Learning environments that support student creativity: Developing the SCALE☆

Carmen Richardson[a,*], Punya Mishra[b]

[a] *Michigan State University, College of Education, East Lansing, MI 48824, United States*
[b] *Arizona State University, Mary Lou Fulton Teachers College, Tempe, AZ 85281, United States*

ABSTRACT

In this article, we report on the creation of an instrument that offers educators a practical tool to aid in the design of learning environments that support student creativity. Based on our literature review, classroom observations, and administrator feedback, three key areas were found to support student creativity: Learner Engagement, Physical Environment, and Learning Climate. These three areas create the foundation of the SCALE: Support for Creativity in a Learning Environment, a tool that provides educators with specific examples for the support of creativity. The 14 items of the SCALE focus on learning tasks, classroom practices, interactions between students and teachers, and the physical setting and availability of resources. The empirical study of creativity in education has grown in the past 10 years as experts have called for schools to prepare students with the skills that enable them to be innovative and creative. However, much of what has been produced has not been practical or immediately useful for educators because the trend has been to focus on behavior or easily measurable aspects of creativity rather than creative potential. The SCALE offers one way of filling this gap.

1. Introduction

Creativity has been identified as a key educational goal and essential 21st century skill that should be supported in schools (Chan & Yuen, 2014; Robinson, 2011; Wagner, 2010). In recent years, scholars and educators alike, have stressed the importance of preparing students for a future that will demand complex problem solving and creative thinking (Wagner, 2010). The type of thinking and working that will be needed is not the industrial behaviors and skills that our school system was designed for and still promotes. Sir Ken Robinson (2011) says that the very future of our civilization hinges upon the creative capabilities of young people and that one of the most important things we can do in schools is foster creativity. With this need to support student creativity, there is a need to assess how learning environments can help educators achieve this goal.

Educators and researchers, particularly in the United States, describe the current state of education as one of standardization and conformity, which is rooted in the compulsory curriculum and high stakes testing of the last 20 years. This has contributed to an environment where teachers are merely technicians focused on improving student scores (Craft, 2006). In recent years there has also been increasing pressure on teachers to support the development of 21 st century skills such as communication, problem solving, and creativity (Wagner, 2010; Robinson, 2011). The constraints of curriculum, time, and space provide discouragement of creativity in schools and lead many to see creativity as something that belongs in art or dance class rather than as a transdisciplinary practice that

---

impacts and is important to all aspects of learning (Beghetto, 2010). The challenge in education is overcoming the constraints of creativity, noted above, and supporting this much needed 21st century skill. This leaves many educators in a quandary, asking: In this system of standardization, how can creativity be supported in classrooms?

Dalke, Cassidy, Grobstein, and Blank (2007) describe teaching that supports creativity as an emergent pedagogy; It is a re-conceiving of the role of a teacher that is less rigid, less structured, more hands-on, and involves multiple ways of learning. In recent years, the study of creativity in educational settings has grown (Beghetto, 2010) but there have been few studies that have thoroughly explored teachers' creativity- supporting practices (Dababneh, Ihmeideh, & Al-Omari, 2010). It is critical to investigate the ways teachers can create environments that support creativity in education because, while many teachers may believe developing students' creativity is important, they may lack the pedagogical strategies to do so (Chan & Yuen, 2014). Much of the existing research in the field of creativity has focused on individual, psychological, and/or personality variables, which, while important, offer minimally practical advice to educators (Beghetto, 2010.) The intentional design of learning environments is an area that has not seen much attention in the educational research literature, yet it is profoundly important to supporting creativity in children (Beghetto & Kaufman, 2014).

In this article, we describe the development of the SCALE − Support for Creativity in a Learning Environment– a tool for teachers and administrators that assists in identifying and measuring the ways in which a learning environment supports student creativity. Through this, we aim to enrich the research around the design of educational environments that support creativity in students, and to guide practitioners seeking to evaluate and improve learning environments for creativity. We begin this article with a look at the study of creativity in education, continue with a description of the process of the development of the SCALE, and end with a discussion of the final version of the instrument and the potential for its use in future research and practice.

1.1. Theoretical background

In the last 50 years there has been an increase in the empirical study of creativity (Runco & Albert, 2010). A recurring problem with research in the field is the lack of a standard definition of the term (Plucker & Makel, 2010). Many articles on creativity lack a specific definition of the very concept being studied. An essential first step is defining the term (Das, 2012; Plucker, Beghetto, & Dow, 2004; Robinson, 2011). Two common components of many definitions of creativity are *originality* and *usefulness* (Runco & Albert, 2010). Originality is seen as the most important aspect of creativity because something must be novel or unique in some way to be considered creative (Runco & Jaeger, 2012). If originality is not present then the process, product, or idea in question is common or mundane. Usefulness is also included in most definitions of creativity because it refers to the need for something to be effective or valuable (Runco & Jaeger, 2012). This usefulness could, for instance, come in the form of emotional value of a piece of art or could be the pragmatic value or effectiveness of a product's design. Mishra, Henriksen, and the Deep Play Group (2013) built on these two components by stating that creativity has three elements: N.E.W. (Novel, Effective, and Whole). By adding the third component of whole, Mishra et al. stress the importance of context (Mishra et al., 2013). Creative products and behaviors are those that are meaningful within a context.

In his seminal work in the field, Rhodes' (1961) Four Ps framework for creativity (*Person*, *Process*, *Press*, and *Product*) continues to provide a guide to thinking about and conducting research on creativity. *Person* refers to the individual that is performing the creative act. This includes the personality and various traits of the individual as well as the individual's creative potential (Kozbelt, Beghetto, & Runco, 2010). *Process* refers to the creative thinking processes that occur during acts of creativity (Kozbelt et al., 2010). *Process* involves the learning, thinking, and communication of ideas that goes on during creative endeavors. *Products* include the physical manifestations of creativity (i.e. works of art, inventions, machines, writings, processes, etc.) (Kozbelt et al., 2010). Finally, *Press*, often called environment, setting, or climate in the literature, is the ways in which the context or specific setting support creativity (Kozbelt et al., 2010). This includes the psychological, pedagogical, and physical factors of any place where learning occurs, including virtual and non-traditional spaces (e.g. museums or gardens) (Jindal-Snape et al., 2013). While all four aspects of Rhodes (1961) framework play a role in understanding creativity, it is the creative environment, or *Press*, that is the focus of our study.

The environment of learning is essential to the support of creativity. Researchers have found that passion based learning, co-creation and collaboration, and an atmosphere in which ideas are valued and mistakes are seen as a necessary part of the learning process are supportive of creativity (Chan & Yuen, 2014). Other creativity supporting activities include exploration with new media technologies, fantasy play, outdoor play, model making, building, planning, and design (Jindal-Snape et al., 2013). Students in creativity supporting atmospheres have been shown to have stronger senses of personal success, higher GPA's, stronger reasoning ability, increased levels of confidence, increased resilience, increased motivation and engagement, and enhanced critical thinking and problem-solving skills (Jindal-Snape et al., 2013). It is important to foster an atmosphere of cooperation where learners are allowed to take sensible risks and make mistakes. A learning environment is a community and the values of the community influence the behaviors of the members − teachers and students influence each other towards the support or constraint of creativity (Peppler & Solomou, 2011).

The context in which creativity exists and the design of the environment in that context has been shown to be a key support for creativity. Environment refers to the set up and design of the physical space, the relationships one has, as well as the resources and supports that are available (Beghetto & Kaufman, 2014). While creativity research overall is on the rise, the majority of efforts to measure creativity have not focused on the impact of environments. In a review of creativity instruments, Henriksen, Mishra, and Mehta (2015) found that only 3% of instruments measured the environmental support of creativity. This is a surprisingly small number given the potential impact that an environment has on creativity (Beghetto & Kaufman, 2014). In addition, less than one fifth of the total measures reviewed by Henriksen et al. (2015) were developed for students in grades K-12 (ages 5–17 years). While there

has been clear articulation of the importance of creativity in grades K-12, little empirical research has been conducted. The design of classroom environments and types of work that students engage in within such spaces are core aspects of teaching. As opposed to psychological studies of creativity, which have dominated creativity research (Henriksen et al., 2015), creative learning environments are an area in which teachers have control of variables that directly impact learners (Lilly & Bramwell-Rejskind, 2004).

One of the key roles of a teacher is fostering the creative potential of students (Eckhoff, 2011). The current focus of education, to have students primarily engaged in teacher led activities and uniform tasks, is highly constraining to creativity (Beghetto, 2010; Plucker et al., 2004). In an investigation of kindergarten children's creativity, Dababneh et al. (2010) found that when teachers avoided recognizing students' ideas, were not tolerant of mistakes, and used an abundance of worksheets, students were less likely to be creative. These findings align with Hennessey and Amabile's (1987) description of behaviors that limited creativity, which also included giving rewards for work and using an excessive amount of teacher surveillance.

The remainder of this article is organized to provide a description of the process that was undertaken to create the SCALE. The research process was conducted in two phases. The first phase involved a review of literature and classroom observations to inform a first draft of the instrument. Nine themes emerged from this process and were used to create the first draft of the SCALE. This draft was then piloted in classrooms by a team of administrators and the first author so that it could be tested in authentic educational settings. A final focus group and round of feedback was conducted and the final version of the SCALE was completed. The final version of the scale is available in Appendix A. The next section includes a description of the literature review, classroom observation, and first version of the SCALE. The final version of the SCALE is then shared as is the process that was undertaken to pilot, critique, and revise it.

2. Method and results: developing the SCALE

2.1. The process

The development of the SCALE was conducted in two phases (see Fig. 1). Phase one began with a literature review to inform the content of the instrument. Classroom observations with peer-identified (by an anonymous survey) creativity supporting teachers were then conducted. Themes gleaned from both the literature review and the classroom observations informed a first draft of the SCALE.

In Phase 2 an administrative team from the participating school provided feedback on the first draft of the SCALE. The instrument was revised based on the feedback and then piloted with four teachers in the elementary school. This involved two teachers that were identified in the survey and two other teachers selected at random from those that were not identified by their peers. Major feedback and suggestions for revision on both the process and instrument itself were garnered from the administrators with a concluding focus group discussion. The final version of the instrument was then created (Appendix A).

2.2. Literature review

The first step in the development of the SCALE involved an analysis of relevant literature. Web searchers included a range of databases, including: Google Scholar, PROQuest, and Science Direct. In addition to the database searches, the following prominent creativity journals were searched: *Thinking Skills and Creativity*, the *Creativity Research Journal*, the *Journal of Creative Behavior*, and the *International Journal of Creativity and Problem Solving*. The search was limited to education research literature. Limiting the search to these databases and journals aligned with the purpose of finding articles that focused on the support of creativity in education. Search terms included: Creative/Creativity AND teacher, children, student, school, environment, climate, pedagogy, education, learning, conditions, and teaching. These terms were chosen because they broadly cover the range of articles that would focus on the topic of creativity in education and more specifically on the support of creativity in a classroom. Over 200 articles were examined for possible inclusion in the literature review. Only articles that directly related to the research purpose: environmental support of creativity in educational contexts, were retained.

The literature search process resulted in a total of 33 articles, 5 of which were reviews of the educational research literature. The first author went through a process of thematic analysis to identify themes among the articles. This process, based on Glesne (2011), involved reading each article a number of times while noting and coding important themes then constantly comparing those to themes from the other articles during further readings. The themes that occurred repeatedly in the literature informed the initial draft of the instrument. These themes are listed in Table 1 and described below.

Phase 1:
1. Literature Review
2. Classroom Observations
3. SCALE First Draft

Phase 2:
1. Administrative Feedback
2. SCALE Revision
3. SCALE Pilot
4. Focus Group
5. SCALE Final Version

Fig. 1. SCALE Development Process.

Table 1
Literature Review Themes and Supporting Studies.

Theme	Supporting Studies
1. Tasks are open ended or involve choice	Cochrane and Antonczak (2015), Cole et al. (1999), Craft (2001), Cress and Holm (2016), Cullingford (2007), Davies et al. (2013), Dababneh et al. (2010), De Souza Fleith, 2000; Driver (2001), Eckhoff (2011), Fasko (2001), Hong et al. (2014), Hung, 2015; Hunter et al. (2007), Jeffrey and Craft (2004), Kangas, 2010, Kazerounian and Foley (2007), McLellan and Nicholl (2013), Meyer and Lederman (2013), Olivant (2015), Robinson and Kakela (2006); Sawyer (2015), Warner and Myers (2009)
2. Tasks are real life, authentic, or relevant	Batchelor and Bintz (2013), Craft et al. (2014), Cress and Holm (2016); Cochrane and Antonczak (2015), Davies et al. (2013); De Souza Fleith, 2000; Eckhoff (2011), Esquivel (1995), Fasko (2001), Hong et al. (2009), Hung, 2015; Kangas, 2010, Jeffrey and Craft (2004), Kangas (2010), McLellan and Nicholl (2013), Peppler and Solomou (2011), Sawyer 2015
3. Students are interested, enthusiastic, or intrinsically motivated	Batchelor and Bintz (2013), Craft et al. (2014), Craft et al. (2014), Cress and Holm (2016), Cullingford (2007), Cochrane and Antonczak (2015), Davies et al. (2013); De Souza Fleith (2000), Eckhoff (2011), Esquivel (1995), Fasko (2001), Forrester and Hui (2007), Hong et al. (2014), Jeffrey and Craft (2004), Kangas (2010), Kazerounian and Foley (2007), Peppler and Solomou (2005), Robinson and Kakela, 2006
4. Mistakes are accepted, risk-taking is supported	Aljughaiman and Mowrer-Reynolds (2005), Batchelor and Bintz (2013), Beghetto (2007), Chan and Yuen (2014), Cole et al. (1999), Craft (2001), Cullingford (2007), Davies et al. (2013), Dababneh et al. (2010), De Souza Fleith, 2000; Driver (2001), Eckhoff (2011), Esquivel (1995), Forrester and Hui (2007), Kazerounian and Foley (2007), McLellan and Nicholl (2013), Olivant (2015), Sawyer (2015), Watson (2012)
5. Novel idea generation and development is encouraged	Aljughaiman and Mowrer-Reynolds (2005), Batchelor and Bintz (2013), Beghetto (2007), Chan and Yuen (2014), Cress and Holm (2016), Cole et al. (1999), Craft et al. (2014), Craft et al. (2014), Dababneh et al. (2010), Hong et al. (2014), De Souza Fleith, 2000; Driver (2001), Esquivel (1995), Fasko (2001), Forrester and Hui (2007), Hung (2015); Jeffrey and Craft (2004), Kangas (2010), Kazerounian and Foley (2007), McLellan and Nicholl (2013), Meyer and Lederman (2013), Peppler and Solomou, (2005), Robinson and Kakela (2006), Sawyer (2015), Watson (2012)
6. Resource availability	Claxton, Edwards, and Scale-Constantinou (2006), Craft (2001), Craft et al. (2014), Davies et al. (2013), McLellan and Nicholl (2013), Warner and Myers (2009), Watson (2012)
7. Physical Environment	Chan and Yuen (2014), Claxton et al. (2006), Davies et al. (2013), Eckhoff (2011), Forrester and Hui (2007), Hong et al. (2009), McCoy and Evans (2002), Robinson and Kakela (2006), Warner and Myers (2009)
8. Atmosphere of care, tolerance, and respect	Chan and Yuen (2014), Chang, Hsu, and Chen (2013), Claxton et al. (2006), Cole et al. (1999), Cress and Holm (2016), Davies et al. (2013), Dababneh et al. (2010), De Souza Fleith (2000), Driver (2001), Esquivel (1995), Fasko (2001), Forrester and Hui (2007), Meyer and Lederman (2013), Olivant (2015), Peppler and Solomou, (2011), Robinson and Kakela (2006); Sawyer (2015), Watson (2012)
9. Teacher as guide, facilitator, or co-learner	Craft (2001), Cress and Holm (2016), De Souza Fleith, 2000, Davies et al. (2013), Driver (2001), Esquivel (1995), Kangas (2010), Sawyer (2015)

In over half the articles reviewed, those activities that were described as *open-ended or involved choice* were seen as essential to the support of creativity. Research has demonstrated that freedom of choice leads to higher levels of intrinsic motivation and supports creativity (Cole, Sugioka, & Yamagata-Lynch, 1999). In addition to open-ended tasks it is also imperative that teachers use open-ended questions to engage students in rich discussions about content as well as to ensure that students answer openly and are not searching for a correct answer or one they think the teacher expects (Cullingford, 2007).

Tasks described as *authentic, real life*, and *relevant* to students' lives arose repeatedly during the analysis of activities that supported students' creativity. Students should have opportunities to engage as "professional inquirers" in a field of study in order to have a rich and meaningful learning experience (Fasko, 2001, p. 322). In a study on how creative ideas emerge and grow within a community, Peppler and Solomou (2011) found that individuals are influenced by their peers during creative acts and that creativity is a collaborative endeavor occurring within the constraints of a community's values. Other relevant learning experiences might involve passion, inquiry (Jeffrey & Craft, 2004), or in other ways encourage multiple ways of knowing and modes of investigation (Robinson & Kakela, 2006).

Learner-centered activities support *intrinsic motivation* and *interest* and in turn do much to support creativity. Robinson and Kakela (2006) described this approach as being central to their attempt at creating a classroom environment that promoted interest, interaction, and trust. The educators ensured that their students knew they were valued and trusted, putting an emphasis on the students' contribution to the class. In Cullingford's (2007) exploration of children's perception of creativity in the classroom he argued that young children's styles of learning are the same as those styles employed by creative artists. Creativity should be the very basis of the work that students do.

Encouraging *mistakes* and *risk-taking* were also seen as essential to the support of creativity. In many traditional classrooms, novel ideas are not well received (Beghetto, 2007). The numerous curricular and environmental constraints can cause students to fear sharing unique ideas. Some teachers have been found to devalue independent thought (Craft, 2001) by viewing unexpected responses as disruptions, thereby identifying ideal learners as those who conform. On the other hand, teachers recognize the importance of encouraging unique ideas and see this as a way to promote creativity and deeper understanding (Beghetto, 2007; Esquivel, 1995). An environment that supports creativity is an environment in which people feel safe to take risks and recognize that mistakes are a necessary part of learning (Chan & Yuen, 2014).

Supporting *novel ideas*, and giving time for *idea development,* discussion, and reflection also appeared repeatedly in the review. Beghetto (2007) studied classroom discussions and discovered that teachers tend to prefer relevant responses over unique ones with a substantial portion of the teachers in his study regarding unique answers as disruptive or distracting. There is some evidence that teachers who believe in the importance of creativity are more likely to create an environment where novel ideas are appreciated (Chan & Yuen, 2014). However, it is not enough to simply encourage novel ideas. Students must be given time to develop ideas (Esquivel, 1995), as this allows them to explore, broaden their understandings, and make connections (Olivant, 2015). Higher level questioning is one strategy that encourages deeper thinking and reflection and often leads to the development of novel ideas, forcing students to get past the questions in which they can simply follow a recipe (Craft, Hall, & Costello, 2014).

The types and availability of *resources* is a key element in the support of creativity. Resources serve as the infrastructure of creativity (Warner & Myers, 2009) and a wide variety of resources, digital and non-digital, can encourage the articulation of creative expression (Craft, 2001) and help fuel creative solutions to problems. These may include print and non-print media, examples of work, access to a variety of supplies, and access to books or online databases (Peterson & Harrison, 2005).

The *physical space*, including furniture and workspaces, play an important role in the support of creativity. Hong, Hartzell, and Greene (2009) noted that when teachers used the space to provide places for collaborative work this supported student creativity. When the environment is filled with cues and students understand how to respond to them, this can also support creativity (Warner and Myers, 2009). McCoy and Evans (2002) found that environments that were highly visually interesting were also high in perceived support of creativity.

There was also a common need for a community or atmosphere that is *respectful, caring, and tolerant of differences*. A teacher must be able to form good relationships and have an open form of communication with his or her students while genuinely accepting students for who they are and recognizing their individual interests (Esquivel, 1995; De Souza Fleith, 2000). The atmosphere should be collaborative and respectful.

In an environment that supports creativity teachers must play a critical role as *facilitators, co-learners*, or *guides* that question, learn, and experiment alongside their students. Teachers must realize that they are significant gatekeepers in the development of their students' creative potential (Forrester and Hui, 2007). Driver (2001) investigated the perceptions of business students and found that support of creativity was not related to any specific content or class; it was related to pedagogy, the role that teachers play to guide their students through the types of experiences that support creativity.

2.3. Classroom observations

In addition to the literature review, classroom observations with peer-identified creativity supporting teachers informed the initial design of the SCALE. An elementary school in a rural part of the United States at which the first author worked was used as the site of the observations. An anonymous digital questionnaire was created to identify the teachers that were recognized by their peers as being most supportive of student creativity. The survey was sent to the entire faculty (N = 26) at the school. The survey began by stating that creativity can occur across all content areas and can be supported by pedagogy, task design, student engagement, the physical space, and more. Teachers were instructed that they could include their own names. A total of 17 teachers were recommended as being supportive of student creativity. The top four teachers together received 52% of the recommendations. The four teachers with the most recommendations (ranging from 8 to 12) from their peers were chosen to participate in this research.

Two 40-min classroom observations were conducted in each of the two teachers' classrooms with the most recommendations. The purpose of the classroom observations was to record the day-to-day activities of the class. Field notes were taken by the first author with the goal of developing a holistic understanding of the classroom that was as objective and accurate as possible (Creswell, 2012). The patterns, categories, and themes extracted from the observations were done from the bottom up by organizing the data into increasingly more complex units of information to ensure that meaning was observation driven and patterns and themes were derived from experiences (Creswell, 2012). This process of data organization was modeled on Glesne's (2011) description of thematic analysis. It began with multiple readings of the data with the purpose of trying to determine what was at the "core" of the data (p. 187). A spreadsheet was created that contained cells of data. The cells of data were then compared and data that was related was synthesized and then compared to the themes that arose from the review of literature. This pattern-finding process of analysis resulted in the list of elements described below.

Both teachers emphasized the importance of *student choice* with either providing an *open-ended* task or time throughout the lessons in which students had control over which direction to take their work. This finding supports literature review theme 1. For example, in Classroom A, the students worked on an integrated social studies and art project where they looked at the symbols of indigenous cultures, discussed their meaning, and then created their own symbols to be represented in their own art pieces.

Idea development through reflection and questioning, supporting literature review theme 5, was also seen in both classrooms during all four observations as teachers purposefully encouraged students to think about their choices, reflect on their work, and make connections to skills and concepts that had been discussed in previous lessons. The majority of the teachers' time was spent in various areas of the room conferencing with individuals or groups of students rather than at the front of the room lecturing the entire class.

Resources and supplies (literature review theme 6), including technological resources, were readily available for students to use in both classrooms and students were encouraged to work in the area of the room that was most comfortable for them. In classroom A, there were two tables filled with paper, markers, crayons, books, printed examples, and other supplies. The teacher in classroom B used a variety of technology tools throughout her lessons. In both rooms students were not constrained to their individual desk but rather free to work in a *variety of spaces* (literature review theme 7).

In both classrooms, there was an *atmosphere of friendliness* and collaboration (literature review theme 8) that permeated the space.

Students were friendly towards each other and the relationship between the teacher and the students was one of kindness and respect. The teachers in both classrooms played the role of a *guide or facilitator* (literature review theme 9) helping students develop and articulate their own ideas. The teachers in both classrooms also deliberately discussed the usefulness of *mistakes as learning experiences* (literature review theme 4) and praised ideas that students offered that were novel or unique. When the teacher in classroom A heard a student suggest a new idea, the teacher supported the idea and encouraged the student to pursue it by asking questions about how to incorporate it in his work. In classroom B, the teacher exhibited similar behaviors explaining the value of the uniqueness of a student's approach to the assignment. During all four observations, the students showed *enthusiasm* and *interest* (literature review theme 3) in the tasks at hand.

Overall the elements described above provide support for the findings of the literature review. This was not expected by the first author, who conducted the observations with an open mindset and a goal of recording classroom behaviors and interactions in general rather than looking specifically for the themes identified in the literature review.

3. Findings

3.1. SCALE version one

The themes garnered from the results of the literature review and classroom observations were used to create the first version of the SCALE. In addition, the design of the SCALE was informed by the format and design of The Reformed Teaching Observation Protocol (RTOP) (Piburn & Sawada, 2000). The RTOP was developed by the Arizona Collaborative for Excellence in the Preparation of Teachers. It is an observational instrument designed to measure reformed teaching in the areas of Lesson Design and Implementation, Content, and Classroom Culture. It is designed to measure many 21st century skills and so the phrasing and types of questions were used as models for the SCALE.

The Three-Minute Classroom Walk-Through (Poston, Downey, Steffy, & Frase, 2004) was also used to inform the SCALE. The purpose of the process is to provide ongoing support, professional development, and coaching by gathering information about the curriculum, pedagogy, and environment of the classroom during observations (Poston et al., 2004). The Three-Minute Walk-Through process involves two key ideas that translated to the SCALE: 1) It is short, focused, and informal. 2) It is not a time to evaluate the teacher but rather a time to gather information about practice (Poston et al., 2004). These core ideas began as important pieces in the SCALE and remained important throughout the revision process.

The first draft of the SCALE was organized into three categories: Physical Environment; Learning Climate; and Learner Engagement (Table 2). The administrative team went through a process of organizing and re-organizing the themes from the literature review and the classroom observations. The goal was to present the information in a way that would make it feasible for an observer to focus on two or three broad and important aspects of the learning environment, keeping the observation focused. After analyzing the themes, they were separated into the three categories named above so that an observer could keep in mind that he or she was viewing, on a large scale, three broad categories. These three categories were also formed by the team with the hope that as the instrument is used, patterns of data might allow one to see that a teacher might be strong in one area (i.e. the physical environment) but need support in another (i.e. learning tasks).

The draft contained 19 items measured with a 4 point Likert scale (0 − no evidence; 1 − minimal evidence; 2–moderate evidence; 3–high evidence). A 4 point Likert scale was used, rather than a 3 or 5 point, because research has shown that the inclusion of a middle option can be seen as a dumping ground for respondents who are ambivalent, indifferent, or unsure and could potentially bias the results (Kulas & Stachowski, 2009; Kulas, Stachowski, & Haynes, 2008). The evidence that is obtained during observations and reported on the SCALE includes any observable features of the physical environment, observable behaviors of teachers and learners, as well as communication that is seen or heard by the observer during the course of the observation. For example, while

Table 2
Initial SCALE Components.

Physical Environment	Learning Climate	Learner Engagement
1. A variety of resources are available to students. 2. Examples of student work appear in the space. 3. A variety of work areas are available to students. 4. The furniture is comfortable and flexible allowing for multiple arrangements and configurations.	1. Messiness and noise are tolerated. 2. Students are involved in active discussions among themselves and with the teacher. 3. Students are members of a learning community that is caring and respectful. 4. The teacher is a co-learner, explorer, and resource person supporting students. 5. The atmosphere is collaborative and friendly. 6. Differences are valued.	1. Students are involved in tasks that are open-ended and/or involve choice. 2. Students are involved in real life/authentic tasks that may include inquiry, project/problem-based learning, and interdisciplinary tasks. 3. Students are encouraged to use multiple perspectives/viewpoints or alternative modes of investigation/problem solving. 4. Mistakes and risk-taking are encouraged. 5. Students are intrinsically motivated. 6. Students are given time for the development of ideas and for creative thinking. 7. Multiple ways of knowing and learning are encouraged. 8. Students are reflective about their learning. 9. Students work at their own pace. Time is used flexibly.

using the instrument, an observer might take note of the spaces in which students are working by writing down that the entire class is on the carpet being led by the teacher, or that small groups of students are working in teams in various parts of the room.

Feedback on the first version of the SCALE was gathered from the administrative team comprised of an instructional coach and curriculum coordinator who were responsible for teacher observation and professional development at the school. The instructional coach and curriculum coordinator met with the researcher. Each item was reviewed, discussed, and then changed if the group felt it was necessary.

The changes made to the first draft involved rewording, combining, and deleting items. In Physical Environment, items one, two, and three were retained without changes because they were judged by the administrative team as being essential. Item four was re-worded as it was deemed by the administrators that the furniture being "comfortable" was not necessarily important for the support of creativity. Item one in Learning Climate was deleted as it was deemed un-needed by the administrative team. The phrase "that deepen their understanding" was added to item two to ensure that the discussions were on topic and supported relevant thinking. Items three and four were re-worded for greater clarity. Items five and six were deleted as they were covered in item three. In Learner Engagement, item one was retained as written, items two and three were re-worded to be more precise, shorter, and student centered. Item four was found to relate more to learning climate and was moved to that section. Item five was re-written to be more descriptive and observable. Item six was re-worded to be more descriptive and was combined with item eight. Item seven was removed as it is reflected in item three. Item nine was re-worded for greater clarity.

The second draft consisting of 14 items was used by the instructional coach and the curriculum coordinator in four classrooms. This included two classrooms that were identified in the initial survey (the 3rd and 4th most recommended) and two other classrooms, not identified by their peers in the survey and selected at random. The two classrooms not identified by their peers were included so the administrators could compare the results between those teachers recognized as being supportive of creativity and those that were not. The instructional coach and the curriculum coordinator used the instrument in two classrooms each. Each observation began with a meeting between the researcher and administrator to be re-familiarized with the instrument. The researcher then accompanied the administrators as they used the instrument to be able to gain instantaneous feedback on the use of the instrument. The researcher was able to note any need for change in protocol or design.

The intent of the pilot was not to examine the results of the observation, but rather to ensure that the instrument was usable in an authentic setting. So, while we will not discuss individual teacher results, we will report overall patterns and tendencies. The observations that were done in the two classrooms that were identified by their peers as being supportive of creativity scored higher on the instrument for all observers while the two classrooms that were chosen at random from those not identified by their peers scored lower. The observers used various designs of the instrument in order to decide on the final version. The variations included having the different components in different orders as well as a landscape view of the instrument that provided more room for taking notes.

Feedback and suggestions for revision on both the process and instrument itself was garnered from the administrators throughout the observations. The feedback was incorporated and was instrumental in the development of the guidelines for use. Minor edits were needed on the instrument items. As a final step the completed guidelines for use and SCALE were shown to the participating administrators for a final round of approval and feedback. The administrators approved the final instrument and suggested minor changes in the wording of the guidelines. The final version was created (see Appendix A) and is discussed in the following section.

4. Discussion and conclusions

4.1. The SCALE

The final version of the SCALE consists of 14 items in three categories: Physical Environment; Learning Climate; and Learner Engagement.

The Physical Environment includes items related to the space of the learning environment itself. The space should be open, containing furniture that is flexible, allowing for multiple spaces in which small groups of students can work together (Warner & Myers, 2009). Teachers should have a variety of resources and materials readily available for student use (Peterson & Harrison, 2005).

In Learning Climate, the relationship between teacher and student, the relationships among students, and the overall atmosphere of a classroom all play an integral role in the support of creativity. An atmosphere in which students communicate freely, accept and discuss new ideas, trust each other, and support taking risks is an ideal climate for the support of creativity (Craft, 2001; Esquivel, 1995; Peterson & Harrison, 2005). Creativity can thrive when there is a climate of community, care, and cooperation that emphasizes positive student and teacher relationships.

Learner Engagement includes the actual tasks that students are involved in. Tasks that support creativity involve active learning and exploration where all members of the environment are seen as co-learners and co-teachers, with an emphasis on the process and not the product. It is important to look at the actual tasks that students are engaged in rather than the objective or goal of the teacher because this may differ from the actual work students are doing.

During the development of the SCALE the administrators discovered there were multiple items that overlapped, especially among Learning Climate and Learner Engagement. These items were discussed individually by the administrative group. If the item in question focused more on relationships or interactions, it was placed in the Learning Climate category. If the item in question focused on the task or the way in which the learner interacted with the content it was placed in the Learner Engagement category. Ultimately the goal was to ensure that each item ended up in the category that most fit that item even though an argument could be made for an item to be in another category.

The administrators that piloted the instruments in the classrooms emphasized the importance of knowing and understanding the purpose of the instrument as well as being familiar with the items on the instrument before an observation is conducted. This resulted in a set of core beliefs and guidelines for use that are included in the final version of the instrument (Appendix A). It is imperative that the SCALE not be used for evaluative purposes. In recent years there has been an influx of evaluative instruments used to judge teacher effectiveness. The purpose of this instrument is not to evaluate, but rather to allow a teacher to reflect on what an observer notices about the support of creativity at a certain time.

4.2. Limitations, reliability and validity

The SCALE contains 14 items that help identify and measure the ways in which a learning environment supports student creativity. While a wide net was cast for articles, and the classroom observations supported the findings of the literature review, it is possible that articles relevant to the topic were not included in the review. This research is also limited by the fact that the classroom observations were conducted at the elementary school level. This risk was mitigated by the triangulation of data (via existing research, peer identified teachers, administrator focus groups) to inform the creation of the instrument as well as the fact that the articles in the literature review spanned a variety of educational settings; from early childhood through college. Additionally, creativity is a complex topic, and it is likely that the SCALE has not captured all the intricacies or potential supports for it in a variety of educational contexts.

Three data sources (the existing literature, teacher practice, and administrator feedback) have contributed to an instrument that, based on initial use reported here, measures what it was designed to measure and supports the instrument's credibility. The researcher contributed to the validity of the instrument by approaching the initial development phase with a mindset of questioning, consistently reconsidering the themes found in the literature review and the classroom observations, and continually asking what important data may be missing (Creswell & Miller, 2000). The rounds of review performed by the administrators, who are responsible for teacher coaching and support, have contributed to the validity of the SCALE with the closeness of the researcher to the administrators throughout the process adding to the accuracy of the study (Creswell, 2012). Finally, returning to the data from the literature review and the classroom observations repeatedly, aided in supporting credibility to ensure that all items that were included had a foundation in both research and practice (Creswell & Miller, 2000). To further assess the reliability and validity of the SCALE, the instrument needs to be used by others in diverse contexts. This has been an initial attempt to create an instrument that will be of practical use to educators as they seek to support creativity. To move this research forward, it is essential that the instrument be piloted in a variety of settings and critiqued by researchers and practitioners.

It is important to mention that the extent to which a teacher strives to foster student creativity depends in part on the supports and constraints of his or her environment − colleagues, students, and administrators, and the vision of the school. When teachers are given flexibility with time and curricula to support student creativity, administrators are sending the message that they value creativity (Richardson & Mishra, 2016). The teachers involved in this study work in a setting that allows for curricular and pedagogical flexibility. The school supports teacher creativity and has articulated a need for teachers to support student creativity so that they can be innovative contributors and global citizens.

4.3. Implications and contribution

As we have previously stated, much of the empirical attention in the field of creativity in education has not been on teachers or environments but rather on individual psychometric assessments of creative behavior (Henriksen et al., 2015). This focus leaves out a plethora of opportunities for scholars to examine the creative potential of young people and the ways that educators can design learning environments to support that potential (Richardson & Mishra, 2016). A change in focus is required. We must seriously look at the support of creative potential because it is the creative potential of young people that will bring us successfully into the 22nd century and it is the students in our classrooms that we will rely on to creatively and innovatively lead the way (Wagner, 2010). It is important that the research that has been done begins to inform the educational decisions and policies that are made at multiple levels: in classrooms, schools, districts, and beyond. The nature of creativity involves autonomy and independence of thought. This is often incompatible with structures of classrooms and schools (Runco, 2003). This study has shown that there are specific ways to support creativity through the setting up of the physical environment, the design of the learning tasks that students are engaged in, and the relationships that are modeled and supported in classrooms. School leaders and teachers play key roles in developing students' creative potential and higher-level administrators must support schools and teachers in these endeavors (Eckhoff, 2011).

As researchers conduct studies that look at the issue of creativity in education and the lack of policy to support it, policy makers will look for research in this area to justify future change. It is imperative that scholars continue to engage in diverse ways of studying creativity in educational settings and report findings that support the importance of student-centered pedagogies that promote creativity. The sweeping standardization of curriculum is a problem in schools; however, research that impacts teacher practice may help inspire systemic change.

Finally, the SCALE represents a contribution to the field of creativity in that it is, to our knowledge, the first instrument developed for assessing creativity in learning environments. As one of the core influences on students, the learning environment is of paramount importance when thinking about how we can support student creativity so that students will become the innovators and problem solvers that our society needs (Robinson, 2011). Appendix A contains the SCALE which we encourage educators and administrators to use. This instrument may help guide future research and lead to a better understanding of what it means to create the types of environments in which student creativity can thrive.

Acknowledgements

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.2017.11.004.

References

*Aljughaiman, A., & Mowrer-Reynolds, E. (2005). Teachers' conceptions of creativity and creative students. *The Journal of Creative Behavior, 39*(1), 17–34.

*Batchelor, K. E., & Bintz, W. P. (2013). Promoting creativity in the middle grades language arts classroom. *Middle School Journal,* 3–11.

Beghetto, R. A., & Kaufman, J. C. (2014). Classroom contexts for creativity. *High Ability Studies, 25*(1), 53–69. http://dx.doi.org/10.1080/13598139.2014.905247.

*Beghetto, R. A. (2007). Does creativity have a place in classroom discussions? Prospective teachers' response preferences. *Thinking Skills and Creativity, 2*(1), 1–9. http://dx.doi.org/10.1016/j.tsc.2006.09.002.

Beghetto, R. (2010). Creativity in the classroom. In J. C. Kaufman, & R. J. Sternberg (Eds.). *The cambridge handbook of creativity* (pp. 447–459). New York: Cambridge University Press.

*Chan, S., & Yuen, M. (2014). Personal and environmental factors affecting teachers' creativity-fostering practices in Hong Kong. *Thinking Skills and Creativity, 12,* 69–77. http://dx.doi.org/10.1016/j.tsc.2014.02.003.

*Chang, C.-P., Hsu, C.-T., & Chen, I.-J. (2013). The relationship between the playfulness climate in the classroom and student creativity. *Quality & Quantity, 47*(3), 1493–1510. http://dx.doi.org/10.1007/s11135-011-9603-1.

*Claxton, G., Edwards, L., & Scale-Constantinou, V. (2006). Cultivating creative mentalities: A framework for education. *Thinking Skills and Creativity, 1*(1), 57–61. http://dx.doi.org/10.1016/j.tsc.2005.11.001.

*Cochrane, T., & Antonczak, L. (2015). Designing creative learning environments. *Interaction Design and Architecture Journal, 24,* 125–144.

*Cole, D. G., Sugioka, H. L., & Yamagata-Lynch, L. C. (1999). Supportive classroom environments for creativity in higher education. *The Journal of Creative Behavior, 33*(4), 277–293.

*Craft, A., Hall, E., & Costello, R. (2014). Passion: Engine of creative teaching in an English university. *Thinking Skills and Creativity, 13,* 91–105. http://dx.doi.org/10.1016/j.tsc.2014.03.003.

*Craft, A. (2001). An analysis of research and literature on creativity in education. *Qualifications and Curriculum Authority,* 1–37.

*Craft, A. (2006). Fostering creativity with wisdom. *Cambridge Journal of Education, 36*(3), 337–350. http://dx.doi.org/10.1080/03057640600865835.

*Cress, S. W., & Holm, D. T. (2016). Creative endeavors: Inspiring creativity in a first grade classroom. *Early Childhood Education Journal, 44*(3), 235–243. http://dx.doi.org/10.1007/s10643-015-0704-7.

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice, 39*(3), 124–130. http://dx.doi.org/10.1207/s15430421tip3903_2.

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches.* CA: Sage Publications: Thousand Oaks.

Cullingford, C. (2007). Creativity and pupils' experience of school. *Education, 2,* 133–142. http://dx.doi.org/10.1080/03004270701311960.

*Dababneh, K., Ihmeideh, F. M., & Al-Omari, A. A. (2010). Promoting kindergarten children's creativity in the classroom environment in Jordan. *Early Child Development and Care, 180*(9), 1165–1184. http://dx.doi.org/10.1080/03004430902872950.

Dalke, A. F., Cassidy, K., Grobstein, P., & Blank, D. (2007). Emergent pedagogy: Learning to enjoy the uncontrollable—and make it productive. *Journal of Educational Change, 8*(2), 111–130.

Das, S. (2012). On two metaphors for pedagogy and creativity in the digital era: Liquid and solid learning. *Innovations in Education and Teaching International, 49*(2), 183–193. http://dx.doi.org/10.1080/14703297.2012.677594.

*Davies, D., Jindal-Snape, D., Collier, C., Digby, R., Hay, P., & Howe, A. (2013). Creative learning environments in education—A systematic literature review. *Thinking Skills and Creativity, 8,* 80–91. http://dx.doi.org/10.1016/j.tsc.2012.07.004.

*De Souza Fleith, D. (2000). Teacher and student perceptions of creativity in the classroom environment. *Roeper Review, 22*(3), 148–153. http://dx.doi.org/10.1080/02783190009554022.

*Driver, M. (2001). Fostering creativity in business education: Developing creative classroom environments to provide students with critical workplace competencies. *Journal of Education for Business, 77*(1), 28–33.

*Eckhoff, A. (2011). Creativity in the early childhood classroom: Perspectives of preservice teachers. *Journal of Early Childhood Teacher Education, 32*(3), 240–255. http://dx.doi.org/10.1080/10901027.2011.594486.

*Esquivel, G. B. (1995). Teacher behaviors that foster creativity. *Educational Psychology Review, 7*(2), 185–202.

*Fasko, D. (2001). Education and creativity. *Creativity Research Journal, 13*(3–4), 317–327.

*Forrester, V., & Hui, A. (2007). Creativity in the Hong Kong classroom: What is the contextual practice? *Thinking Skills and Creativity, 2*(1), 30–38. http://dx.doi.org/10.1016/j.tsc.2006.10.003.

Glesne, C. (2011). *Becoming qualitative researchers.* Boston, MA: Pearson.

Hennessey, B. A., & Amabile, T. (1987). *Creativity and learning.* Washington, D.C: NEA Professional Library, National Education Association.

Henriksen, D., Mishra, P., & Mehta, R. (2015). Novel, effective, whole: Toward a NEW framework for evaluations of creative products. *Journal of Technology & Teacher Education,* 455–478.

*Hong, E., Hartzell, S. A., & Greene, M. T. (2009). Fostering creativity in the classroom: Effects of teachers' epistemological beliefs, motivation, and goal orientation. *The Journal of Creative Behavior, 43*(3), 192–208. http://dx.doi.org/10.1002/j.2162-6057.2009.tb01314.x.

*Hong, H.-Y., Chang, Y.-H., & Chai, C. S. (2014). Fostering a collaborative and creative climate in a college class through idea-centered knowledge-building. *Instructional Science, 42*(3), 389–407. http://dx.doi.org/10.1007/s11251-013-9289-y.

Hung, W. (2015). Cultivating creative problem solvers: The PBL style. *Asia Pacific Education Review, 16*(2), 237–246. http://dx.doi.org/10.1007/s12564-015-9368-7.

*Hunter, S. T., Bedell, K. E., & Mumford, M. D. (2007). Climate for creativity: A quantitative review. *Creativity Research Journal, 19*(1), 69–90. http://dx.doi.org/10.1080/10400410709336883.

*Jeffrey, B., & Craft, A. (2004). Teaching creatively and teaching for creativity: Distinctions and relationships. *Educational Studies, 30*(1), 77–87. http://dx.doi.org/10.1080/0305569032000159750.

Jindal-Snape, D., Davies, D., Collier, C., Howe, A., Digby, R., & Hay, P. (2013). The impact of creative learning environments on learners: A systematic literature review. *Improving Schools, 16*(1), 21–31.

Kangas, M. (2010). Creative and playful learning: Learning through game co-creation and games in a playful learning environment. *Thinking Skills and Creativity, 5*(1), 1–15. http://dx.doi.org/10.1016/j.tsc.2009.11.001.

Kazerounian, K., & Foley, S. (2007). Barriers to creativity in engineering education: A study of instructors and students' perceptions. *Journal of Mechanical Design, 129*(7), 761. http://dx.doi.org/10.1115/1.2739569.

Kozbelt, A., Beghetto, A. B., & Runco, A. M. (2010). Theories of creativity. In J. C. Kaufman, & R. J. Sternberg (Eds.). *The cambridge handbook of creativity* (pp. 447–459). New York: Cambridge University Press.

Kulas, J. T., & Stachowski, A. A. (2009). Middle category endorsement in odd-numbered Likert response scales: Associated item characteristics, cognitive demands, and preferred meanings. *Journal of Research in Personality, 43*(3), 489–493. http://dx.doi.org/10.1016/j.jrp.2008.12.005.

Kulas, J. T., Stachowski, A. A., & Haynes, B. A. (2008). Middle response functioning in likert-responses to personality items. *Journal of Business and Psychology, 22*(3), 251–259. http://dx.doi.org/10.1007/s10869-008-9064-2.

Lilly, F. R., & Bramwell-Rejskind, G. (2004). The dynamics of creative teaching. *The Journal of Creative Behavior, 38*(2), 102–124.

*McCoy, J. M., & Evans, G. W. (2002). The potential role of the physical environment in fostering Creativity. *Creativity Research Journal, 14*(3-4), 409–426. http://dx.doi.org/10.1207/S15326934CRJ1434_11.

*McLellan, R., & Nicholl, B. (2013). Creativity in crisis in design & technology: Are classroom climates conducive for creativity in English secondary schools? *Thinking Skills and Creativity.* http://dx.doi.org/10.1016/j.tsc.2012.11.004.

*Meyer, A. A., & Lederman, N. G. (2013). Inventing creativity: An exploration of the pedagogy of ingenuity in science classrooms. *School Science and Mathematics, 113*(8), 400–409.

Mishra, P., Henriksen, D., & the Deep Play Research Group (2013). Rethinking technology & creativity in the 21st century. *TechTrends, 57*(3), 11.

*Olivant, K. F. (2015). I Am Not a Format: Teachers' experiences with fostering creativity in the era of accountability. *Journal of Research in Childhood Education, 29*(1), 115–129. http://dx.doi.org/10.1080/02568543.2014.978920.

*Peppler, K. A., & Solomou, M. (2011). Building creativity: Collaborative learning and creativity in social media environments. *On the Horizon, 19*(1), 13–23. http://dx.doi.org/10.1108/10748121111107672.

Peterson, R. E., & Harrison, H. L., III (2005). The created environment: An assessment tool for technology education teachers: Creativity doesn't just happen by chance; the prepared environment nourishes it. *The Technology Teacher, 64*(6), 7–11.

Piburn, M., & Sawada, D. (2000). *Reformed teaching observation protocol (RTOP) reference manual.* Arlington, Virginia: National Science Foundation.

Plucker, J. A., & Makel, M. C. (2010). Assessment of creativity. In J. C. Kaufman (Ed.). *The cambridge handbook of creativity*. New York: Cambridge University Press.

Plucker, J. A., Beghetto, R. A., & Dow, G. T. (2004). Why isn't creativity more important to educational psychologists? potentials, pitfalls, and future directions in creativity research. *Educational Psychologist, 39*(2), 83–96. http://dx.doi.org/10.1207/s15326985ep3902_1.

Poston, W., Downey, C., Steffy, B., & Frase, L. (2004). *The three minute classroom walk through: Changing school supervisory practices.* Thousand Oaks, CA: Corwin press.

Rhodes, M. (1961). An analysis of creativity. *Phi Delta Kappan, 42*(7), 305–310.

Richardson, C., & Mishra, P. (2016). Navigating the Tensions Inherent in Understanding Creativity: An Interview with Mark Runco. *TechTrends, 60*(5), 415–418. http://dx.doi.org/10.1007/s11528-016-0106-8.

Robinson, C. F., & Kakela, P. J. (2006). Creating a space to learn: A classroom of fun, interaction, and trust. *College Teaching, 54*(1), 202–207. http://dx.doi.org/10.3200/CTCH.54.1.202-207.

Robinson, K. (2011). *Out of our minds.* West Sussex, United Kingdom: Capstone Publishing.

Runco, M. A., & Jaeger, G. J. (2012). The standard definition of creativity. *Creativity Research Journal, 24*(1), 92–96. http://dx.doi.org/10.1080/10400419.2012.650092.

Runco, M. A., & Albert, R. S. (2010). Creativity research: a historical view. In J. C. Kaufman, J. Caaa, & R. J. Sternberg (Eds.). *The cambridge handbook of creativity* (pp. 3–19). New York: Cambridge University Press.

Runco, M. A. (2003). Education for creative potential. *Scandinavian Journal of Educational Research, 47*(3), 317–324. http://dx.doi.org/10.1080/00313830308598.

Sawyer, K. (2015). A call to action: The challenges of creative teaching and learning. *Teachers College Record, 117*, 100303.

Wagner, T. (2010). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need–and what we can do about it.* New York: Basic Books.

*Warner, S. A., & Myers, K. L. (2009). The creative classroom: The role of space and place toward facilitating creativity. *Technology Teacher, 69*(4), 28–34.

*Watson, J. S. (2012). Comfortably uncomfortable: A study of undergraduate students' responses to working in a creative learning environment. *Creativity: Insights, Directions, and Pnd Possibilities,* 443.