy

Empathy is to be distinguished from perspective taking. While perspective taking involves understanding what others are thinking and feeling, empathy entails the taking on of others feelings – feeling joy in others' joy, sorrow in others' pain. As mentioned earlier, empathy is a centrally important human ability that makes possible understanding among people.

Adult actors

Although many researchers have suggested that acting training should lead to increases in empathy (Levy, 1997; Metcalf, 1931; Verducci, 2000), there has been little empirical investigation into this question. Two studies with adult actors have shown higher levels of empathy in actors than non-actors. One unpublished dissertation examined whether adults involved in acting had high empathy levels (Collum, 1976). In this study, empathy was assessed by the Hogan Empathy Scale (Hogan, 1969), a self-report measure that defines empathy (erroneously, in our view) as an intellectual understanding of another's mind without the experience of that person's feelings (Hogan, 1969). This scale includes items measuring far more than empathy: social confidence (e.g. "I usually take an active part in the entertainment at parties"), emotion regulation (e.g. "I am usually calm and not easily upset"), emotional sensitivity (e.g. "I have tried my hand at poetry"), and nonconformity (e.g.`"It is the duty of a citizen to support his country, right or wrong"), as well as what would normally be considered empathy (e.g. "I easily become impatient with people"). Eighty-three professional actors, MFA students in acting at the University of Florida, and undergraduate theatre majors were compared to a group of 24 non-theatre majors at the university.

Actors scored significantly higher on this measure than did non-actors. However, empathy scores declined with age in professional actors, with those professional actors who had worked the most as actors in the previous year showing the lowest overall levels of empathy within the actor population. Actors who made 100% of their previous year's income from acting actually had negative correlations with their empathy scores. Collum (1976) hypothesised that actors are drawn to acting

because of underlying higher levels of empathy. However, as an actor becomes more involved in the business of professional acting, the harsh difficulties of living one's life in the theatre may lead to a decline in empathy.

More recently, using Baron-Cohen and Wheelwright's (2004) Empathising Quotient (EQ), Nettle (2006) found that professional actors scored higher than a control group on this measure of empathy. Nettle hypothesised that acting attracts people with high empathy to begin with, rather than fostering growth in empathy as a function of acting experience.

Correlational and quasi-experimental studies

We found two studies investigating the effect of acting training on children and adolescents, one correlational and one quasi-experimental, summarised in Table 9.13.

Goldstein, Wu and Winner (2009-2010) (study described earlier) found that students studying acting in high school scored higher on self-report standard empathy scales than students not majoring in acting. However, this was only a moderate correlational finding. In Study 2 they report that college students majoring in acting had the same level of empathy as those majoring in psychology.

In the longitudinal study described earlier, Goldstein and Winner (2010) found that after one year of training, both children and adolescents in acting classes increased their empathy above and beyond both children and adolescents involved in the other arts classes.

Table 9.13. **Two studies assessing whether learning in theatre improves empathy**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Goldstein, Wu and Winner (2009-2010)		X
Goldstein and Winner (2012)*	X	

Note: The asterisked study is quasi-experimental. The other one is correlational.

While more research is called for, we conclude here that there is a small amount of evidence supporting the hypothesis that theatre training improves empathy.

Theatre education and perspective taking

Actors must be able to grasp subtle aspects of their character's intentions, desires, motivations, beliefs, and emotions in order to create a realistic portrayal of a complex human on stage or screen. This "cold" understanding of the character's

mental states is what allows the actor to adopt the perspective of the character and see the world through the character's eyes. We use the term "cold" because one can understand another's mental states, including feeling states, without oneself experiencing the other's emotions. In the psychological literature, this is referred to having a "theory of mind" (see Wellman, Cross and Watson, 2001), "mentalising" (Morton, Frith and Leslie, 1991), "mind reading" (Whiten, 1991), or "social intelligence" (Baron-Cohen, Jolliffe, Mortimore and Robertson, 1997), all of which we refer to below by the umbrella term "theory of mind". Having a good theory of mind is critically important in a wide variety of professions where it pays to understand others and be able to predict their behaviour: clinical psychologists, teachers, lawyers, and leaders are all likely to be more successful if equipped with a strong theory of mind.

Table 9.14. **Six studies assessing whether learning in theatre improves perspective taking**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Chandler (1973)**	X	
Chandler, Greenspan and Barenboim (1974)**	X	
DICE Consortium*	X	
Goldstein, Wu and Winner (2009-2010)	X	
Goldstein and Winner (2012): Adolescents*	X	
Goldstein and Winner (2012): Children*		X

Note: The experimental studies are double asterisked and the quasi-experimental studies are asterisked.

We located five studies assessing the relationship between learning in theatre and perspective taking, summarised in Table 9.14.

In the two studies by Chandler described in the section above on theatre and social behaviour (Chandler, 1973; Chandler, Greenspan and Barenboim, 1974), role playing was shown not only to improve problem behaviour but also to improve perspective taking.

Goldstein, Wu and Winner (2009-2010) administered the *Reading the Mind in the Eyes* test to two groups of adolescents aged 14-17. One group was involved in acting training intensively at an independent arts high school or through extracurricular theatre at their public high school. The acting group was compared to a group of adolescents not involved in theatre. The *Reading the Mind in the Eyes* test is a measure of perspective taking (called a theory of mind task) (Baron-Cohen, Wheelwright, Hill, Raste and Plumb, 2001). Participants are shown pictures of faces, like the sample item in Figure 9.1, with only the eyes showing, and they are asked to select from four choices the label that best describes what the person is feeling. This is a difficult test on which improvement is seen throughout adolescence, and even adults do not score

perfectly. Individuals with Asperger's syndrome and autism perform poorly on this test, as they have difficulty understanding others. Dysphoric adolescents show higher levels of performance than do those without dysphoria (Harkness, Sabbagh, Jacobson, Chowdrey and Chen, 2005). High levels of perceptual theory of mind in depression may be due to the kind of ruminative introspection that so often accompanies depression (Nolen-Hoeksema, Morrow and Fredrickson, 1993). Adults readers of fiction score higher than those who prefer nonfiction (Mar, Oatley, Hirsch, de la Paz and Peterson, 2006), probably due to the kind of interaction with, and comprehension of characters, which occurs when one reads fiction deeply. Students also completed a control test of visual memory not predicted to be associated with acting experience.

Figure 9.1. **Sample item from reading the mind in the eyes test**

apologetic friendly

uneasy* dispirited

Note: The correct choice is asterisked.

Source: Baron-Cohen et al. (2001).

As hypothesised, adolescents involved in theatre showed advantages on the *Reading the Mind in the Eyes* test, but not on visual memory. This skill may have been developed by the training these students received: acting students in the United States are taught to think deeply about characters' mental states; and they are taught to think about how to convey cognitive and emotional states through their facial expressions. Experience understanding and then showing emotion may then lead to the ability to recognise emotion. Goldstein, Wu and Winner (2009-2010) then administered the *Movie for the Assessment of Social Cognition* to a group of university students studying theatre. This is a series of short scenes in which the participants must judge the mental states behind the actions of the characters in the scenes. The authors found that students studying theatre scored higher than students studying psychology.

The study by Goldstein, Wu and Winner (2009-10) is correlational and cannot tell us whether skill in theory of mind is a preexisting ability that draws students to acting, or whether acting training actually develops this skill. To answer this question about causality, Goldstein and Winner (2012) conducted a quasi-experimental longitudinal study comparing two age groups of children involved in acting over a year. They compared a group of 8-10 year olds receiving after school acting classes to a matched age group receiving drawing lessons, and a group of 13-16 year olds majoring in acting at an arts high school to a matched age group majoring in another art form. Various measures of theory of mind were administered before and after a year of theatre/other arts instruction. The 8-10 year olds were given the *Reading the Mind in the Eyes* test, and two tasks assessing understanding of story characters' motivations. The adolescents were also given the *Empathic Accuracy Paradigm* (Ickes, 2001). Here participants view a film which is stopped at various points and they must identify the mental state of the filmed character at each point. This test assesses the ability to infer a person's mental states from moment to moment as that person interacts with another. Unlike the *Reading the Mind in the Eyes* test, this measure assesses the ability to process dynamic cues and is a highly ecologically valid, naturalistic measure of theory of mind. The most dramatic results were revealed by the *Empathic Accuracy Paradigm*: after 10 months, the adolescents receiving acting training improved significantly more than the control group on this measure. No improvements were found on theory of mind measures in the younger age group; and no improvements were found on the other measures for the older group. Nonetheless, the most ecologically valid measure of understanding others did prove sensitive to the effects of acting training. It is possible that the younger group did not improve because the acting training they received was far less intense than that received by the older group. In addition, a qualitative analysis of the teaching at each age group revealed more explicit instruction in perspective taking at the older age group. It is important to note that perspective taking was not increased in the control population who received music or visual arts training.

The DICE study described in Box 9.3 also finds that students taking theatre programmes improved more their perspective taking than students not studying theatre (DICE Consortium, 2010).

There is mounting evidence that learning in theatre helps children to adopt the perspectives of others, and hence increases psychological understanding of others mental states.

Dance education and social outcomes

Dance education and self-concept

Adult dancers

Two correlational studies of adult dancers show an inconsistent picture of the relationship between self-concept and dancing. Carter (2005) reported that dancers

have higher levels of self-concept than do non-dancers. Bettle (2001) reported that dancers have lower body esteem than do non-dancers. What do we know about children involved in dance?

Quasi-experimental and experimental studies

We found one quasi-experimental and two experimental studies testing whether involvement in dance improves self-concept or self-efficacy (Table 9.15).

Seham (1997) reported no relationship between dance involvement and self-assessed competence. Eighty-seven at risk US children, 99% from a racial minority, in fourth and fifth grade (9 and 10 years old) were assigned to either dance or no intervention. Students rated their own competence, and the dance and non-dance group did not differ over the course of the dance training.

In Korea, Lee (2007) randomly assigned 82 first-year middle school female students to two dance and non-dance classes in two schools: students in the dance group significanctly outperformed the non-dance group in terms of self-reported educational self-efficacy. While there was no difference in academic interest, the dance group improved more in confidence and self-control than the non-dance group. Another experiment involving 200 female first-year high school students in Suwan (Korea) compared two randomly assigned groups: a creative dance programme vs. traditional physical education (Lee, 2006). The dance group had a higher score in self-reported self-concept (general, social and emotional), but as there was no pre-test it is difficult to assess whether there was any difference in the growth.

Table 9.15. **Three quasi-experimental or experimental studies assessing effects of dance education on self-concept**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Lee (2006)*	X	
Lee (2007)*	X	
Seham (1997)		X

Note: The experimental studies are asterisked.

The evidence on the relationship between dance education and self-concept is too weak and inconsistent to yield any conclusions.

Dance education and social skills

Quasi-experimental studies

We identified three quasi-experimental studies assessing the effects of dance education on social competence, summarised in Table 9.16, and both report positive effects for atypical populations.

Greer-Paglia (2006) showed that dance education can improve social competence in non-verbal autistic children. Children with autism participating in dance classes were compared to those participating in "circle time" – an activity with the goal of increasing social competence. Verbal students with autism initially demonstrated a higher level of social competence in the circle-time condition, but improved at a slightly faster rate in the creative dance condition on average, while nonverbal students performed similarly in each condition at first, but also improved at a faster rate in the dance condition on average. The performance gap in social competence between verbal and nonverbal students with autism was smaller in the creative dance condition than in the circle-time condition.

Koshland, Wittaker and Wilson (2004) showed that dance education can reduce aggressive behaviour in low SES (primarily Hispanic) children in a US public school. Children in first, second and third grade classes received 12 consecutive weeks of dance and were compared to older children (fourth, fifth and sixth grade students) who had not received any dance training. As reported by observers, there was a decrease in aggressive behaviours in the (younger) dance group, but no corresponding increase in prosocial behaviours. The report does not make clear whether the decrease in aggression was significantly greater than the somewhat smaller decrease in aggression shown in the control group.

Kim (2001) assigned 60 primary school students to a control group with no treatment and an experimental group taught the "Creative Dancing Learning Program" for 18 4-hour classes during 6 weeks. The dance group showed bigger improvements in self-reported perseverance, attention, positive attitude and partnership, which were recognised as key skills underpinning sociability for first graders.

Table 9.16. **Three quasi-experimental studies assessing whether learning in dance improves social competence**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Greer-Paglia (2006)	X	
Kim (2001)	X	
Koshland et al. (2006)	X	

Experimental studies

We identified two experimental studies assessing the effects of dance education on social competence, summarised in Table 9.17.

Lobo (2006) showed that dance education improved social skills of preschool aged children from low socio-economic background (enrolled in a Head Start programme). Children between the ages of 39-62 months were randomly assigned to either a control group or a dance group, and were tested before and after eight weeks.

Lee (2007) also found that dance education improved the social skills of female first-year middle school students in Korea, with higher growth in the levels of cooperative ability, sympathy, self-control and persistence.

Table 9.17. **Two experimental studies assessing whether learning in dance improves social competence**

Study	Positive findings	Negative or inconslusive or Inconsitent findings
Lee (2007)	X	
Lobo (2006)	X	

The few studies examining the effects of dance on social skills suggest a positive impact for some elementary and secondary school students, but also for non-verbal autistic students and for students from low socio-economic background, pointing to possibly different impacts for different sub-populations. However, few of these studies compared the effects of dance to some other form of treatment. Before we assume that the effects are due to dance education rather than to any special kind of new programme, we need more studies comparing the effects of dance vs. other kinds of arts and non-arts interventions on social skills. We also need more comparable studies. Still, the above reported effects are promising.

Social skills outcomes of arts education: Conclusions

Evidence that any form of arts education improves social skills for children is weak. By social skills or social outcomes, we refer to children's self-esteem, their ability to communicate and get along with others, their empathy for others, their ability to discern what others are thinking and feeling (perspective taking), their ability to regulate their emotions by expressing themselves rather than suppressing their emotions.

The area of most promise is theatre: there is some initial evidence that theatre education improves empathy, perspective taking, and emotion regulation. This is a very plausible finding, since theatre education asks children to step into the shoes of others, feel their feelings, and understand their mental states. In addition, theatre education teaches children to express emotions. In a way, this could be seen as a case of near transfer. But more research is needed before we can draw firm conclusions about the power of theatre to affect these very important kinds of social skills.

Another area to explore further is the differentiated impact of different types of training or art forms for different groups of students as several studies found an effect in atypical populations.

Notes

1. *www.boston.com/ae/music/articles/2010/07/11/there_is_magic_in_the_music/*.
2. *www.boston.com/lifestyle/family/articles/2010/07/18/inspired_by_a_venezuelan_music_program_two_prepare_to_bring_its_benefits_to_boston_kids/*.
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Chapter 10

Brain outcomes of arts education

In this chapter we discuss how a growing body of neuroscientific research explores the links between arts education and brain outcomes. We give a few examples of the types of research carried out but argue that brain stimulation or changes are not a good outcome per se, which is why we have decided to present the findings of this important research body in the other chapters, according to outcomes that we consider as more meaningful.

It is well established that the brains of trained musicians differ both structurally (anatomically) and functionally (in terms of areas activated by music) from the brains of non-musicians (e.g. Jäncke, 2006; Schlaug, 2001). These differences are most likely not inborn but rather caused by the work of learning an instrument because these differences are found most sharply in children who begin instrumental training at an early age (Amunts et al., 1997; Elbert et al., 1995; Jäncke, 2008; Jäncke et al., 1997; Lotze et al., 2003; Schlaug et al., 1995a,b).

Functional differences between the brains of visual artists and non-artists when making or imagining making art have been reported by Belkofer (2008) and by Bhattacharya and Petsche (2005). And functional differences between the brains of dancers and non-dancers when responding to dance (Calvo-Merino, Glaser, Grezes, Passingham and Haggard, 2005), thinking about creating a dance (Fink et al., 2009), and actually doing simple dance steps (Brown et al, 2006) have been reported (see also Grafton and Cross, 2008).

In this book we have reported brain outcomes of arts education where relevant and when these have been associated with behavioural (cognitive) outcomes. Thus we described studies showing that music training alters the brain stem response to

sound. We do not provide a separate analysis on brain outcomes as we believe that brain outcomes are most clearly understood when they are discussed in terms of the cognitive/behavioural outcomes with which they are associated.

Advocates for arts education have sometimes pointed to these kinds of findings as proof of the importance of arts education. For example, in his 2001 book entitled *Arts with the Brain in Mind*, one of the arguments that the author Eric Jensen makes for the centrality of the arts in education is that the arts are "brain based," which appears to mean that we can identify areas in the brain that respond selectively to specific art forms. But of course everything we do activates certain areas of the brain. The claim that, for example, music activates just about all areas of the brain (Levitin, 2006, 2008) or even increases the volume in some areas of the brain cannot be a justification for teaching music in schools since everything that we do and learn changes the brain. For example, the brains of London taxi drivers have been found to be enlarged in an area important for spatial representation (Maguire et al., 2000), and three months of training in juggling has been shown to lead to growth in areas associated with processing complex visual motion (Draganski et al., 2004).

These findings contradict the traditional view that brain plasticity in adulthood occurs only functionally but not anatomically. We now know that adult brains change structurally in response to learning. A study of the effects of instrumental music training in childhood showed that after 15 months of lessons, children (who entered the study between the ages of 5 and 7) showed structural (and not just functional) brain changes that correlated with changes in both music perception and hand motor skills (Hyde et al., 2009).

Since all learning changes the brain, the important question to ask about arts education and the brain is not whether art education changes the brain. Of course it does. The question to ask, if we are interested in the question of transfer, is whether arts education alters the brain in a way that makes learning of another non-arts kind of skill more possible. Stimulation of the brain is not *per se* an argument for an activity: we must show that the particular kind of brain activation in question is associated with an outcome that we value (Croft, 2009). Hence our decision to present studies of brain outcomes along with the studies of skills that they subserve.

In Box 10.1, we present a summary of music studies with brain outcomes (some of which were mentioned in earlier chapters because they also has cognitive outcomes).

Studies of the effects of other forms of arts training on the brain remain to be conducted. The music-brain studies described suggest that instrumental training affects areas of the brain involved in speech perception, auditory working memory, executive functioning, and attention. Most of these studies are correlational, however; experimental studies need to be conducted to determine whether these children and adults had atypical brains to begin with, or whether, as is more likely, their brains were shaped by music training.

Box 10.1. **Music and brain outcomes: A few examples**

There is a growing body of neuroscientific literature on music training and brain outcomes. Here we offer a few examples of these studies to give the reader an idea of this literature.

Instrumental music training is correlated with enhanced brain activity in the left supramarginal gyrus, a region involved in phonological working memory (Ellis, Bruijn, Norton, Winner and Schlaug, 2013). This suggests that music training strengthens auditory working memory. However, we cannot conclude a causal relationship since the study was correlational rather than experimental.

Children with music training have a stronger brain response than those without training to pitch patterns in their native language (Besson, 2007). A stronger brain response means there is likely to be a stronger behavioural response to pitch patterns; a stronger behavioural response means means greater sensitivity to pitch patterns.

Musically trained children show a stronger event related potentials (ERP) brain response to both music and language violations than do those without training (Jentschke, Koelsch and Friederici, 2005).

Instrumentally trained children have a stronger electrical brain response to irregularities of syntax in both language and music than do non-musically trained children (Jentschke and Koelsch, 2009).

When exposed to speech, the brain stem response in adult musicians corresponds more directly to the pitch cues than we see in the brain stem response of non-musicians (Parbery-Clark, Skoe, and Kraus, 2009). This implies that the musicians should have a greater sensitivity to pitch in speech.

Violin training affected a brain outcome known to be associated with attention (Fujioka et al., 2006, as described in Box 3.7).

A kind of neural response seen in children who have had at least one year of music lessons is associated with stronger executive functions of attention and memory (Shahin et al., 2008).

After 20 days of interactive computerised music training given to 4-6 year old children (compared to 20 days of interactive computerised visual arts training, each randomly assigned), children in the music but not the visual arts group improved significantly on an executive function task assessing level of control and attention, and there was a positive correlation between performance on the changes in functional brain plasticity related to executive function (Moreno, Bialystok, Barac, Schellenberg, Cepeda and Ghau (2011).

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Chapter 11

Why arts education? Summary and conclusions

In this concluding chapter, we summarise the methodology and main findings of the report, propose an agenda for future research and explore some policy implications of our findings. The first section sets the policy context and gives a brief overview of the skills needed in innovation-driven societies. The second section presents the main findings of our review of the impact of arts education. The third section suggests an agenda for future research on arts education. And the final section argues that the main contribution of arts education to innovation societies lies in its development of broad habits of mind. We conclude by arguing that the value of the arts for human experience is a sufficient reason to justify its presence in school curricula.

One of the key messages of the OECD Innovation Strategy is to "empower people to innovate" (OECD, 2010). How does arts education contribute to this agenda? In this concluding chapter, we summarise the methodology and main findings of the report, propose an agenda for future research and explore some policy implications of our findings. We begin by setting the policy context and providing a brief overview of the skills needed in innovation-driven societies. We then summarise the main findings of our review of the impact of arts education. Next we propose an agenda for future research on arts education, followed by a policy agenda. A key argument we make is that the main contribution of arts education to innovation societies lies in its development of broad and important habits of mind. We conclude by arguing that the value of the arts for human experience is a sufficient reason to justify its presence in school curricula whether or not transfer results from arts education.

Skills and education for innovation

A shared feeling across countries that education systems are not delivering the skills needed for the post-industrial and globalised economies of the 21st century has led several groups and initiatives to seek to identify these skills. The European Commission has identified eight "key competences" for tomorrow's world. Initiatives such as the New Commission on The Skills of the American Workforce, the Partnership for 21st Century Skills and the Assessment & Teaching of 21st Century Skills (AT21CS) have also done the same under the label of "21st century skills". Finally, the OECD Skills Strategy (OECD, 2012) and the OECD Innovation Strategy (OECD, 2010) have emphasised, among other things, the importance of fostering individual skills that allow countries to compete in an increasingly knowledge-based society, in which innovation is critical to future growth and wellbeing.

The study of innovation in the economy has allowed us to identify some skill requirements for innovation societies. Some of the main findings are the following. First, innovation requires a more intense use of all skills in the workplace at the individual level. Recent innovation has also led to more demand for tertiary educated graduates in most OECD countries. Second, innovation requires a good framework of lifelong learning and continuous training. As innovation incurs "creative destruction," people have to retrain, and we know that a certain level of initial education and basic skills is important for this to happen. Moreover, there is evidence that companies offering more training and learning opportunities to their employees are more strongly associated with lead innovation than are companies offering fewer such opportunities.

A close look at the composition of the workforce involved in innovation reveals that innovation relies on a broad mix of skills, as measured by professional and academic qualifications. Keeping in mind the variety of innovation processes and sectors that we have in all countries, this is not surprising. Several types of people drive innovation: scientists and developers, entrepreneurs, practitioners, and users. Moreover, innovation takes several forms, typically categorised as innovation in product, process, organisation, and marketing method. Finally, and perhaps more importantly, innovation in different sectors and activities requires different mixes of skills: thus for example, innovation in the financial market requires a different set of qualifications and skills than does innovation in the mobile phone market.

While we know we may need *more* skills in the future, we cannot define precisely what kind of skill mix is required for more innovation at the country level. As education policy makers reconsider the mission of our education systems, the objective of equipping every individual with "skills for innovation" appears as a conservative approach. We define these skills as three sets of overlapping skills:

technical skills (content and procedural knowledge); skills in thinking and creativity (questioning ideas, finding problems, understanding the limits of knowledge, making connections, imagining); and behavioural and social skills (persistence, self-confidence, collaboration, communication). One aim of teaching is to develop these three sets of skills simultaneously, and thus to go beyond the technical skills in some disciplines which are generally emphasised in school examinations and tests.

How to do it in practice? Education stakeholders face this important question when redesigning school curricula and reviewing the teaching and learning that will best prepare students for tomorrow's life. Because great scientists, artists and entrepreneurs represent role models for innovation, arts education, science education and entrepreneurship education are often presented as privileged vehicles to foster these skills. What does the research evidence tell us about the impact of arts education on various kinds of non-arts skills?

A new review on the impact of arts education

Arts education is often said to be a means of developing critical and creative thinking. It has also been argued to develop skills that enhance performance in non-arts academic subjects such as mathematics, science, reading and writing, and to strengthen students' academic motivation, self-confidence, and ability to communicate and cooperate effectively. Arts education has thus often been assumed to have a positive impact on the three subsets of skills that we define as "skills for innovation": technical skills, including in some non-arts subjects; skills in thinking and creativity; and behavioural and social skills (or character).

In this report, we have examined in detail the state of empirical knowledge about the impact of arts education on these kinds of outcomes. The kinds of arts education examined include arts classes in school (classes in music, visual arts, theatre, and dance), arts integrated classes (where the arts are taught as a support for an academic subject), and arts study undertaken outside of school (e.g. private, individualised instrumental music lessons; out of school classes in theatre, visual arts, and dance). The report does not deal with education *about* the arts or cultural education.

Our report updates and extends to behavioural and social skills the meta-analyses published in 2000 by the "Reviewing Education and the Arts Project" (REAP) directed by Hetland and Winner (2000). In addition to studies already reviewed in the REAP project, this new enquiry involves the systematic investigation of research databases in education and psychology in the following languages: Dutch, English, Finnish, French, German, Italian, Japanese, Korean, Portuguese, Spanish and Swedish. It attempts to cover all empirical studies published at least since the 1980s, and makes fresh use of studies unearthed in former meta-analyses (from 1950 on).

Using these international data bases, we have reviewed what is known about the possible impact of the main forms of arts education on the three categories of skills for innovation presented above. We examine verbal, mathematical and spatial skills; creativity; academic motivation; and social skills including self-confidence, empathy, perspective taking, emotion regulation. Neuroscientific literature relating to arts education was also examined.

While our interest is mainly in the skills developed by school-based arts education, our review builds on research approaching the question from a "transfer" perspective. Many reviewed studies investigate whether arts education has an impact on test scores or school marks in other academic subjects. Some of these studies also try to identify the skills that lead to "transfer" and allow us to assess more directly the non-arts skills developed by various forms of arts education. The studies reviewed also include those assessing the impact of arts education on creativity, social skills or behavioural skills, even though the measures of these outcomes could still be improved.

Our report distinguishes firmly between correlational studies (from which one can make no causal conclusions), quasi-experimental studies (which do not rely on random assignment, and thus their causal inferences can generally not be conclusive), and the few true experimental studies on these topics (which randomly assign students to arts vs. no-arts "treatments," and from which causal inferences can be drawn). The report also distinguishes between cross-sectional and longitudinal studies (following the same students over time), the latter often producing stronger evidence than the former.

The main results to emerge from this study are summarised below.

Arts education and academic skills in non-arts subjects

Multi-arts education. An extensive body of correlational data in the United States reveals that students who participate in a large number of arts courses (these studies do not specify type of arts courses and are likely to be a mixture of kinds of arts courses) have higher educational attainment levels (as measured by grades in school and scores on verbal and mathematical standardised tests) than do those who take fewer or no arts courses, and one study showed that this relationship exists for students at both the high and low ends of the socio-economic spectrum. These correlational findings should not be taken as showing that the arts courses *cause* the higher educational attainment. Plausible non-causal explanations cannot be ruled out: students who excel academically and who study the arts may come from families that value both academics and the arts, or attend schools that stress both; and good scores or educational ability no doubt have a positive influence on whether students receive arts education because, for example, those proficient at school may have more time to spend on the arts activities, or may be more encouraged to study the arts by their teachers or parents. It is notable that a study in the United Kingdom found the reverse: students in the arts track performed less

well on their national exams than did those in the academic track – pointing to the importance of considering the kinds of students who self-select into the arts (Harland, Kinder, Haynes and Schagen, 1998). A handful of multi-arts experimental (non-correlational) studies examining the causal effect of arts classes on educational attainment do not show a significant causal impact, and there is no clear theoretical reason to expect future studies to do so.

Music. Music education strengthens IQ (intelligence quotient), academic performance, phonological skills, and the ability to hear speech in a noisy environment, and there is preliminary evidence that music education might facilitate foreign language learning. There are at least two mechanisms at play which could explain these results. Music may improve verbal skills (including reading, writing, and foreign language learning) via its facilitation of auditory skills. And music may stimulate IQ and academic performance because music education is a school-like activity and thus may train school-like skills of concentration and reading of notation, which in turn could elevate IQ.

While there are a number of studies showing a positive impact of music education on visual-spatial reasoning, the sole longitudinal study on this question detected no persistent influence after three years of music, which suggests the need for caution. There is also no evidence yet that music education has any causal impact on mathematics scores, even though music has an underlying mathematical structure.

Theatre. Strong evidence shows that theatre education in the form of enacting stories in the classroom (classroom drama) strengthens verbal skills, but there is no evidence for a link between theatre training and general academic skills.

Visual arts. While there is no evidence that training in visual arts improves verbal or mathematical academic skills, two new correlational studies reveal that students who study the visual arts are stronger in geometrical reasoning than students who do not study the visual arts. However, causality has yet to be established. And one experimental study found that learning to look closely at works of visual art seems to improve skills in observing scientific images – a typical instance of close skills transfer.

Dance. Some studies show that instruction in dance improves visual-spatial skills as measured by paper and pencil tests, but such studies are still too few in number to be conclusive. We found no evidence that dance education improves verbal or mathematical academic skills.

Arts education and skills in thinking and creativity

Everyone associates art with creativity. There are a few studies linking enhanced creativity with theatre and dance education, but the limited number of studies and statistical power of the positive evidence does not allow us to generalise this finding. Research on multi-arts education has not clearly demonstrated a causal impact on student creativity and problem solving.

One possible reason for the weak evidence on this question is the limited way in which creativity has been measured – using "domain-general" tests such as the Torrance Tests of Creativity (in which students must for example come up with original uses for common objects, or title pictures in unusual ways). Another reason for the lack of a strong demonstrated link between arts education and creativity is that anything can be taught so as to stimulate creativity and imagination, and anything can also be taught in a deadening way. Thus, a science class – indeed, a class in any subject – can teach creativity and imagination if well-taught; and an art class can leave creativity and imagination untouched if poorly taught. It is possible that, even in art, these skills are only developed very deliberately. It is also possible that students who gain expertise in an art form develop creative abilities in that art form but that this new creativity does not spill over into other domains. Studies assessing domain-specific creativity (i.e. creative thinking in music as a function of music instruction) remain to be carried out.

Though we did not find any empirical study that aimed to assess the impact of arts education on critical thinking, such a study is called for in light of the fact that Hetland, Winner, Veenema and Sheridan (2013) showed that visual arts teachers at their best aim to promote reflection and meta-cognition. It seems highly plausible that other forms of arts education do the same if teachers expect students to evaluate their own works and those of their peers and to talk about their working process.

Arts education and social and behavioural skills

Arts education is often viewed by public policy makers and educators as a means of getting students to enjoy school and motivate them for learning in other academic subjects. Empirical studies show that students enrolled in arts education courses display a more ambitious attitude to academic work as well as higher levels of commitment and motivation. Commitment and motivation are generally measured by higher school attendance, lower dropout rates, and observed or self-reported attitudes such as persistence, being "on task", interest, etc. However, these studies are correlational and thus do not allow the conclusion that arts education is what motivates students. Possible non-causal explanations exist: for example, students taking the arts may attend schools that are better all around and thus more motivating; or students who self-select into the arts may be more motivated to begin with. Experimental studies are called for.

There is also no more than tentative evidence regarding the impact of arts education in its various forms on other behavioural and social skills, such as self-confidence, self-concept, skills in communication and cooperation, empathy, perspective taking and the ability to regulate one's emotions by expressing rather than suppressing them. Initial evidence concerned with education in dramatic

art appears the most promising, with a few studies revealing that drama classes enhance empathy, perspective taking, and emotion regulation – plausible findings given the nature of such education.

Because motivation can have so many different drivers, and is often measured by indicators such as dropout rates or absenteeism that are distant from the arts education exposure, we must be cautious in making causal links from arts education to motivation. We do not suggest that arts education has no causal impact on student motivation. Rather, our research frameworks are too broad as of now to capture this causal impact if it exists. Moreover, it is difficult to imagine why arts education per se would motivate students more than would other subjects. It seems more likely that students are motivated by what they enjoy, and what they enjoy differs across individuals. To the extent that arts education might be particularly motivating for all students, this effect may come from factors *associated* with arts education. For example, particularly engaging pedagogies may be more often used in arts classes than in other subjects; infusing the arts might change the school culture and make the culture more inquiry based, which in turn could lead to better motivational outcomes; students might enjoy arts courses more than other courses because they are "low stakes," or because they do not have right and wrong answers, and this enjoyment might eventually change their relation to schooling and school learning; or finally, students might notice that their peers value the arts, which could then raise their own engagement.

All of these assumptions would be consistent with the possibility that arts education leads to heightened student motivation. One would simply have to argue that arts education is motivating as a function of the complex bundle of factors associated with such education. Researchers will then need to unpack the complex factors and conditions under which arts education has this causal effect so that they can better understand the variability of its outcomes under different circumstances. Should a causal link between arts education and motivation be ascertained in a given historical and socio-cultural context, decision makers could make use of this information, noting all the while that there are likely numerous factors mediating the relationship between arts education and student motivation. In short, arts education is a complex "treatment" and it is useful to know whether it leads to positive outcomes even if we do not know which of its ingredients, or which mediating factors, are actually causing the outcomes.

Conclusions

This systematic overview of the research provides the basis for a clear and qualified response to the initial research questions. The report shows that learning certain forms of arts instruction does indeed have an impact on the development

of very specific skills, as summarised above. The body of empirical research does not cover all skills of interest though – far from it. The kinds of learning that occur in particular art forms shape the kinds of skills that spill over into other areas. Thus, music learning involves auditory training, and music learning "spills over" into skill in speech perception; music learning is highly school-like, involving discipline and practice and notation reading, and spills over into the domain of academic performance; theatre involves character analysis and spills over into skill in understanding the perspectives of others.

Evidence of any impact of arts learning on creativity and critical thinking, or on behavioural and social skills, remains largely inconclusive, partly because of an insufficient volume of experimental research on these matters and also because of the difficulty of adequately measuring these skills.

An agenda for further research

Based on our systematic overview of the extant empirical research since 1950, we have identified some methodological and theoretical weaknesses that need to be addressed in order to improve our knowledge of the development of skills for innovation through arts education. It is noteworthy that the relative quantity of empirical studies on arts education is limited: we found about 510 results for 39 types of outcomes monitored, which means about 13 studies per outcome on average. Considering the scope of our review, this is not much. For many outcomes, there are no more than 2 or 3 studies available. Research on arts education represents only a tiny share of educational research.

Beyond a call for more empirical research on arts education, our state of the art of existing research nonetheless allows us to suggest some research priorities for the coming decade. One priority is to use and to develop better methodologies for impact studies. The second priority, even more important, is to develop sound and testable theories about why and how arts education would have an impact on various outcomes of interest.

Methodological improvements

Some methodological caveats in the arts education transfer studies thus far would need to be addressed in future research. While there are many correlational findings showing that children who study the arts do better in school than those who do not, there are few true experimental studies (with random assignment to an arts intervention vs. some kind of non-arts intervention) testing whether studying the arts actually causes some non-arts outcome to improve.

There are some quasi-experimental studies (with a control group but without any random assignment) showing that students self-selecting into an arts infused kind of school improve more on some academic measure than do students selecting into a non-arts infused school. But then we are comparing schools that differ on a whole host of dimensions, not just on the presence of the arts. In addition, we have the problem of self-selection, leading to the likelihood of students in the two schools differing from the start. These concerns limit our ability to conclude anything about the causal impact of arts education.

The most convincing way to demonstrate that the arts cause academic improvement is to randomly assign children to an arts infused school vs. another identical school without arts infusion, and to track their progress over time. Moreover, to avoid confusing an effect of the arts with the so called Hawthorne effect (i.e. the effect of any kind of intervention, equivalent to the placebo effect in medical science), the students assigned to the non-arts school need to be assigned to a school that provides another kind of special treatment (e.g a focus on globalisation, sports, chess, or technology, etc.) so that we can disentangle effects due to the arts vs. due to any kind of new programme. This kind of study is exceedingly difficult to do, which is perhaps why it has not been done.

Another approach that is more feasible that also meets the requirements of random assignment is to randomly assign classrooms to treatments. Thus, one might find 30 schools, each of which have two classes of students at the same age which show no systematic differences in the distribution of student IQ or academic achievement. One could then assign arts instruction to one class and some kind of non-arts instruction to the other class. Each class would be assessed on the outcome of interest at pre-test (e.g. beginning of the year) and post-test (e.g. end of year). Ideally there should be no systematic difference in the distribution of scores between treatment and control classes at pre-test. If the classes assigned to the arts show significantly greater improvement on the outcome of interest, we can conclude that the arts instruction is causing the change in outcome. Because these kinds of random assignment experimental studies have been carried out very minimally, the question of the impact of arts education on different subsets of skills for innovation has not yet been adequately tested.

A third approach that is even more feasible is to continue to conduct correlational studies but to rigourously control for all possible confounding variables such as initial IQ, socio-economic status, academic achievement, and family valuing of arts and of academic achievement. None of the identified correlational studies controlled for all such variables.

Box 11.1. Suggested areas of research focus on the impact of arts education

Based on our review of the research literature on the impact of arts education on a variety of non-arts skills, we recommend developing further research projects on studies that:

- Examine the kinds of habits of mind developed in the arts. Such research is really the first step towards good research on transfer.
- Search for plausible links between specific arts and specific non-arts skills and subject matters. It may be more reasonable to expect transfer from the arts to higher-order cognition (reflection, critical thinking, creative thinking, ability to tolerate ambiguity) than to more basic skills such as verbal and mathematical performance on standardised tests (Perkins, 2001; Tishman, MacGillivray, and Palmer, 1999). The differential effect of different arts forms on these different types of skills should be better understood. Even within an art form, for example music, we may expect different kinds of learning outcomes from different types of activities, such as learning to compose fugue, playing violin, singing in a choir, or playing jazz, classical or pop music (Vuust, Brattico, Seppänen, Näätänen, Tervaniemi, 2012). We may also expect different relations with different dimensions of an academic subject: for example, an art form may have an impact on geometry but no impact on arithmetic (which could balance out in general maths tests).
- Measure learning in the art form itself and compare that to learning in the hypothesised transfer domain. Higher levels of learning in the art form should correlate with higher levels of achievement in the transfer domain (Bransford and Schwartz, 1999).
- Investigate transfer by asking whether learning in an art form results not in higher achievement in a transfer domain, but rather, in greater ease of learning in that transfer domain.
- Examine the effects of explicit teaching for transfer in the arts. Perhaps it is only when teachers make clear that the skills being taught in arts classes can be used in other subject areas, can help students see how they might do so, and/or can work with students to reflect on and practice making such connections, that students become able to transfer skills learned in the arts.
- Explore whether using the arts as entry points to academic subjects is particularly useful to certain kinds of students. For example, it is possible that music serves as a strong entry point for maths but only for those students who have difficulties in maths but who are strong in music. It is also possible that children with special needs may be helped to learn through the arts: perhaps dyslexic children can be helped by music since music improves phonological skills; perhaps autistic children can be helped by theatre training since theatre training improves the very kinds of social skills lacked by children with autism (especially understanding others' mental states)

(continues...)

Box 11.1. **Suggested areas of research focus on the impact of arts education** (continued)

- Investigate how other subject areas can learn about good teaching and deep learning by looking at arts classes. Would students in mathematics or English classes benefit from greater proportions of class-time being devoted to working on projects while teachers offer individual consultations of ongoing work, similar to the way studio art courses are run? Or would science, history, or language classes benefit from the kind of regular, mid-project critiques that are common in studio arts courses? We believe that they would.
- Study the effects of the arts over time to find out whether effects, if found, last, and to find out whether such effects have an impact on non-test measures - i.e. on real life.
- Study the relative effectiveness of different kinds of pedagogies, assessments and curricula in fostering various kinds of learning outcomes in the arts and, possibly, the simultaneous development of skills and habits of minds that can be used in other domains.

A fourth approach that can yield robust evidence lies in longitudinal studies following individual students (those involved and those not involved in the arts) over a long period of time. This type of study allows for controlling all time-invariant characteristics mentioned above at once by comparing skill growth trajectories rather than levels at one point of time.

This report allows us to identify an agenda for empirical research on the links between arts education and skills development and contains all of the elements for an up-to-date meta-analysis, which we have been unable to undertake for practical reasons. However, given the paucity of true experimental work, we recommend that instead of meta-analysing the extant work, researchers should rather conduct the kind of rigourous controlled research suggested above. Given the wide variety of causal questions that could be tested (there are many forms of arts instruction and many forms of outcomes of interest), we recommend developing a prioritised research agenda and inviting research teams to collaborate on specific research questions so that multiple, converging studies on specific questions can be carried out. Box 11.1 summarises some of our research agenda recommendations.

Theoretical improvements

Methodological weakenesses often indicate a lack of theoretical reflection about why and how desired effects of arts education would be achieved. The extant empirical research does not always build on strong theoretical frameworks. Very few studies of skill development and transfer have been based on an analysis of the habits of mind learned in the art domain from which transfer is expected. This kind of analysis was carried out by Hetland et al. (2013) and could be used as a basis for

transfer research. Researchers need to build stronger theoretical frameworks on why and how arts education can be hypothesised to develop certain skills which then transfer to other academic subjects. The first step is to develop a clear understanding of the kinds of skills developed by different forms of arts education, and then to determine whether these skills are specific to the arts or may also spill over to other fields. As in other fields of education, it is also important to study how different ways of teaching the arts foster differents mixes of skills.

Any study of transfer should first analyse the kinds of habits of mind taught in the art domain and then develop a plausible hypothesis about the kinds of transfer outcomes one might expect. Thus it is not sufficient to test the hypothesis that infusing many kinds of arts into the academic curriculum will lead to higher test scores. What is needed is a theory of what infusing the arts will do to learning and why that kind of learning should be reflected in the kinds of test scores examined. Studies must identify one or more habits of mind hypothesised to be learned from some kind of arts instruction and then assess the level of learning of that kind of habit of mind in the art form itself. Logically, if there is to be transfer from arts learning to some non-arts kind of learning, there must first be arts learning. As Bransford and Schwartz (1999) point out, many educational studies reporting failure of transfer can be traced to limited learning in the original domain. Future studies on this question should measure learning in the "parent" art domain and in the transfer domain. In addition, a finding of transfer should rest on a strong correlation between level of learning in the art domain and level of learning in the transfer domain (Schwartz et al., 2005).

None of the transfer studies we reviewed were based on any kind of explicit teaching for transfer, in which the teacher helps the student see parallels between what was learned in an art form and how that might be applied to a non-arts area of learning. A hypothetical example of this kind of teaching for transfer might be a teacher pointing out the observational skills learned in the visual arts and reminding students to use these same kinds of skills when peering through a microscope in biology class. One is far more likely to get transfer when there is explicit teaching for transfer than when transfer is expected to occur on its own (Salomon and Perkins, 1989; Terwal, van Oers, van Dijk and van den Eeden, 2009).

Bransford and Schwartz (1999) suggest going beyond the traditional approach to the study of transfer in which we examine whether learning in one domain predicts achievement in a transfer domain. They suggest that transfer studies should instead examine whether learning in one domain predicts greater *preparation for future learning* in a transfer domain environment. If we applied this to the arts, we might investigate not whether students coming out of an arts class now score higher on geometry, but rather whether students who have completed an arts class are now more able to learn geometry than those who have not taken such a class. Similarly, one might investigate whether learning in music makes it easier for students to master arithmetical concepts when they are later exposed to a class in arithmetic.

This kind of research – looking for greater ease of learning in a non-arts domain after studying an arts form – has yet to be carried out.

Finally, transfer studies are just one kind of research in the area arts education. Better understanding the relative effectiveness of different kinds of pedagogies in different arts forms on the acquisition of artistic skills themselves is another key area for research on arts education. This kind of research is much more developed in academic areas than in arts education. Studies on the skills and dispositions developed by arts education, and on the different impact of various pedagogies in the arts should contribute to the improvement of arts education.

Conclusions

In sum, we believe that more empirical research on arts education should be carried out to investigate the impact of arts education on the development of a variety of skills, including artistic skills themselves. This research should also focus on the quality and effectiveness of different types of teaching in arts education, as is commonly done in other areas. In order to allow some level of causal inference, we recommend longitudinal studies, with an experimental or quasi-experimental design. However, empirical research should only come after the development of a strong theory about the skills and outcomes that quality arts education should foster. Given the scarcity of funding for research on arts education, we also suggest that research teams collaborate to examine some specific questions and replicate findings in different contexts. We suggest that a high priority area of study would be to investigate the effect of arts education on skills important to innovation, such as creativity, metacognition, and skills supporting good communication.

A policy agenda

Understanding the impact of arts education on skills for innovation can help education decision makers to design or give incentives for the design of appropriate curricula. What should be the place of the arts in school curricula? What kinds of skills can one expect arts education to develop, and with what kind of pedagogy? Does arts education simultaneously foster academic achievement, creativity, critical thinking, as well as valued behavioural and social skills? Policy reports and advocates of arts education often claim that this is the case in order to justify the arts in today's curricula. Our report brings together research evidence on this issue and summarises what we know (and do not know). In this respect, our report helps to clarify why arts education should remain an integral part of every child's education.

We argue that the main justification for arts education is clearly the acquisition of artistic skills – the current priority objective of arts education in the curricula of OECD countries. By artistic skills, we mean not only the technical skills developed in different arts forms (playing an instrument, composing a piece, dancing, choreographing, painting and drawing, acting, etc.) but also the habits of mind and

behaviour that are developed in the arts. Arts education matters because people trained in the arts play a significant role in the innovation process in OECD countries: the arts should undoubtedly be one dimension of a country's innovation strategy. Ultimately, however, the arts are an essential part of human heritage and of what makes us human, and it is difficult to imagine an education for better lives without arts education.

Advocacy and transfer effects

Much of the research findings showing positive impacts of arts education on all sorts of achievements and competences in other subjects and activities have been used for advocacy purposes. Claims about the impact of arts education on academic achievement and motivation tend to reflect the view that the arts are important not in themselves, but only for how they can support other aspects of the curriculum. These kinds of claims may well have developed pragmatically – as a way to save the arts because the arts are perceived as endangered.

While the arts were never given as much weight in the school curriculum as traditional academic subjects, instructional time in the arts has not decreased as much as concerned advocates tend to think. In the past decade, on average there has been relative stability in the time devoted to arts education in countries' (intended) instruction time. In 10 out of 18 OECD countries, the share of time devoted to arts education has decreased in compulsory instruction time for 9-11 year old children between 2001 and 2010, but the decrease has generally been very small. This recent stability may hide a decrease over a longer period of time, but recent change has been limited on average. A 2012 report by the US Department of Education showed that the offering of dance and theatre in US elementary schools had dramatically decreased in the past decade: in 2010, 3% of schools offered dance, and 4%, theatre, against 20% in 2000. However, there was no decrease for music and visual arts education, which have always represented the principal forms of arts education in US elementary schools. Thus, to reiterate, the decrease of arts education in US schools has been limited. The report also points to inequities in access as disadvantaged students are those who have suffered the most from the decrease (NCES, 2012).

This decrease (or perceived decrease) has led arts advocates to promote arts education on the basis of their transfer effects on other, more established disciplines. If learning in the arts has "collateral benefits" in other areas, so much the better. However, we do not believe that the existence of arts education should be justified in terms of skills in other, traditional academic subjects: if one seeks first and foremost to develop skills in geometry, studying geometry – rather than music or dance – is always likely to be more effective. Indeed, as mentioned above, one can raise the question of why training in the arts *should* improve skills in reading or mathematics or science. What is the underlying mechanism? Even if one could show that arts training has some effect on reading, writing and arithmetic (the so-called three Rs),

it should be obvious that improvement in these basic subjects is more likely to come about if they are the direct focus of the curriculum. The primary justification of arts education should remain the intrinsic importance of the arts and the related skills that they develop.

Moreover, in any domain, transfer is always difficult to demonstrate. In a book entitled *Transfer on Trial*, Detterman states in the introductory chapter: "First, most studies fail to find transfer. Second, those studies claiming transfer can only be said to have found transfer by the most generous of criteria and would not meet the classical definition of transfer [defined by Detterman as the degree to which a behaviour will be repeated in a new situation]" (Detterman and Sternberg, 1993). Research shows that transfer is rare and that its likelihood of occurrence is directly related to the similarity between two situations. Thus, limitations in rigourous attempts to demonstrate transfer from the arts are in no different a position than attempts to demonstrate other forms of transfer of learning. Arts advocates should thus not be surprised that so limited strong evidence of transfer from arts education to other, more socially valued school subjects, exists.

Arts education in innovation-driven societies

Another instrumental justification is that the artistic skills (rather than non-artistic skills) developed in arts education are increasingly important in our societies. Hence the importance of arts education for the innovation and skills strategies of OECD countries.

First, arts education is important for vocational reasons. There will always be students with strong potential in an art form who may or may not also be strong academically. If these students are not exposed to arts education in school, they may never discover their strengths in the arts. Discovering artistic strengths can lead to self-confidence and well-being. In addition, such discovery can lead students to choose careers in arts-related fields: graphic design, industrial design, lighting design, the music industry, as well as the more challenging path of choosing a career in the fine and performing arts. The economy of culture and "creative industries" play a key role in the economy and growth of many OECD countries. The relative share of cultural industries in the gross domestic product of five countries (Australia, Canada, France, the United Kingdom and the United States) has been estimated at 3-6% of GDP.

Second, arts education is important from a user (or "consumer") perspective. On average, in 2011, cultural and recreational goods and services were the fifth item of household expenditure in OECD countries. Literacy in the arts thus needs to be developed so that people make the best of these cultural and artistic activities, and there continues to be a vibrant demand for and innovative supply of them.

Finally, despite the lack of evidence thus far for arts education strengthening creativity as measured by domain-generic creativity tests, it seems that arts graduates are likely to have the complex set of skills that are useful in highly innovative occupations. When concerned with human resources, policies for innovation usually tend to focus on skills in science and engineering. However, artistic skills are often involved in the innovation process. The analysis of two international databases of tertiary educated professionals (Reflex and Hegesco) shows that art graduates are among the most likely to have a highly innovative job five years after graduation. Fifty-four percent of arts graduates have a highly innovative job dealing with some type of innovation. They rank second for product innovation, and they come fifth and seventh for innovation of technology and innovation of knowledge (Avvisati, Jacotin and Vincent-Lancrin, 2013). While people with more innovative skills may self-select in arts studies, it is also plausible that arts education develop a bundle of skills that matter for innovation. Professional artists certainly contribute to a country's innovation culture through their artistic production. However, most art graduates are not professional artists: they work in all sectors of the economy. In fact, arts graduates are distributed across economic sectors along the same pattern as other graduates, except that more of them work in education and services, and fewer work in the health sector.

One simple explanation for the above findings is that the importance given to design and marketing in devising products have led companies to form multidisciplinary teams for innovation, and these teams include staff with artistic skills. After all, it is because Apple devised and delivered the design of the iPod (and not because it invented its technology) that it has secured an estimated 36% profit margin on sale of the product. But again, we should keep in mind that most people who receive arts education will not work as artists or use their technical artistic skills in their occupation, as is the case for most scientists and engineers. It may rather be some less visible skills that are developed in their training (or that they had prior to their education) that make them more likely to hold innovative jobs in the workplace.

Recognising the value of arts education for innovation, an increasing number of universities are developing new types of inter-disciplinary curricula or institutions that try to take advantage of the skills developed in arts education. An interesting and inspiring example is the newly established Aalto University in Finland, which was created from the merger of three Finnish universities (Helsinki School of Economics, University of Art and Design Helsinki, and Helsinki University of Technology) in order to bring together art, engineering and business and nurture a stronger spirit of innovation and entrepreneurship among students.

Concluding remarks

While future societies may or may not need more people trained in the arts than today, they probably will not need fewer such people. As in other subjects, notably science and mathematics, arts education in elementary and secondary school

plays a twofold role: arts education gives students some literacy and some level of technical skills in the arts, and also provides them with some understanding of and interest in the domain so that they may consider studying it in higher education.

People's lives are infused with the arts as they listen to music on their iPods, read fiction, attend museums, watch TV dramas, dance, etc. We believe that the well-being and happiness of individuals will be higher in countries where the arts are given a prominent role in our schools, because of the inherent pleasure gained from the arts. A study showing that this is the case remains to be carried out.

Ultimately, even though we find some evidence of the impact of arts education on skills outside of the arts, the impact of arts education on other non-arts skills and on innovation in the labour market is not necessarily the most important justification for arts education in today's curricula. The arts have been in existence since the earliest humans, are parts of all cultures, and are a major domain of human experience, just like science, technology, mathematics, and humanities. In that respect, they are important in their own rights for education. Students who gain mastery in an art form may discover their life's work or their life's passion. But for all children, the arts allow a different way of understanding than the sciences and other academic subjects. Because they are an arena without right and wrong answers, they free students to explore and experiment. They are also a place to introspect and find personal meaning.

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This book examines the state of empirical knowledge about the impact of arts education on these kinds of outcomes. The kinds of arts education examined include arts classes in school (classes in music, visual arts, theatre, and dance), arts-integrated classes (where the arts are taught as a support for an academic subject), and arts study undertaken outside of school (e.g. private music lessons; out-of-school classes in theatre, visual arts, and dance). The report does not deal with education *about* the arts or cultural education, which may be included in all kinds of subjects.

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