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ABSTRACT

This paper reports on a systematic review of 210 pieces of educational research, policy and professional literature relating to creative environments for learning in schools, commissioned by Learning and Teaching Scotland (LTS). Despite the volume of academic literature in this field, the team of six reviewers found comparatively few empirical studies published in the period 2005–2011 providing findings addressing the review objectives. There was, however a reasonable weight of research evidence to support the importance of the following factors in supporting creative skills development in children and young people: flexible use of space and time; availability of appropriate materials; working outside the classroom/school; 'playful' or 'games-bases' approaches with a degree of learner autonomy; respectful relationships between teachers and learners; opportunities for peer collaboration; partnerships with outside agencies; awareness of learners' needs; and non-prescriptive planning. The review also found evidence for impact of creative environments on pupil attainment and the development of teacher professionalism. LTS intend to use the review as a basis for recommendations to Scottish schools in promoting creativity within *Curriculum for Excellence*. However, the findings of the review and methodological gaps in the reviewed studies have implications for policy, practice and research internationally.

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1. Introduction and background

In March 2011, the Scottish Government curriculum agency Learning and Teaching Scotland (LTS, now Education Scotland) commissioned a review of 'evidence identifying the most effective learning environments and conditions which promote creative skills development in children and young people' (LTS, 2011). In this context, 'learning environment' was taken to extend beyond the physical architecture of the space in which learning takes place (Dudek, 2000) to encompass psychosocial and pedagogical features (Fraser & Fisher, 1982; Roth, 2000); and should include the influence of places and people outside the school. Similarly, the phrase 'creative skills' was to be interpreted broadly within the review, particularly since it is not well-represented in the literature. Thus, creative thought processes (Mumford, Mobley, Uhlman, Reiter-Palmon, & Doares, 1991), creative problem-solving skills (Williamson, 2011), creative thinking (Torrance, 1977), creative learning (Jeffrey, 2006) and possibility thinking (Craft, 2000) could all fall under the general heading of 'creative skills', acknowledging that such skills have both cognitive and practical elements.

This is not the first literature review of creativity in education; for example Loveless (2002, 2007) undertook a literature review in creativity, new technologies and learning, whilst Banaji and Burn (2006) and Banaji, Burn, and Buckingham (2010)

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have reviewed a range of literature from which nine 'rhetorics' of creativity emerged: creative genius; democratic and political creativity; ubiquitous creativity; creativity for social good; creativity as economic imperative; play and creativity; creativity and cognition; the creative affordances of technology; and the creative classroom. The Scottish Executive Education Department (SEED, 2006) produced an overview of some key national policy developments and other initiatives across the UK promoting creativity in education. More recently, Creativity, Culture and Education (CCE – formerly Creative Partnerships) have produced a series of literature reviews on different aspects of creativity and education (Bragg, 2010; Fleming, 2010; Jewitt, 2008; Jones, 2009; Menter, 2010; O'Connor, 2010; Thomson, 2010). The differences between our literature review and those referred to above are that we have used a recognised systematic methodology (EPPI-Centre, 2007); we have reviewed studies published since 2005 in order to add to previous reviews rather than replicate them; and have only included literature based on empirical research, so that any policy recommendations arising from the review are supported not only by powerful ideas but by evidence from practice.

The policy background to this review dates back to the influential *All Our Futures* report (NACCCE, 1999) and its Scottish equivalent *Creativity in Education* (SCEAG, 2001). In Scotland, *Curriculum for Excellence* (2004) is built around four capacities, one of which – successful learners – includes the encouragement to 'think creatively and independently'. The publication of a revised *Action Plan for Education and the Arts, Culture and Creativity* demonstrates strong Scottish Government support to '. . . develop a shared vision for creativity and its role in learning and teaching in the context of *Curriculum for Excellence*, highlighting the importance of the creative skills of children and young people, and the characteristics which should be promoted by creative learning and teaching in the arts and culture, and across the curriculum' (Scottish Parliament, 2010, p. 6). A survey of evidence from inspections of pre-school centres, primary and secondary schools and community learning and development (CLD) in Scotland by HMIE (2006) recommended a synthesis of elements of good practice in promoting creativity. In England, OfSTED (2010), in a survey of inspection findings from 44 schools: two nursery schools, 22 primary schools, 19 secondary schools and a special school, identified a similar set of characteristics of effective creative teaching. Although not explicitly empirical research – so not included within the reviewed literature – the characteristics of a pedagogical learning environment emerging from inspection evidence provided a useful background framework against which we could compare our emerging findings.

2. Methodology

Our approach to the research was that of *systematic review* (EPPI-Centre, 2007; Thomas & Harden, 2008), in order to establish a reliable evidence base for recommendations to schools, teachers and CPD providers. Systematic review has been defined as: "a scientific process governed by a set of explicit and demanding rules oriented towards demonstrating comprehensiveness, immunity from bias, and transparency and accountability of technique and execution" (Dixon-Woods, 2011, p. 332). The approach has been criticised as taking a reductionist perspective on research evidence, potentially leading to limited findings (MacLure, 2005), though the recent trend towards including robust qualitative – in addition to quantitative – studies (Higgins & Green, 2009) has gone some way towards addressing this perceived narrowness of scope. In our review, most of the studies used predominantly qualitative data, so the systematic processes for assessing weight of evidence did not unduly restrict our findings.

The review was driven by the following research questions, based on the four objectives specified by LTS:

1. What evidence in the literature is there for identifying key characteristics of the environments and conditions that are most effective in promoting creative skills development in children and young people?
2. What evidence in the literature is there for the impact of creative school learning environments on the educational development of children and young people, taking into account gender and cultural or socio-economic contexts?
3. What evidence in the literature is there for identifying specific roles of teachers which promote creative skills development in pupils?
4. What evidence in the literature is there for ways in which teachers can best be supported to develop the skills and confidence to facilitate creative learning environments?

To ensure that the review was systematic, we carried out the following steps, as recommended by EPPI-Centre (2007) and illustrated diagrammatically in Fig. 1:

1. Scoping the review: we started by developing explicit criteria for specifying which studies would be included in the review (Table 1).
2. Searching for studies: each member of the research team set out to identify relevant studies in particular types of literature (see Table 2) using a prescribed set of search terms agreed with LTS. All 210 studies found using this method (Appendix A) were recorded on a grid with summary judgements made against each of the selection criteria.
3. Screening studies: each piece of literature was screened against the inclusion criteria (Appendix B). This helped to avoid hidden bias, by having clear consistent rules about which studies were being used to answer the above research questions. By appraising each study against the same criteria and recording the results, the basis for the review's conclusions was made transparent. We met as a team to review all the decisions and re-distribute the literature under the four research questions.
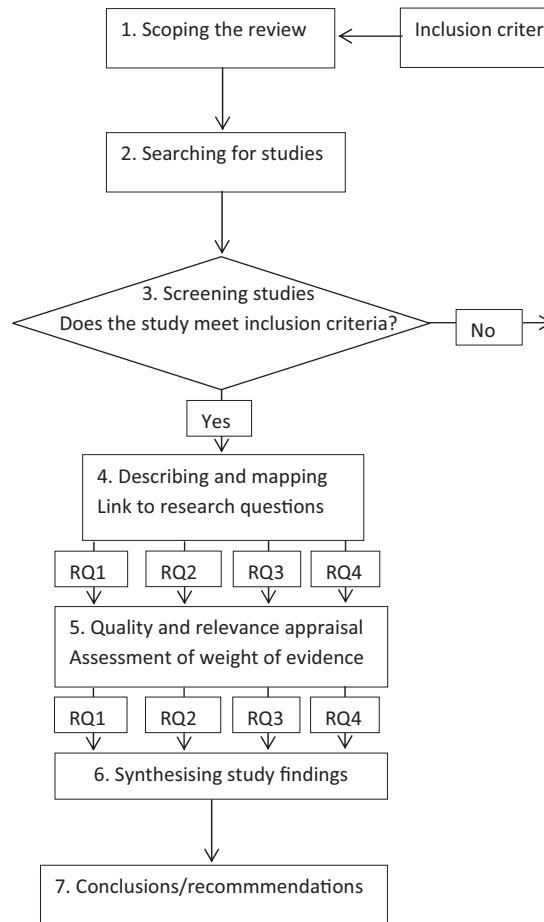
Fig. 1. Flow chart illustrating systematic review process.

Table 1
Inclusion criteria for the review.

Criterion type	Inclusion criteria
Topic	Literature must relate directly to one of the research questions above (environments, impact on learners, teacher's role, teacher support).
Recency	Literature should have been published between 2005 and 2011 (although 39 older studies of particular relevance to the review objectives were also requested by LTS for inclusion).
Age-range	Literature should relate to school-age pupils (5–18).
Geographical spread	Literature should relate primarily to studies in the UK (particularly Scotland), together with examples from other countries with similar education systems or where the context of the study was similar to that in Scottish schools.
Research base	Literature must be based upon empirical research (either qualitative or quantitative).
Transparency	The methodology of the research upon which the literature is based must be made explicit (e.g. sample sizes, instruments, analysis).
Reliability/validity	As far as can be determined, the findings upon which the literature is based must be valid and reliable, taking into account the type of study.

4. Describing and mapping: we outlined the methodology and findings from each included study, including variables such as population focus, study design and key characteristics related to the research questions. These were used to draw up a 'descriptive map' providing a systematic description of research activity in relation to each question (Harden & Thomas, 2005). Triangulation was provided by two researchers reviewing literature for each question, and by independent analysis of the eighteen studies which addressed more than one question.
5. Quality and relevance appraisal: we evaluated each study in the descriptive map (Appendix C) in terms of:
   - The trustworthiness of the results judged by the quality of the study within the accepted norms for undertaking the particular type of research design used in the study (methodological quality).
   - The appropriateness of the use of that study design for addressing their particular research question (methodological relevance).

Table 2
Types of literature and sources searched.

Type of literature	How sourced
Journal articles	Searching the online databases *Education Research Complete*, *Educationline* and *Web of Science*. Scanning the contents of key journals in the field such as *Creativity and Thinking Skills* and *Creative Education*. Contacting eminent researchers in the field.
Scottish 'grey' literature	Reports of studies in Scottish schools. Scottish government, professional and research publications.
Arts-based grey literature	Research reports from *Creative Partnerships/CCE*. Arts-Council funded research. NSEAD database.
Books on the theme of creativity in education	Chapters in books which may not include creativity in the title. Library catalogue and information services at Bath Spa and Dundee universities. Inter-library loan.
UK and Scottish government websites	Scottish Government, DfE, The Standards Site, NFER, ESRC and AHRB databases of reports.
World Wide Web	Including *Google Scholar, Google, ERIC, Wikipedia* and other non-academic sites.
Agreed search terms:	
Creativity	

Creativity AND . . . teacher, children, pupil, student, research, learner agency, impact, supporting, developing, facilitating, evaluating, documenting, life wide, training, school, Teaching AND . . . for creativity, creatively

Creative AND . . . teaching, teacher, learner, learning, attitudes, environment, community, project, curriculum, skills, attributes, pedagogy, conditions, school, disposition, behaviour, education, children, capacity(ies), value(s), ecosystem, ethos, development, partnership, cultural capital, primary, secondary, professional, assessment, enquiry, technology?

Innovation

Innovative AND. . . approaches, teaching, teacher, school environments, learning

Table 3
Criteria for judging 'weight of evidence'.

Level/criterion	Methodological quality	Methodological relevance	Topic relevance
1: Excellent	Excellent research design justifying all decisions taken: e.g. sample, instruments, analysis. Clear evidence of measures taken to maximise validity and reliability.	Research questions clearly stated. Methodology is highly relevant to RQs and answers them in detail.	Study is very closely aligned to one of the key review questions and provides very strong evidence upon which to base future policy/action.
2: Good	Research design clearly stated with evidence of sensible decisions taken to provide valid and reliable findings.	Research questions are explicit or can be deduced from text. Findings address RQs.	Study is broadly in line with one of the key review questions and provides useful evidence.
3: Satisfactory	Research design may be implicit but appears sensible and likely to yield useful data.	RQs implicit but appear to be broadly matched by research design and findings.	At least part of the study findings is relevant to one of the key review questions.
4: Inadequate	Research design not stated and contains flaws.	RQs not stated or not matched by design.	Study does not address key questions.

- The appropriateness of focus of the research for answering the review question (topic relevance).
- Judgement of overall weight of evidence (WoE) (Gough, 2007) based on the assessments made for each of the above criteria (see Table 3).

6. Synthesising study findings: we used the approach of *Narrative Empirical Synthesis* (EPPI-Centre, 2007) to bring together the results of the mapping exercise to provide an accessible combination of results from individual studies in structured summaries. This involved bringing the summaries of research methodology, findings and weight of evidence from the mapping exercise together under thematic headings, as narrative paragraphs summarising the key messages and their relative evidence bases. Where several studies, each with high WoE, supported a finding, this was described as 'strong' evidence. Findings for which there were fewer studies, or studies with lower WoE, were described as 'reasonable evidence'.

7. Conclusions/recommendations: we drew up a set of recommendations closely linked to the findings of the synthesis to make transparent the basis on which each recommendation was made. This included identification of potential limitations in the generalisability or transferability of findings.

3. Findings

From a systematic review of 210 pieces of educational research, policy and professional literature published in the period 2005–2011 we found only 58 empirical studies whose findings addressed the research questions. Of these, 34 were case studies, involving the collection of qualitative data such as interviews, classroom observations and teachers' or pupils' reflective journals. There were 13 large scale studies, usually involving attitude surveys though pupil test scores were employed in four examples. Only two involved experimental designs, whilst six employed forms of action research.

Overall, 24 of the empirical studies involved primary pupils, 18 secondary and eight special schools or early years settings. Six were set in out-of-school locations and eight in initial or continuing teacher education. The greatest number of studies (32) related to research question 1 – which was also the main driving question set by LTS – therefore we focus upon it in the discussion below. This is followed by a brief description of findings for research questions 2–4.

What evidence in the literature is there for identifying key characteristics of the environments and conditions that are most effective in promoting creative skills development in children and young people?

The evidence from the 32 studies addressing question 1 falls into three broad themes: the physical environment, the pedagogical environment and the role of partnerships beyond the school. Of these 32, 19 studies were reporting on a 'critical event', i.e. a project or experience which is in some way 'special' or different from everyday practice, in order to create or enhance some of the conditions for pupil creativity. This needs to be borne in mind when applying these findings to work with children and young people in general, as there is reasonable evidence (e.g. Burgess & Addison, 2007; Hall, Thomson, & Russell, 2007; Halsey, Jones, & Lord, 2006; Troman, Jeffrey, & Raggl, 2007) that the lessons from such 'critical events' do not readily become incorporated into everyday practice once the special project has finished. However, there is evidence across research sites ranging from early years classes through secondary schools, higher education and adult learning in several European countries that creative learning initiatives generally conform to the structure of a critical event; passing through well-defined stages of conceptualisation, preparation and planning, divergence, convergence, consolidation, and celebration (Jeffrey, 2006). This would suggest that the findings below, many of which derive from critical events, are applicable to schools seeking to enhance their creative environment.

3.1. The physical environment

There is reasonable evidence across a number of studies that the space within a classroom or workshop should be capable of being used flexibly to promote pupils' creativity (Addison, Burgess, Steers, & Trowell, 2010; Bancroft, Fawcett, & Hay, 2008; Jeffrey, 2006). In the context of early years settings, this can involve the abandonment of specifically themed role-play areas and props (Bancroft et al., 2008; Davies, 2011) to give children's imagination greater freedom. Children and their parents should be involved as much as possible in planning and resourcing these spaces (Davies, 2011). There should be a general sense of openness and spaciousness (Bancroft et al., 2008), removing as much furniture as possible to enable pupils to move around the space, making use of different areas to support the growth of ideas (Gandini, Hill, Cadwell, & Schwall, 2005). There is a note of caution here, however, in that students whose home environments are not conducive to study can find themselves alienated by too much flexibility in the school environment (Jeffrey, 2006). From a series of case studies in schools in Reggio Emilia, Vecchi (2010) has demonstrated the importance of sensory qualities in learning environments – light, colour, sound, micro-climate – and how these influence children's and young people's perceptions of how creative they are able to be within them. She recommends the use of small spaces ('mini ateliers'), acoustically but not visually separate from the rest of the class (Vecchi, 2010) to enable pupils to work quietly in groups. Another important feature of the visual environment to stimulate pupils' creativity is displays of work in progress (Addison et al., 2010).

3.2. Availability of resources/materials

In the context of learning activities involving the making of artefacts (for example during art and design or design and technology) there is strong evidence across a number of studies that providing a wide range of appropriate materials, tools and other resources can stimulate creativity (Addison et al., 2010; Bancroft et al., 2008; Gandini et al., 2005; Gkolia, Brundett, & Switzer, 2009; Grainger, Craft, & Burnard, 2007; Halsey et al., 2006; Robson & Jaaniste, 2010). From case studies in a number of early years settings and primary schools in the $5 \times 5 \times 5 = creativity$ project, Bancroft et al. (2008) emphasise the availability of lots of light, almost formless materials which can take on any shape, such as clay, modelling foam, wire, cellophane, tissue paper, etc. For older pupils, access to enhanced or specialist resources appears to stimulate creativity. From a study of five NESTA-funded projects for socially excluded young people Halsey et al. (2006) found that access to new or different media and technologies was widely attributed with stimulating creativity by staff members and young participants alike. In the context of secondary art and design education, Addison et al. (2010) identify the importance of a range of material, technical and reference resources, available outside timetabled hours. From interviews with 16 arts organisations in Australia and the UK, Robson and Jaaniste (2010) found that such organisations could provide young people with access to, and experimentation with, new media technologies and a range of other innovation products and processes. ICT resources such as the interactive whiteboard (IWB) can be used to support visual learners in developing their creative skills (Wood & Ashfield, 2008). Through observations of whole-class lessons – five each in literacy and numeracy – in five primary schools in Surrey, they identified pupil interactions with the IWB and opportunities for exploring and imagining.

3.3. Use of the outdoor environment

There is reasonable evidence across several studies that taking pupils out of the classroom and working in an outdoor environment for part of their time in school can foster their creative development (Addison et al., 2010; Bancroft et al., 2008; Borradaile, 2006; Dillon, Craft, Best, Rigby, & Simms, 2007). The reasons for this may be connected with ownership

and collaboration. In a case study of a primary school which worked with landscape architects to transform its outside space, Dillon et al. (2007) found that, whilst each teacher felt ownership of particular spaces indoors, once outdoors, time and space was seen as more owned by pupils. Inside, work tended towards being individually focused, whereas outside, learning activities were more likely to involve collaboration. In the context of early years education, Bancroft et al. (2008) recommend taking an initial walk, whether in urban or rural neighbourhoods, which can provide a rich context for the purpose of discovering children's schemas and interests on which teachers can build to enhance their creativity. Forest School is an approach to outdoor education which offers an alternative teaching environment, to complement the indoor curriculum. Following three field visits each to two forest schools in Scotland, gathering interview and self-evaluation data from staff and pupils, Borradaile (2006) concluded that the characteristics of forest schools as 'creative environments' include:

- Use of a local woodland (therefore 'wild') setting.
- Regular, frequent contact in the same setting over a significant period of time.
- Providing freedom to explore using multiple senses and intelligences.
- Time and space for individual learning styles to be recognised and nurtured.
- A low pupil:adult ratio.

These characteristics may be transferable to work in other outdoor environments.

3.4. The pedagogical environment

There is evidence from a two-year study of 211 children in Paris and the surrounding areas (Besancon & Lubart, 2008) that the overall ethos and learning environment of a school can account for variance in children's creative performance scores, as measured by divergent thinking tasks from the Torrance Tests of Creative Thinking. In this study, children attending Montessori schools showed greater originality in thinking than those in other types of primary school (Besancon & Lubart, 2008). In the classroom there is reasonable evidence that, in order to stimulate creative responses from pupils, activities need an element of novelty (Gkolia et al., 2009; Rutland & Barlex, 2008). In a study of an urban Education Action Zone (EAZ) with three 11–16 secondary schools and 12 primary schools, Gkolia et al. (2009) found that new and exciting school activities were significant in motivating pupils. In their study of five projects for socially excluded young people, Halsey et al. (2006) identify the importance of the 'authenticity' of the task – it should be set within as real a context as possible and be self-evidently worthwhile – whilst in the context of secondary D&T education Rutland and Barlex (2008) point to the need for interesting, motivating and relevant projects with exciting starting points and stimulus materials in order to develop and open the pupils' minds. Such findings are perhaps self-evident; few would expect that old, boring or meaningless tasks would be effective in developing creative skills. However, there appears to be more research evidence about the role of the learner in relation to the task than the nature of the task itself.

There is strong evidence from across the curriculum and age-range that where children and young people are given some control over their learning and supported to take risks with the right balance between structure and freedom, their creativity is enhanced (Burgess & Addison, 2007; Cremin, Burnard, & Craft, 2006; Ewing, 2011; Gandini et al., 2005; Grainger, Gooch, & Lambirth, 2005; Hall et al., 2007; Halsey et al., 2006; Wood & Ashfield, 2008). In a case study of three primary teachers' classroom approaches, Cremin et al. (2006) identify the importance of providing multiple opportunities in which the children could initiate their own activities or make their own choices within a loosely framed activity. However, despite the emphasis on self-expression, secondary-aged pupils in Burgess and Addison's (2007) study appreciated a structured and supported environment. The provision of 'safe' structure appears to be particularly important to enable pupils to take risks, to think creatively and critically, and to question, as with the disaffected young people in the study undertaken by Halsey et al. (2006), who found that creativity was felt to be best served by an equal balance between structured and unstructured work. Similarly, the presence of structure and clear expectations was significant for the primary-aged children in the *We're Writers* project (Grainger et al., 2005); and the case studies of arts education in Australia reviewed by Ewing (2011). In the study of three primary teachers' approaches by Cremin et al. (2006) the most effective practice was that which both framed challenges for pupils but also provided freedom in the ways in which they could choose to address these challenges.

It is important, however, not to over-emphasise the need for structure, as this may be seen as perpetuating models of pedagogy favouring performativity (Troman et al., 2007). Hall et al. (2007, p. 615), in their ESRC-funded ethnographic study of a primary school engaged in three Creative Partnerships projects using Bernstein's analytical frame, found that arts activities with strong framing and classification of space and time, and with marked 'performance pedagogies' fit most easily into primary school culture. By contrast, in studying the use of the interactive whiteboard for creativity in five primary schools, Wood and Ashfield (2008) remind us that opportunities for exploring and imagining are the most important aspect in promoting creative learning. From a range of case studies of practice in Reggio Emilia schools, Gandini et al. (2005) suggest that, rather than being explicitly planned for, creativity emerges from multiple experiences, coupled with a well-supported development of personal resources. They argue that this complexity should lead teachers away from planning a lesson and towards searching for systems that organise and prepare adults and children to think together (Gandini et al., 2005).

3.5. The role of play

The role of play in early years pedagogy is well documented, however there is reasonable evidence that bringing more 'playful' or 'games-based' approaches into classrooms at all ages can support the development of creative skills (Cremin et al., 2006; Cumming, 2007; European Commission, 2009; Halsey et al., 2006; Jindal-Snape, Baird, & Miller, 2011; Miller, Hudson, Miller, & Shimi, 2010). Cremin et al. (2006) observed their three case study primary teachers blurring the boundary between 'work' and 'play', whilst what worked best for the disaffected young people in four of the five projects in the study by Halsey et al. was an approach that was different to formal education, was flexible, informal and allowed the young people to work at their own pace without pressure. From a detailed analysis of two English primary teachers' and their pupils' experiences of poetry, Cumming (2007) emphasises the need for opportunities for play with language. However, in a European Commission large-scale survey (Jeffrey, 2006) teachers considered that mixing academic work and play was fostered to a much lesser degree than other creativity-enhancing elements in their schools. For children undertaking the transition from primary to secondary school in Scotland, games based approaches such as those using *Guitar Hero* were found to motivate young people to participate and to learn (Jindal-Snape et al., 2011). However, in a study of four classes of 6–8-year-old children using the *Nintendogs* game, Miller et al. (2010) found that the creativity-enhancing elements of games were easily disrupted by over-eager teachers.

3.6. Use of time

As with physical environments, there is reasonable evidence that creativity is best served through flexible use of time (Addison et al., 2010; Burnard, Craft, & Cremin, 2006; European Commission, 2009; Halsey et al., 2006; Jeffrey, 2006). In their collaborative, video-based study of three early years settings, Burnard et al. (2006) found that young children needed sufficient time for immersion in an activity in order to realise creative outcomes, whilst for Halsey et al. (2006), the most successful NESTA-funded projects for disaffected young people allowed them to work at their own pace without pressure. Jeffrey (2006), reporting on the European Commission-funded *Creative Learning and Student Perspectives* (CLASP) project, recommends special arrangements for extended time periods for creative activities, and notes the increased interest and commitment that time can give to the value of creative learning. In the context of secondary art and design education, Addison et al. (2010) points to the value of resources being available outside timetabled hours. The importance of extra-curricular activities and time spent outside the normal constraints of the classroom is further emphasised in the European Commission survey, which identified these as creativity-enhancing factors which are reported as being fostered in schools to a high degree.

3.7. Relationships between teachers and learners

An important enabling feature of the pedagogic environment for which there is strong research evidence is the nature of the relationship between teachers and learners. In their study of three early years settings, Burnard et al. (2006) observed that an enabling environment has to be fostered by teachers in their responses to children's creative activity. From case studies of Reggio Emilia practice, Gandini et al. (2005) conclude that creativity seems to be favoured or disfavoured according to the expectations of teachers and others, and according to the ways children perceive those expectations. In the context of secondary art and design education, Burgess and Addison (2007) found that students prefer pedagogic relationships in which there is mutual respect, a finding echoed in the early years (Burnard et al., 2006). According to Gandini et al. (2005) such creative attitudes should include flexibility, freedom and open-ended possibility, since their observations in Reggio Emilia schools over many years revealed that the ways in which children invent with materials are often unexpected and surprising. Menter (2010) also emphasises the need for flexibility in the pedagogic relationship, to enable teachers to alter their practice to accommodate the directions pupils may wish to take a project. For Jeffrey (2006), commenting on practice across Europe, this ability to act spontaneously and change plans is part of teachers' modelling of creative learning.

Dialogue appears to be key to the pedagogical relationship. Gandini et al. (2005) observed in Reggio Emilia schools that regularly scheduled conversation between children and teachers serves as a framework to support children's work. Regularly practiced dialogue can support and sustain a culture and community that thinks together, whilst the most favourable situation for creativity seems to be interpersonal exchange, with negotiation of conflict and comparison of ideas and actions being the decisive elements (Gandini et al., 2005). In the case of Forest School, such fruitful dialogue is supported by a low adult to pupil ratio (Borradaile, 2006). A final element of the pedagogical relationship which emerges from Cumming's study of primary poetry lessons is a general air of humour and enjoyment of language (Cumming, 2007).

As well as supportive relationships with their teachers, there is strong evidence that pupil creativity is closely related to opportunities for working collaboratively with their peers (Burgess & Addison, 2007; Dillon et al., 2007; Halsey et al., 2006; Rutland & Barlex, 2008; Wood & Ashfield, 2008). In secondary art and design, the presence of collaborative activities is a significant feature of a creative environment (Burgess & Addison, 2007), whilst in secondary D&T, the use of group and team work with peers was seen as especially effective (Rutland & Barlex, 2008). For Dillon et al. (2007), their case study of a primary school which worked with landscape architects to transform its outside space suggested that pupil collaboration was more likely to occur outdoors than in the classroom. One feature of the outdoor collaboration they observed was its cross-age nature, in which older pupils were seen positioning themselves as both teacher and researcher for younger children (Dillon

et al., 2007). Creative activity can itself promote greater collaboration, as in the case of the *Nintendogs* project in four Scottish primary schools, where Miller et al. (2010) observed that the single most striking message from the whole study was the emergence of enhanced peer interaction.

3.8. Use of other environments beyond the school

There is reasonable evidence (Burgess & Addison, 2007; European Commission, 2009; Halsey et al., 2006; Kendall, Muirfield, White, & Wilkin, 2007; Rutland & Barlex, 2008) to suggest that taking children and young people out of school to work in environments such as museums and galleries enhances their creative skills. For example, Burgess and Addison (2007) studied the work of art teachers, artists and gallery educators in four London secondary schools working with four galleries. Building on the teachers' own action research, Burgess and Addison collected case study data on each gallery project, focusing on three pupils from each of the four schools, selected using the following categories: 'good at art', 'resistant to art' and 'wild card'. Discourse analysis of pupil interviews and action researchers' final reviews suggested that a significant feature of the learning environment contributing to pupils' creativity was relocating sites for learning into the galleries, and that pupils were particularly influenced by the acoustic potential of the gallery space (Burgess & Addison, 2007). In a built environment education survey of 51 teachers (including 13 telephone interviews) the 'vast majority' considered buildings and localities to be a 'very valuable' or 'valuable' learning resource (Kendall et al., 2007); whilst a survey of 12,893 teachers in 32 European countries found that visits to museums were one of what were identified as 'creativity enhancing factors' which were fostered in schools to a 'high degree'. In the context of D&T education, Rutland and Barlex's (2008) ethnographic study of three secondary departments emphasised the importance of a local environment with resources that help stimulate creativity. Reporting on visits to five National Endowment for Science, Technology and the Arts (NESTA)-funded projects for socially excluded young people – including 44 interviews with participants and staff – Halsey et al. (2006) found that an effective strategy was for the artists, mentors or other staff members to visit the spaces in which the young people spend their time outside school, such as youth clubs or local parks. Making connections between such 'informal' spaces, other out-of-school locations and the school environment increased engagement, motivation and hence creative outcomes.

There is strong evidence from nine studies that involvement with outside agencies, including the local business community, the wider sporting and Arts community, and other community organisations can significantly contribute to a creative learning environment (Burgess & Addison, 2007; Cumming, 2007; Gkolia et al., 2009; Grainger et al., 2005; Hall et al., 2007; Halsey et al., 2006; Jeffrey, 2006; Robson & Jaaniste, 2010; Sharp et al., 2008). Such organisations can embody and exemplify innovative practice through their organisational management and business operations, whilst the involvement of artists and other creative professionals can be a significant feature of a creative environment. The careful creation and management of such partnerships are crucial to ensure sharing of practice and creation of knowledge for longer-term impact.

3.9. Findings against research questions 2–4

In this article we have chosen to focus on evidence relating to the main research question. A brief summary of findings relating to the other questions is presented below:

What evidence in the literature is there for the impact of creative school learning environments on the educational development of children and young people, taking into account gender and cultural or socio-economic contexts?

- There is reasonable evidence from six studies (Craft, Chappell, & Twining, 2008; Freund & Holling, 2008; Grainger et al., 2005; Kendall, Morrison, Sharp, & Yeshanew, 2008, Whitebread, Coltman, Jameson, & Lander, 2009; Schacter, Thum, & Zifkin, 2006) of positive impact on pupils' academic attainment and progress from immersion in creative environments, particularly in the case of lower-achieving students.
- There is reasonable evidence from four studies (Bancroft et al., 2008; Craft et al., 2008; Cremin et al., 2006; Wood & Ashfield, 2008) for increased levels of pupil motivation, engagement, enthusiasm, enjoyment, concentration, attention and focus associated with creativity initiatives.
- Four studies across a range of countries (Cremin et al., 2006; Webster & Campbell, 2006; Haigh, 2007; Whitebread et al., 2009) provide reasonable evidence to suggest that creative learning environments can enhance the creative thinking of students, leading to a greater level of originality on open tasks, particularly where they are given 'incubation' time.
- There is reasonable evidence from four studies (Bancroft et al., 2008; Galton, 2010; Matthews, 2007; Whitebread et al., 2009) that creative learning environments can aid children and young people's emotional development and social skills.

What evidence in the literature is there for identifying specific roles of teachers which promote creative skills development in pupils?

- There is reasonable evidence from five studies (Cochrane, Cockett, & Cape, 2007; Davies, 2006; Grainger et al., 2005; Jeffrey, 2006; Wood & Ashfield, 2008) to suggest that 'creative' teachers adopt a positive stance towards learner engagement,

creativity and creative learning; that they take a 'long-term view' of a learner's potential; and that they continue to develop the skill and the professional knowledge to facilitate the development of pupils' creative responses.

- There is reasonable evidence from four studies (Bancroft et al., 2008; Burnard et al., 2006; Jeffrey, 2006; Sharp et al., 2008) that in order to develop their creativity teachers need to develop an awareness of learners' needs – including those associated with multiple intelligences and different learning styles – and involve them in the planning of their own learning.
- There is reasonable weight evidence from five studies (Braund & Campbell, 2010; Cochrane et al., 2007; Jeffrey, 2006; Schacter et al., 2006; Sharp et al., 2008) to suggest that creativity is associated with a shift towards being 'less prescriptive' in lesson planning (i.e. allowing more room for individual pupil responses).
- There is reasonable evidence from four studies (Braund & Campbell, 2010; Davies, 2006; Waite, Rogers, Nichols, & Evans, 2009; Wyse & Spendlove, 2007) of the factors tending to inhibit teachers' adoption of creative pedagogies, including the pressures of the 'performativity culture', time, curriculum, assessment and the level of professional development undertaken.

What evidence in the literature is there for ways in which teachers can best be supported to develop the skills and confidence to facilitate creative learning environments?

- There is reasonable evidence from three studies that the presence of a 'professional learning culture' within or between schools – which provides opportunities for teachers to take risks in a supportive environment – greatly enhances effective sharing (Downing, Jones, Lord, Martin, & Springate, 2007; Thomson & Sanders, 2010; Troman et al., 2007).
- There is strong evidence from six studies (Bolden, Harries, & Newton, 2010; Bore, 2006; Cremin, 2006; Crow, 2008; Hong, Hartzell, & Greene, 2009; Newton & Newton, 2009) to suggest that teachers hold a range of preconceptions about creativity and pedagogy which need to be unpicked as part of the professional learning process.
- There is reasonable evidence from four studies (Loveless, Burton, & Turvey, 2006; Mullins, 2007; Sharp et al., 2008; Wyse & Spendlove, 2007) that the involvement of external partners is important to facilitate the productive dialogue, co-construction of knowledge and reflection on practice needed to help teachers construct creative learning environments.

4. Conclusions and recommendations

The review highlighted several key characteristics of the environments and conditions that are most effective in promoting creative skills in children and young people. These include the physical environment, availability of resources/materials, use of the outdoor environment, pedagogical environment, use of other environments beyond the school, play based learning, effective and flexible use of time, and relationships between teachers and learners. The common features seen to be promoting creativity were flexibility in the physical and pedagogical environment, learners having control of their learning and ownership of the activity, varied physical environment at school and elsewhere such as museums, flexible use of time (including time beyond school and curriculum boundaries), and allowing pupils to work at their own pace without pressure. An important feature of the pedagogic environment that can promote creativity is the nature of the relationship between teachers and learners, including high expectations, mutual respect, modelling of creative attitudes, flexibility and dialogue. There is strong evidence that pupil creativity is closely related to opportunities for working collaboratively with their peers, which can productively extend to peer and self-assessment.

There is evidence that suggests an impact of creative learning environments on learners' academic achievement; increased confidence and resilience; enhanced motivation and engagement; development of social, emotional and thinking skills; and improved school attendance. The evidence from the review suggests that teacher skills and attitudes; a willingness to act as a role model; awareness of learners' needs; flexible approaches to curriculum and lesson structure; particular types of classroom interaction with pupils, together with the use of ICT and assessment, are important components of teaching for creativity. The evidence also highlights the importance of school culture in supporting or impeding creative practice; the need to elicit teachers' prior conceptions of creativity in education; teachers taking on the role of learners to develop their own creativity; working co-constructively with a mentor or coach – which may be a creative professional from an outside agency; and the importance of teachers undertaking action research and reflection on their own classroom practice.

Although we have endeavoured to synthesise relevant findings from as wide a range of eligible literature as possible, the evidence presented above may be incomplete for the following reasons. Firstly, significant pieces of research may have been missed in our initial trawl. Whilst the six researchers searched different sources and types of documentation according to the table above and using the search terms agreed with LTS, there is a possibility that relevant studies may not have been picked up using these sources or terms. We did find a measure of overlap between the literature found by different researchers, which gives us some reassurance that key studies were surfacing through several routes. Secondly, the date or geographical criteria placed on the search may have excluded significant studies, either published before 2005 or in a country not included. This is inevitable in a carefully scoped and bounded study such as this, but older studies may either no longer be relevant or may have been picked up in previous reviews such as those undertaken by Loveless (2002, 2007). In relation to the geographical restriction, a great deal of literature on creativity in education has emerged from the USA, but this has tended to adopt psychological definitions with positivist, experimental approaches which would be more culturally appropriate to the USA school system than that in Scotland. However, it is important to acknowledge that the weight of evidence of these studies might be strong. Thirdly, the screening and quality and relevance appraisal processes may have

excluded relevant studies. Certainly, for most of the research questions, the total of 210 pieces of literature found through the trawl were reduced substantially during screening. However, we ensured this process was undertaken collaboratively by the team and the decisions taken checked with LTS, to enhance reliability in the decisions taken with an external check built in. Finally, we may have missed significant findings within the studies selected for review. Whilst each piece of eligible literature has been mapped and summarised before synthesis into this report, we cannot entirely discount this possibility.

4.1. Recommendations for policy and practice

Although this review was undertaken to inform the Scottish curriculum, our findings are applicable internationally. On the basis of the evidence from the studies we selected for inclusion, our recommendations to support schools and teachers in developing creative learning environments for children and young people are as follows:

1. Present to schools the evidence of impact on pupil attainment and attitudes of creative learning environments outlined above.
2. Clearly distinguish between the roles of 'critical events' (projects, themed weeks, work with outside agencies) and on-going good classroom practice in the establishment of creative environments, since there is evidence from the review that much 'creative' work in schools is associated with special initiatives which do not necessarily influence ongoing practice – therefore there needs to be an emphasis upon everyday classroom creative environments.
3. Provide guidance to schools on the establishment and maintenance of partnerships with arts and other community organisations to enhance the creative environment and facilitate CPD, so that such partnerships have a long-term impact on pedagogy.
4. Provide support to teachers to focus upon the processes of creative skills development rather than outcomes, as review evidence suggests that external pressures in terms of achievement or exhibition deadlines can tend to distort creative relationships in the classroom and hence disturb creative learning environments.
5. Issue guidance to teachers on the flexible use of physical environments – including the outdoor environment, time and planning to best support children and young people's creativity.
6. Raise teachers' awareness of the importance of positive respectful relationships with the learners whereby they model creative attitudes, are flexible and encourage dialogue.
7. Teachers should provide pupils more control of their learning and opportunities to work at their own pace and with peers.
8. Commission CPD for teachers that elicits their preconceptions of creativity; stimulates dialogue around models of creativity, teaching and learning; provides them with opportunities to develop their own creativity and engages them in reflective professional enquiry into their own pedagogy.

4.2. Recommendations for research

Whilst this review has provided some evidence against the research questions, we have been surprised by the general lack of an empirical base in relation to creative learning environments, given the attention of governments, schools and academics across the world over the past decade. The relatively small number of studies used in the actual review reflects the lack of an empirical evidence base in what is sometimes seen as the relatively 'soft' and hard-to-define area of creativity and education. Much literature in this area tends to be either philosophical, anecdotal or polemical, which has led to a strong belief about the effectiveness but significant evidence gaps in relation to the research questions underpinning this review. For example the literature has surprisingly little to say about cross-curricular approaches in fostering pupils' creative skills, nor the impact upon pupils from different socio-economic, ethnic or cultural groups. With these in mind we offer the following recommendations:

1. Future research in this area needs to be methodologically sound and transparent which can provide clear evidence of the effectiveness of creative learning environments.
2. It is important to undertake research which explores the links between the effectiveness of creative approaches and diversity of the learners including ethnicity, socio-economic status, etc.
3. Further research is required that can clearly establish the impact of creative learning environments on pupils' attainment, motivation, and emotional and social skills. Research designs that capture the baseline prior to the introduction of creative curriculum or environment might help in establishing this evidence clearly.
4. It is important to undertake participatory studies that capture the voices of learners and gives them ownership of the research process in line with the key characteristics of a creative environment.
5. Cross-sectional and longitudinal studies should be undertaken that can identify the impact across school years and ages as well as the short and long term impact of creative environments in schools.
6. It is important to undertake further studies that explore the impact of the organisational culture and supportive environment on teachers' willingness and readiness to undertake and sustain creative activities in schools.
7. Research needs to be conducted to identify the best ways of building up on one-off critical creative events so that they can be embedded into the day to day curriculum of the schools.

8. A wider international literature review should be undertaken that takes cognisance of empirical studies, including those with more experimental research designs. It might be useful to undertake this as an international collaborative project so that the researchers can present their unique insights about the systems in their own countries but also a unique perspective on those in other countries.
9. Further research is required to identify the link between curricular areas and creativity, with a view to identifying the best ways of embedding creativity in a cross-curricular context.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.tsc.2012.07.004.

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