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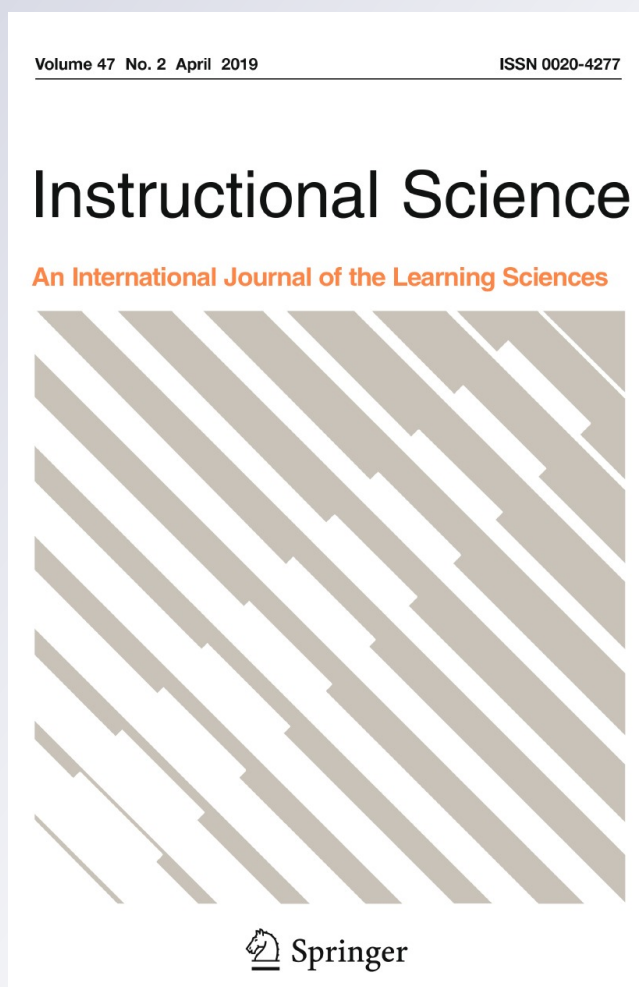
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Fostering creative performance in art and design education via self-regulated learning

Jeffrey A. Greene¹ · Rebekah Freed¹ · R. Keith Sawyer¹

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Abstract

There is a lack of research and practice focused on how to foster higher-order processing, such as creative performance, within higher education settings. To address this gap in research, we chose to study pedagogical practices in schools of art and design, where one of the intended learning outcomes is creativity. Based upon data gathered as part of a larger study (Sawyer in *Thinking Skills and Creativity*, <http://doi.org/10.1016/J.TSC.2018.08.002>, 2018), we found that among a large number of creative performance pedagogical practices we identified, a subset seemed to foster self-regulated learning (SRL). Therefore, the goal of our study was to identify the ways art and design professors enacted practices that foster their students' self-regulation during learning and performance. We found these professors utilized a number of direct and indirect methods of fostering their students' SRL, all intended to enhance students' ability to enact creative performance. In addition to revealing interesting comparisons between SRL in art and design and other more commonly studied contexts such as science or history, our findings suggested numerous directions for expanding SRL models, including a greater focus on process as the outcome of SRL, a need to continue research into SRL during higher-order processing, and gaps regarding the development of SRL.

Keywords Self-regulated learning · Creativity · Art and design education · Qualitative research

It is widely acknowledged that humanity has entered an innovation age, where individual and societal creativity are increasingly important (Trilling and Fadel 2009). As a result, there have been calls for schools to educate students for creativity (OECD 2013). In this article, we respond to this broad societal imperative by studying how to teach people to be creative. The third author had previously conducted one-year ethnographic studies of art and design education at each of two universities and follow-up studies at six additional universities (Sawyer 2018). Using an inductive methodology that allowed beliefs and practices to emerge from interviews with professors and observations of studio classes,

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creativity emerged as an important learning outcome in both fine arts and design programs. In addition, multiple themes regarding creativity were identified, with several focused upon the pedagogies art and design professors used to help their students attain creative performance.

As we reviewed these previously identified themes, we realized that these professors were engaged in pedagogical practices that aligned with several tenets of research and theory on self-regulated learning (SRL; Zimmerman 2013). SRL involves the active pursuit of desired learning goals via planning, monitoring, controlling, and reflecting upon various aspects of the learning process, including cognition, motivation, emotions, behavior, and context; and research has shown that SRL predicts numerous academic and learning outcomes (Greene 2018; Winne 2001; Zimmerman 2013). However, there is a need for more research on the role of SRL during higher-order processing, including creative performance, in ill-structured tasks or domains (Powers 2017; Schunk and Greene 2018). Thus, in this study, our research question was: In what ways did professors in professional schools of art and design use practices that could foster SRL? We were interested in the ways these professors' pedagogical practices helped to build students' SRL knowledge, skills, and dispositions in the pursuit of creative performance. Given the lack of research on SRL in schools of art and design, and the qualitative nature of our data, we chose to use thematic analysis to understand how Sawyer's (2018) themes revealed SRL in the art and design pedagogical context. This inductive approach is ideally suited for studying new phenomena or contexts, where theory must be generated rather than used in a deductive manner to derive hypotheses for testing (Levitt et al. 2018). Our findings revealed insights into how professors fostered SRL in an ill-structured domain (i.e., art and design education), with interesting directions for future research on models of SRL.

Creative practice in art and design

Studies of professional practice in art and design have revealed that professional creatives engage in an iterative process that involves working skillfully with the materials of the medium, as well as being alert to new concepts and directions that emerge from the process of working (Cross et al. 1992). The core feature of this design process is its iterative nature. The iterative design process involves exploration, ideation, the construction of drafts and sketches, and reflective analysis of these components, with repeated cycles through these activities (Cross 2011). The process of experimentation involves risk taking, and creators must learn to expect failure and to incorporate failure productively into the design process. As with design studies, empirical studies of visual artists, for example fine art painters, have revealed that the artistic process is nonlinear and iterative and that what typifies such performance is mastery of the creative process itself, rather than realization of a predetermined goal, vision, or concept (e.g., Mace and Ward 2002; Sawyer 2018). The creative process itself is generally considered to be a process that involves an interaction between aptitude, process, and environment by which a group or individual produces a novel "perceptual product" (Rubenstein et al. 2018, p. 2) that is useful within a given social context. When engaging in the creative process, artists and designers are working on an ill-structured task, with no clear task definition, definitive criterion for success, or algorithmic way of achieving it, thus differentiating art and design from well-structured tasks (Jonassen 1997; Simon 1973).

There have been very few studies of education in professional schools of art and design (as noted by Lee 2009; Oh et al. 2013; Sawyer 2017). These few studies have demonstrated that a central intended learning outcome of these programs is the same iterative creative process as documented in studies of professional creative practice. Art and design education and learning involve an increasing mastery of the ability to engage in this creative process in a way that is more likely to lead to successful creative outcomes (Powers 2017; Sawyer 2018). This depiction of the creative process, including its iterative, reflective, and process components, has many parallels with the iterative and reflective nature of self-regulation during learning and performance (Greene 2018; Schunk and Greene 2018). As Rubenstein et al. (2018) wrote, learning to engage in the creative process should be studied within an SRL (Zimmerman 2013) framework, because such work can inform how the creative process can be taught and learned in art and design education. Connections among the SRL, design education, and art education literatures are lacking, and empirical investigations of such connections even more so (cf. Powers 2017). Given the posited role of self-regulatory processing in creative performance, as well as the numerous studies showing self-regulation as a key discriminator between novice and more expert levels of performance (Kistner et al. 2010; Zimmerman 2006, 2013), there is a clear case for investigating the role of SRL in art and design education.

Self-regulated learning

SRL involves the cognitive, metacognitive, motivational, affective, and behavioral processes people enact to systematically reach their learning goals (Greene 2018). Each of these processes on their own predict performance, but by examining how they interact in dynamic, contingent ways over the course of learning, researchers have been able to better understand and predict learning than they could with a focus on only one of these phenomena (Ben-Eliyahu and Bernacki 2015; Dent and Koenka 2016). SRL processing is a mediator between individual characteristics and learning, as well as performance (Greene et al. 2010; Zimmerman 2013). The ability to engage in SRL is a skill that can be learned and developed, for example through direct instruction and practice (Kistner et al. 2010; Schunk and Greene 2018; Zepeda et al. 2015). Teachers who support student engagement in SRL through instruction or modeling can thereby enhance their students' learning and performance (Schunk and Greene 2018).

Much of the SRL empirical literature has involved performance on well-structured tasks (Azevedo, 2014; Ge et al. 2016; cf. Lodewyk et al. 2009; Malmberg et al. 2014), however, "most creativity occurs when people are working on ill-defined problems" (Sawyer 2012, p. 90; also see Mumford et al. 2003; Jay and Perkins 1997; Powers 2017). As a result, it is unclear as to the degree to which current models of SRL adequately capture self-regulation during creative learning and performance. Nonetheless, numerous researchers have argued that successful acquisition and use of higher-order mental processes, such as creative performance, requires people who can successfully enact the knowledge, skills, and dispositions of self-regulation during learning and performance (Rubenstein et al. 2018; Schunk and Greene 2018; Zimmerman 2006).

Models of SRL

Researchers continue to find connections and coherences among the many models of SRL (e.g., Winne 2001; Schunk and Greene 2018; Zimmerman 2013), and to discover ways that SRL plays a role in many aspects of education, including across multiple academic domains (e.g., Alexander et al. 2011; Greene et al. 2015) and among both students and teachers (e.g., Moos and Ringdal 2012; Kramarski 2018). Despite findings of variance in the frequency and enactment of SRL processes across domains (e.g., Greene et al. 2015), there are a common set of phases, targets, and processes across SRL models. Here, we present the common elements of a synthesized SRL model as described by Greene (2018), to ground our research on the role of SRL in fostering creative performance in art and design education.

One of the important early contributions of SRL theory, beyond work in metacognition or motivation, was the identification and enunciation of three predominant phases to self-regulated learning: before, during, and after (Rubenstein et al. 2018; Schunk and Greene 2018). Prior to the establishment of SRL theory, researchers and learners alike often focused most upon what occurs during a learning task (e.g., strategy use, monitoring progress toward a goal), with great success at identifying the strategies and activities predictive of academic success (Dinsmore 2017). However, the planning, goal-setting, and self-beliefs that are enacted before the actual task begins are powerful predictors of what will occur during the task, and therefore important to study (Zimmerman 2013). For example, Greene et al. (2012) found that the quality of students' task definition and plans predicted their monitoring and strategy use during learning. Likewise, after the task, how learners do or do not reflect upon what occurred during the task are also powerful predictors of how learners will approach the next educational task (e.g., Weiner 2010). Thus, before, during, and after engaging in an academic or educational task, there are critical cognitive, metacognitive, motivational, affective, and behavioral processes that can interact to dramatically affect the process of learning (Greene 2018). Learners sometimes skip the before or after phase of SRL, often to their detriment (Greene et al. 2012; Winne 2001), but effective SRL involves many kinds of processing within each phase, and also frequent iteration back and forth among them (Zimmerman 2013).

Before, during, and after the learning task, there are various targets of self-regulation, in other words, various processes and phenomena that can be planned, monitored, controlled, and evaluated. These include cognition (e.g., strategies; Dinsmore 2017), metacognition (e.g., calibrating one's perception of understanding with actual performance; Bol et al. 2012; Chen and Bembenuddy 2018), motivation (e.g., self-efficacy; Zimmerman 2013), behavior (e.g., help seeking; Karabenick and Gonida 2018), and external environmental targets (e.g., find a productive place to learn; Winne 2001). Each of the prominent models of SRL describe, to varying degrees, target of self-regulation and how learners can optimize their functioning relative to these targets.

Effective SRL involves a combination of automated, effective processing (e.g., monitoring understanding of text while reading; Thiede and de Bruin 2018) and the ability to inhibit that automated processing when needed, replacing it with more effortful but appropriate processing (e.g., elaborating upon key ideas; Greene 2018). Such effortful processing can occur within any of the phases of learning, such as reflecting upon one's understanding of the depth of the task and the plans made to achieve it (Dinsmore and Parkinson 2013; Pieschl 2009; Winne 2001), changing strategies when confusion occurs (Binbasaran Tüysüzoğlu and Greene 2015), or evaluating the efficacy and efficiency of various learning

strategies and altering future learning to use only those strategies that meet those criteria (Winne 2001). In particular, metacognitive monitoring and control form the hub of SRL (Winne 2001), and the degree to which students are accurately calibrated predicts their effective use of SRL (Chen and Bembenuy 2018; Koriat 2012; Pieschl et al. 2012). Much of the research on calibration has been focused upon the accuracy of people's judgment of their performance compared to their actual performance on well-defined tasks, and how such judgments predict SRL processing (Alexander 2013; Bol and Hacker 2012; Rutherford 2017). There has been a growing movement toward broadening the definition of calibration to include people's perceptions of the task and external environment, and the appropriateness of their subsequent metacognitive control decisions, to the actual task and environment, particularly in terms of ill-structured tasks (Dinsmore and Parkinson 2013; Pieschl 2009).

Domain-specificity of SRL

SRL models have their roots in domain-general psychological and educational literatures (e.g., Bandura 1980; Zimmerman 1986), but over time there has been increasing interest in the ways SRL functioning may differ by academic discipline or context (e.g., Alexander et al. 2011; Greene et al. 2015; Rotgans and Schmidt 2009). A majority of the research on SRL in academic contexts has been conducted within STEM and history disciplines (e.g., Azevedo and Jacobson 2008; Greene et al. 2010; Poitras and Lajoie 2013, 2018; Schraw et al. 2006; Sinatra and Taasobshirazi 2018). In these contexts, there is some evidence that domain-general SRL processes can be useful (e.g., knowledge elaboration, taking notes) but that more advanced tasks require domain-specific SRL processes, particularly in terms of strategies (e.g., inferring source content in history; evaluating the adequacy of content representations in science; Greene et al. 2015; Poitras and Lajoie 2013). On the other hand, Rotgans and Schmidt (2009) found no differences in motivation or strategy use across mathematics, history, and English contexts. There is a clear need for more research on how SRL is enacted across a variety of disciplinary contexts, such as art and design (Powers 2017).

Teaching students to develop and engage in SRL

According to Zimmerman (2013), students learn to incorporate regulation into their learning and performance progressively through four levels. The first level is through observation, meaning students learn regulation through modeling and vicarious reinforcement. The second level is via emulation, which means through direct performance and feedback. The third level is through self-control, in which self-reinforcement and automatization of behaviors and processes occur. The fourth level is through self-regulation. At this level, students can adapt to dynamic task conditions and adjust their performance accordingly. Teachers can help students move through these four levels via expert modeling (Zimmerman 2013). Experts, such as teachers, can directly instruct and then model SRL processes, including what students can and should do before, during, and after learning. Then, students can practice and receive feedback to continue developing their SRL knowledge, skills, and disposition. Such instruction, practice, and feedback can occur in classrooms, such as in the case of our study.

Paris and Paris (2001) proposed four principles for teaching SRL. The first principle is to provide opportunities for self-appraisal. This promotes monitoring of progress and

repair strategies. The second principle is to provide opportunities for self-management of thinking, effort, and affect in the process of learning and goal-striving. This promotes adaptive, persistent, self-controlled, and goal-oriented problem-solving. The third principle is to teach self-regulation in diverse ways. This means teachers should use a variety of strategies to teach self-regulation, including explicit instruction, directed reflection, meta-cognitive discussions, active practice with experts, modeling, activities that include reflection, and through taking opportunities to document and chart personal growth. Lastly, the fourth principle is to ensure that self-regulation is woven into the story and identity of each individual. How students self-reflect is guided by their identity, which is shaped by their classroom community. Teachers can ensure that their classroom community is a place that fosters self-regulated learning.

Kistner et al. (2010) synthesized researching on SRL instruction and studied how teachers enacted it in classrooms. They found teachers used both direct and indirect methods to promote SRL (see Table 1). Direct methods included explicit instruction in SRL processing (e.g., teaching students how to plan, use strategies, monitor) as well as implicit instruction (e.g., teacher modeling of SRL processing). Indirect methods involved the ways teachers constructed environments that both require and support SRL processing. Such environments were typified by authentic, high-demand learning tasks (e.g., critical thinking as opposed to simple memorization) requiring active construction of knowledge and student cooperation (cf. De Corte et al. 2004). In these environments, students must enact SRL, and in so doing, they surface opportunities for teachers and peers to provide scaffolding and support for further SRL development (Zimmerman 2013).

Purpose of this study

There has been increasing interest in how SRL is enacted within various academic domains (Alexander et al. 2011) as well as across well- and ill-structured tasks (Azevedo 2014), and one understudied context is art and design education (Powers 2017; Rubenstein et al. 2018). Our secondary analysis of data from a large, ethnographic study of undergraduate art and design education (Sawyer 2018) suggested an important role of SRL in this context, warranting the investigation reported here. Previous art and design research has documented the iterative and reflective nature of professional creative practice (Sawyer 2018), and previous SRL research has also documented an iterative and reflective process (e.g., Rubenstein et al. 2018), therefore it was not surprising that our data could be productively represented using an SRL framework. Our research question was: In what ways did professors in professional schools of art and design use practices that could foster SRL?

Methods

Participants

As part of a multi-year ethnographic study (Sawyer 2018), the third author conducted 17 studio class observations and 54 open-ended interviews at two professional schools of art and design: Art School (AS), a free-standing art and design school, and Research University (RU), an art and design school embedded within a comprehensive research university. A total of 38 professors were involved in the study. Thirty-three of these professors were

Table 1 Kistner et al.'s (2010) methods teachers use to promote SRL in classrooms

Method	Subtype	Definition	Example
Direct	Explicit	Clearly indicating an SRL strategy in use	"Do you see here how I checked my answer two different ways, to make sure it is correct? That is a good strategy"
	Implicit	Modeling an SRL strategy without explicitly naming it as such	"Let's see, I guess I should see if I remember this definition by closing my eyes and trying to recite it"
Indirect		Designing the learning environment to support SRL	Creating a syllabus that includes opportunities for formative assessment and feedback

Table 2 Instructors interviewed and class observations

	Instructors	Class observations Number (total duration)	Interviews
Art school	22	8 (10:29)	35 (19:50)
Research university	16	9 (10:43)	19 (16:24)
Total	38	17 (21:12)	54 (36:14)

Some professors were interviewed or observed more than once. Total data recorded, transcribed, and coded = 57 h, 26 min

Table 3 Number of professors interviewed by discipline

Art school	Research university
Fine arts	
Illustration (1)	Illustration (3)
Painting (3)	Painting (2)
Sculpture (4)	Sculpture (2)
Photography (1)	Printmaking (1)
	Book making (1)
Design	
Architecture (2)	Architecture (3)
Foundations (4)	Foundations (1)
Advertising (2)	2D design (1)
Graphic design (2)	Communication design (1)
Typesetting (1)	Typeface design (1)
Totals	
10 disciplines, 22 professors	10 disciplines, 16 professors

interviewed, many two or three times, for a total of 54 interviews. The studio classes of 15 professors were observed, two professors twice, for a total of 17 studio class observations. Twelve of the professors were both interviewed and observed. In total, 38 professors were represented in the dataset. A total of 15 different art and design disciplines were included in the dataset (see Tables 2, 3). The professors were recommended by their Deans, their department chairs, or their colleagues, using their own professional evaluations of teaching expertise. The average years of teaching experience was just over 14. These two different sites, and 15 different art and design disciplines, were chosen to allow the identification of a set of beliefs and practices that were shared across creative fields, and thus more likely to represent common understandings of creative learning across disciplines than doing such work at a single site or in a single creative discipline.

Context and data collection

At each institution, the third author gathered two types of data. Open-ended interviews were conducted with professors, with the focus on the topic of teaching for creativity. Each interview began with the question “How do you teach students to be creative?” Then the interview was conducted in a free-flowing manner, with subsequent questions motivated by

the participant's previous answers. In addition, the third author conducted observations of studio classroom interactions, to observe pedagogical practices used by professors that may not have emerged in interviews. Interviews were audio recorded and observations were video recorded. All audios and videos were transcribed.

Data representation and analysis

Thematic analysis conducted in Sawyer (2018)

To analyze the transcribed interviews and studio observations, a grounded theory methodology was used (see Sawyer 2018, for details). This inductive method was chosen because of its ability to identify new areas of understanding and scholarship, based on what pedagogical themes are most important within the target community being studied. Inductive methods are appropriate when there is no relevant prior theory that would suggest coding categories. There were no identifiable, extant empirically-grounded theories of art and design pedagogy that would have provided a basis for a set of theory-based coding categories. Therefore, in this situation, using a theory-driven approach would risk imposing a partially-developed and inappropriate theoretical framework on this body of data (Levitt et al. 2018).

Instead, the third author chose a methodology that allows theory to be inductively developed in a way that is grounded in the data. The *constant comparative method* was used to identify themes that emerged from the interviews and observations and were shared across the 38 professors (Charmaz 2014; Glaser 1978, 1992; Glaser and Strauss 1967; Strauss and Corbin 1990). The third author began by reviewing all transcripts and adding comments to specific dialogue turns. Then a second analysis of all transcripts was conducted to identify a tentative set of *initial themes*. An initial theme was identified when similar comments were found to have been applied to at least four dialogue turns, as follows: at least one dialogue turn at both institutions, either in an interview or a classroom observation; and at least one dialogue turn in both an art discipline and a design discipline. As a result, each emergent theme was representative of at least two disciplines, at least two different professors, and two different institutions. No emergent themes were unique to any one professor, discipline, or institution.

Then the author engaged in a third stage of review, re-analyzing all transcripts with the list of initial themes, which resulted in the *integration*, or merging, of pairs of initial themes (Glaser and Strauss 1967). After this integration step, the third author conducted another seven stages of iterative data analysis in which additional dialogue turns were often matched with these emergent, integrated themes, and these themes were occasionally merged once again. Following grounded theory methodology, the analysis concluded when the list of themes reached *saturation*: when no additional dialogue turns could be identified with a theme, and no two themes could be merged (Charmaz 2014; Corbin and Strauss 2008). This methodology resulted in a set of 45 themes, each capturing a belief about pedagogy, or an aspect of studio practice, that were found at both institutions and in both art and design (see Sawyer 2018).

After the 45 themes had emerged, a validation stage was conducted to confirm that the findings that emerged from the methodology accurately represented the pedagogical beliefs and practices of educators at art and design schools. The third author validated the emergent themes (e.g., "Students often start with an idea that's too big for one work. I guide them to narrow, focus, simplify") by developing a structured interview with a statement for

each theme. The validation interview was conducted with 22 professors: Sixteen professors at six art and design schools that were not part of the original interview study, and six professors interviewed in the original study. Professors were asked: "Rate your agreement with each statement from 1 (Definitely do not agree) to 5 (Definitely agree)." For each theme, the 22 responses were averaged to compute a *validation interview* (VI) score. VI scores were high for all 45 themes; the average of all 45 VI scores was 4.3 out of 5, indicating a high level of validity for the research findings. Thus, the themes were endorsed by both participants in the study as well as professors who were not in the original study, thus lending credence to the claim that these themes accurately represented art and design educators' pedagogical activities and views. For more information on the development of these themes, see Sawyer (2018).

Thematic analyses for this study

This study involved secondary data analysis. In a first step of this secondary data analysis, the three authors independently reviewed the original 45 themes from the larger study (Sawyer 2018), and identified those that had conceptual or empirical links with SRL theory and research. After meeting and discussing their identified themes, there were a total of nine identified as relevant to SRL, which we interpreted as evidence that a detailed examination of the raw data was warranted. In a second stage of analysis, the complete set of dialogue turns (i.e., participant quotations and researcher observations) that the third author had associated with each of the 45 themes were collaboratively analyzed. This stage of analysis resulted in the identification of relevant dialogue turns from three additional themes, which were incorporated in our analysis, for a total of 12 themes along with the supporting data for those themes (i.e., participant quotations and researcher observations). The other 33 themes not identified in the first or second stages of our analysis were not incongruent with our findings, but instead often were orthogonal to them, dealing with other topics (e.g., experimentation, the importance of active, practical learning and pedagogies).

In the third stage of analysis, we individually synthesized the dialogue turns from the 12 themes, and then met to discuss and integrate our syntheses. When helpful and relevant, we incorporated SRL research and theory (e.g., Kistner et al. 2010; Zimmerman 2013) to inform our syntheses, per qualitative research methods (Levitt et al. 2018). At the end of this stage, all three authors agreed upon the data representations found in the Results section.

Authenticity

Quantitative ideas about reliability and replicability of coding are not appropriate for qualitative research such as our study (Levitt et al. 2018). For the larger original study, rather than developing a coding scheme a priori, or crafting codes from a portion of the data and then applying them to the rest of the corpus of data, Sawyer (2018) identified emergent themes from all of the data using the constant comparative method. Then, these themes were validated with a second set of relevant participants. For this secondary data analysis study, each author acted as an external auditor for the others, and together the group triangulated upon the findings at each stage of analysis. At each meeting, we reached consensus upon the themes, quotes, and syntheses used in the final analysis, and their meaning for

SRL theory. Finally, for each finding we verified there were relevant participant quotes to support our claims.

Results

In response to our research question, we identified several specific ways that art and design professors taught SRL to help students learn and subsequently engage in creative performance (Powers 2017; Rubenstein et al. 2018). Per qualitative research methods, we did not approach our data analysis with a particular organizing principle or framework in mind, rather we allowed the data to speak (Levitt et al. 2018). After each author individually immersed themselves in the data, and as a result of our meetings to discuss the data, we came to the conclusion that the professors' efforts could be usefully grouped into categories using Kistner et al.'s (2010) framework of how teachers promote SRL in the classroom using both direct and indirect methods.

Direct methods of promoting SRL

Goal-setting and revision before learning

Zimmerman (2006) claimed that experts set attainable goals, whereas non-experts' goals were often too broad. Likewise, Cleary and Zimmerman (2001) found that non-experts set goals that were too general (e.g., basketball non-experts set goals such as "to make shots"). In our work, art and design professors frequently mentioned that competent students often set goals that are too ambitious or complex for what can be accomplished in a single work session. For example, one architecture student began her presentation by stating a very general and overly ambitious goal: "my thesis proposal is that I want to address the void of the female body in architecture."

In our data, art and design professors helped students develop the ability to reflectively examine their own creative process, so that they could reframe what could be accomplished in a single project assignment. They helped students to perceive that their original goal was overly broad and ambitious, and to use that reflective understanding to work towards a narrower focus that would be more likely to result in success. Such direct instruction often happened in cooperative learning settings, where professors would explicitly comment upon students' work for all to hear, as when a professor asked a student, with the rest of the class observing the encounter: "How would you make it more simple?" As another example, one architecture professor stated it this way: "You're provided with a block of ice, at the beginning you're just chipping away at the edges, trying to find any type of form, any direction. You have to narrow your ideas because everyone comes in with sixty ideas that they've built up over five years." Professors often directly instructed students to set narrower goals. In a studio class observation of an interim review of a student's work, an architecture professor enacted this pedagogical principle via an 8-minute exploration of possible ways to focus or narrow the student's work, for example by saying "it gives you reasons to make certain decisions, which is very, very helpful. Rather than the options being so vast that you don't quite know what to do with it...it gives you opportunities to make some more concrete decisions."

Guiding monitoring, control, and reflection

In our data, art and design professors engaged in explicit and implicit instruction of several kinds of metacognitive monitoring, of both process and products, to foster their students' creativity. These professors clearly understood the need to foster these types of self-regulation among their students, helping them "understand why they're doing" whatever creative work they were enacting. As one professor mentioned, "I try to explain why he or she is doing this. And maybe they know, but it's good to be reminded." These actions fostered the kind of monitoring and reflection typical of SRL processing (Greene 2018; Powers 2017), where students "can criticize their own work. They can step back and look at their work as if they're somebody else," as one professor described it. As another professor put it, "art making really is conscious." Part of art and design education is teaching students "to speak about their creativity" and "explain why they chose the things they chose to do...with some degree of specificity so you can then uh, figure how to replicate it, and you get, be better next time." As an advertising professor told us, "I wouldn't accept an explanation [such as] it just looked cool." And an architecture professor stressed that "There's no such thing as a good student who generates great work, but can't explain why they did each thing."

We observed many professors guiding students to monitor and reflect on their own process, including these quotations from different classes: "how do you explain what you wanted to achieve?" and "let's start with the talk and then explain your process." Professors also helped students connect their current work to prior work, emphasizing the iterative nature of the creative process. They modeled how to adapt and elaborate on plans based upon their evaluation of the student's ongoing performance:

Instructor to Student: "In your next hour of painting, what are things that you're going to dig into?"

Student walks to his painting. "I'm going to fix this part."

Instructor: "What needs to be fixed about it?"

By modeling and externalizing the kinds of self-regulatory processing the professors want their students to adopt during performance, they make it more likely that the students will do so (Bransford et al. 2000).

In studio observations, we found several examples of professors scaffolding a student's developing ability to reflect on their own process. In a product design class, during an interim review of a student's design of a carrying case for art supplies, a professor modeled a reflective thought process:

Professor: "I just want to think about that." (referring to the possibility that a carrying case might be designed to unfold and be used as an easel)

The student responded with an extended reflective account of her prior creative process, including statements such as:

"Oh, that's when I was still thinking about the apron. Um, I was thinking about...but I kind of nixed that idea."

"I looked at the drawer right here, but that just got really complicated."

"it was kind of a nice idea that I liked...and I was thinking about if it was a box form, maybe having..."

"because I thought about the box breaking off..."

During the student's extended metacognitive account of her creative process, the professor backchanneled affirmation, with "okay" and "right." In these dialogic encounters, professors scaffold the enactment of metacognition, reflection, and cognitive evaluation (Winne 2001).

Likewise, art and design professors have developed a number of methods to help students monitor and reflect upon their work after engaging in the creative process. Professors often asked students to explicitly reflect on their learning. For example, an interior design professor asked a student "What challenged you, what have you learned most from the assignment, have you learned by experimenting?" To answer such questions, the student must engage in metacognitive processes such as reflection and whether their goals were met. Another direct pedagogical technique is to scaffold student ability to reflect on their current project work in the context of their extended learning trajectory. For example, a graphic design professor scaffolded a student's reflection by noting similarities between the student's current work and their prior work: "I am highlighting some things I've seen in your work before...[points to work from previous two quarters]...it's something you have explored before." By guiding students to reflect on their overall learning trajectory through the semester, the professor helps students contextualize their current work in an ongoing learning process. Such discussions, during class, were intentional ways to promote reflection. Reflection is fundamental to self-regulated learning across fields (Zimmerman 2013), and these professors taught students to reflect because it is a key aspect of art and design performance (Powers 2017). As a professor said in an interview: "It's that reflectivity, looking at art together, and criticizing it, and doing it in a positive way. That's a major learning tool." In an interview, another professor said that she taught for reflection after completing the task by using "journals where they can track their own learning. And they can go back, and they can see the process of art making." A professor of communication design stressed that even in senior-level classes, the purpose of the entire course was "to help the students identify how they draw" via reflection.

Using feedback to foster students' understanding of their process after learning

Finally, we noted that arts and design professors offered ample feedback to students on their process, but offered little to no indication of the professors' own aesthetics, or their own personal preferences. Art and design professors told us that they avoid discussing their own aesthetics because when they do: "we begin to talk about aesthetic qualities, not creative thinking, not learning, and we get into some gray area." A focus on the professor's aesthetic detracts from the students' work to understand their own aesthetic. Instead, professors focused upon helping their students to enact self-regulation rather than depend on the other-regulation of the professor: "I could guarantee that you could probably poll a hundred students and not one of them would be able to tell you what my aesthetic tastes are. They would not, they would not be able to guess what I like, and what I don't like, in terms of my own personal taste." This further reflects the professors' goal of helping students develop their own internal standards, rather than adopting the standards or criteria of other critics such as the professor. Doing so requires students to attend to their own perceptions of their own work, which are typically unstated and not fully understood by the student. These poorly articulated perceptions can prevent students from seeing how their work will be perceived by others, and are surfaced through professors' questioning of why students made particular choices, or why they did or did not take a particular risk. Art and design professors often asked what students intended, and then reflected back to them

whether or not what they are doing is “working,” in other words, whether they are achieving the aesthetic goals in ways that others will perceive. This kind of feedback is explicit regarding the types of reflection students must internalize if they are to engage in the risky act of creative performance (Kistner et al. 2010).

Indirect methods of fostering SRL

Taking risks and failing

Art and design professors created learning environments where students had to take risks and fail (Sawyer 2018), which are key aspects of creative performance (Powers 2017). Professional creatives understand that risk is an important and necessary part of the creative process; if they perceive their own process to be too predictable, or if their current path is not leading to a creative idea or solution, they can reflectively understand this and intentionally engage in a riskier path forward. Creative professionals know that in the face of risk, they are likely to encounter unexpected dead-ends or even outright failures that require them to start over again. Professional artists and designers know to expect dead-ends and mistakes in the process; they are able to recognize these moments. Rather than attempting to work through them and to continue down the same path, they reflect on these moments, how their process up to that point led to them, and why they occurred at that point in the process. They use these reflections to help them identify promising new creative paths forward (Mace and Ward 2002).

However, the professors in this study reported that when students first begin their education in art or design instruction, many are not comfortable with failure and they tend to avoid risk. In an interior design class, when a student presentation was wrapping up, there was the following exchange:

Professor to student presenter: “I think this assignment really helped you understand it, the lighting effects that come through them. You think so?”

Student presenter [nodding slowly, and saying ruefully]: “Trial and error.”

Professor: “Do you think you like trial and error?”

Student presenter: “Sometimes.”

Presenter and entire class: [nervous laughter]

(The laughter is followed by a 10s silence, as the professor gazes at students, waiting for comments, before the professor breaks the silence:)

Professor to entire class: “Hopefully, you allow yourself enough time to fail before you present your work, which I think almost all projects do best.”

Professors create situations where students not only take risks and fail, but also learn from those failures. An architecture professor shared “I tend to espouse an environment that throws them in deep water. And I’m waiting there with them, kind of in a boat [laughs], you know extending the oar to them when they need it...without risk, you don’t learn. And you’re just going about things in a highly prescribed way, you’re always playing it safe.” One professor stressed that providing creative freedom to students makes them uncomfortable at first, and that they have to “break down some of the conditioning that [students] already had.”

Learning from failure requires effective SRL (Dweck and Master 2008), and professors guide students in how to learn from their failures, including when their work leads to a dead-end. Many students are not able to successfully reflect on these dead-ends. Often,

they do not realize what has happened, and they attempt to continue their work process by ignoring this event. A related concern is that when students become aware that their intended process has been derailed, they might perceive these mistakes to be failures, or interpret these failures as indications they are poor students and ineffective creators.

Sawyer (2018) reported that the professors in this study said that students become frustrated in the face of these events, yet the professors believed that students must encounter such dead-ends. As one art school painting professor told us, “You want to get an A, you’ve got to fail 70% of the time.” Similarly, a sculpture professor at a research university said that “You have to learn early that you will make mistakes, you’re supposed to make mistakes.” Sawyer (2018) also found that some professors intentionally design environments and assignments such that students will fail early in the process, to guide students to an understanding of the importance of mistakes in the creative process. When students encounter these mistakes and dead-ends in their work process, the professor works to help the student reflect productively on their own creative process. Sawyer (2018) likewise found that professors guided students to reflect on their own failures, and to be able to see how their process led to this failure, as well as helping students identify how they might use the mistake to drive their process forward in a positive direction. These findings suggest that professors use student failure as an opportunity to foster SRL and self-regulation.

Ambiguity and open-endedness

In art and design classes, professors gave students project assignments with open-ended parameters, resulting in ambiguity regarding exactly what students should do, or what type of work would constitute an “A” grade. This sort of ambiguity is uncomfortable for students, particularly those who have progressed through, and even excelled in, the American educational system (Dweck 2015; Haimovitz and Dweck 2016). One art instructor told us that first year undergraduates “just want to know how to get an A on that project right now.” But professors believed that students have greater potential for creativity when project assignments are open-ended, with ambiguous project specifications, and even with incomplete descriptions of how to receive a high grade.

Discussion

In this study, we responded to recent calls for expanded research on self-regulated learning and performance “in the areas of visual and performing arts” (Schunk and Greene 2018, p. 12), ill-structured tasks and domains (Powers 2017; Rubenstein et al. 2018; Schunk and Greene 2018), as well as research across academic disciplines to examine the domain-specificity of SRL (Alexander et al. 2011). Prior empirical studies of SRL have involved declarative, procedural, or conceptual knowledge outcomes (Winne 2017; Zimmerman 2013); but this research has neglected self-regulation during higher-order processing such as the creative process, and the learning of that process (Ericsson 2015; Zimmerman 2006). Researchers have posited that an important learning outcome of art and design education is an ability to successfully enact self-regulation during this iterative, nonlinear creative process (Powers 2017; Rubenstein et al. 2018). Therefore, we saw a need for focused research into what aspects of SRL were taught in art and design education in higher education contexts. We found that, indeed, art and design professors did strive to foster their students’ SRL knowledge, skills, and dispositions via both direct and indirect methods of promoting

SRL in the service of creative performance (Kistner et al. 2010; Kramarski 2018). Such findings aligned with, and supported, the use of SRL models to understand expert performance, and how to help competent students move toward it (Alexander et al. 2004; Kistner et al. 2010; Sawyer 2018; Powers 2017; Zimmerman 2006, 2013).

Art and design professors engaged in many practices that have been found to foster the internalization of SRL, including both indirect (e.g., creating an environment that encourages and reconceptualizes risks) and direct (e.g., teaching monitoring and reflection) methods. These professors were engaged in other-regulation of learning, where teachers take an active role in scaffolding students' SRL (Hadwin et al. 2018). However, of particular interest to us was that these instructors focused on the students' creative processes, rather than the aesthetic quality of the work product that had been generated. A focus on one's creative process involves reflection and self-regulation, and the professor's focus on process when interacting with students indicates that self-regulation is an important goal of their teaching. Professors believed that the end result of a project assignment was less important than whether the students' understanding of the creative process had improved as a result of working on that project. Much has been written about how the quality and quantity of SRL processing predicts certain *products* such as academic performance (e.g., Winne 2001; Zimmerman 2013), but these data illustrated that SRL also fosters an important higher-order mental *process* in art and design education: creative performance.

Specifically, art and design professors helped their students refine their often-too-ambitious or too-complex goals, which corroborated differences between experts and novices found in past SRL research (Cleary and Zimmerman, 2001). This focus on a "before" phase of self-regulation was matched by direct instruction on the kinds of processing necessary during and after engaging in creative performance. For example, art and design professors directly modeled and scaffolded ways of monitoring, controlling, and reflecting upon the creative process. These emphases are not unique to art and design, however, as they mirror processes taught in math and science education (Azevedo 2005; Enyedy 2005; Halverson and Sheridan 2014), and are emphasized in most models of SRL (i.e., Efklides 2011; Winne 2001; Zimmerman 2013).

The feedback the art and design educators provided their students was also intriguing. These professors reported that they focused most on helping students develop an understanding of the students' own aesthetic, rather than providing clear criteria or benchmarks for what their creative performance should produce. The art and design educators endeavored to "hide" their own aesthetic, explicitly deemphasizing any external criterion or standard for a successful creative product (Winne 2001).

Finally, these professors created environments where students were taught how to take the risks inherent to creative performance and internalize self-regulation (Zimmerman 2013) without internalizing negative attributions or dispositions about the inevitable failures that often, but not always, result (Dweck and Master 2008; Mace and Ward 2002; Weiner 2010). They did so via ambiguous and open-ended tasks. In art and design education, taking risks and failing are key aspects of the creative process, for both non-experts and experts. These tasks helped students not only learn how to productively deal with failure, but to also recognize when their work had reached a dead-end. Rather than pushing through dead-ends, art and design professors believed that students must learn to recognize such moments as opportunities for reflection, and then a pivot to a new direction or creative process. Educators in other contexts, such as primary and secondary school, might benefit from incorporating into their own work the art and design professors' language regarding failure. In particular, the explicit instruction on, and modeling of, a growth mindset and a mastery-oriented classroom goal structure (Dweck 2015; Meece et al. 2006) may

be particularly helpful to educators who have to adopt higher-order learning outcomes in response to changes in educational standards (e.g., National Education Association 2014; NGSS Lead States 2013).

We were heartened that SRL models (e.g., Zimmerman 2006) seemed useful in describing and understanding how art and design professors attempted to foster their students' creative performance. At the same time, our research context was usefully dissimilar to the typical contexts studied in SRL research (Schunk and Greene 2018). Our focus on the visual arts, and the art and design professors' explicit focus upon a higher-order cognitive process (i.e., creative performance), were aspects of this study that made it unique within the SRL literature. As such, the findings from this context productively problematized several aspects of SRL models, pointing to directions for future research.

Directions for future research

Focus on process rather than product

We were intrigued by our art and design educators' focus on students' creative process, rather than any one particular product. This was somewhat different than the typical focus of SRL research and instruction. Most models of SRL emphasize the acquisition of knowledge, skills, and dispositions [e.g., operations in Winne's (2001) model, strategies in Zimmerman's (2013) model] to achieve learning tasks, and the results of learning tasks or goals themselves are often tangible work products such as grades (Dent and Koenka 2016) or demonstrated understanding (e.g., effective integration of information on the Internet within a written essay; Greene et al. 2014). We found that in art and design pedagogy, tangible products are explicitly not the goal; rather, students acquire strategies and ways of thinking (e.g., how to engage in SRL, reflection) that help them learn to deemphasize a particular goal (e.g., such as a portrait of a human model, or a sculpture of a piece of fruit, or an illustration of a motorcycle) in lieu of the ability to embrace what emerges during the creative process, and follow that to whatever final product results. Such pedagogical goals are not incommensurate with models of SRL, but they do illustrate where such models could be expanded. The focus upon the acquisition of particular kinds of normative knowledge (e.g., declarative, procedural, conceptual) in the majority of SRL research has been important and very fruitful, but more research is needed on higher-order cognitive processing as an outcome or product of successful SRL (Zimmerman 2006, 2013). It may be that teaching SRL as a means of acquiring and successfully using higher-order processes in ill-structured tasks such as creativity requires different operations, standards, and cognitive evaluations than when the focus of SRL is a particular well-structured product (Winne 2001).

Further, the art and design professors stressed that students must internalize particular dispositions to be successful creators, including the ability to "see" both their work and others' work in complex ways, including in ways that acknowledged the importance of taking risk and failing. These professors encouraged students to use particular strategies to subvert the students' typical ways of interpreting work in the service of helping students reframe their perceptions. These strategies are similar to ones taught in other fields (e.g., acquisition of argumentation skill in science; NGSS Lead States 2013), but our art and design professors also encouraged the internalization of particular dispositions to utilize these strategies (e.g., embracing failure and dead-ends), and these dispositions have received far less attention in SRL literature. The disposition to "see" one's work differently,

and to adopt a critical perspective of others' work and the world itself, is an advanced perspective not explicitly captured or described in models of the development of expertise (e.g., Alexander 2003; Ericsson 2015) or SRL (e.g., Hoyle and Dent 2018; Zimmerman 2013). Our art and design professors' practices for fostering creative performance included a far more explicit and elaborated focus upon dispositions than what is articulated currently in models of SRL (e.g., Efklides 2011).

Comparisons of SRL across domains and disciplines

More research is needed on direct comparisons of SRL processing and the viability of SRL models across domains and contexts (Alexander et al. 2011; Greene et al. 2015). Such work could involve observing students as they engage in complex learning tasks across domains or contexts (e.g., same participants in multiple contexts), or observing the same types of people, across domains or contexts, as they engage in SRL (e.g., different expert participants in their varying contexts and settings). Regardless, as SRL conceptualizations grow from their domain-general roots in social and developmental psychology (Greene 2018), it will be important to examine what aspects of SRL do and do not vary based upon context (Järvenoja et al. 2015).

Development

Researchers should continue to explore learners' developmental process of acquiring and using SRL in diverse contexts. Zimmerman's (2013) general description provided a strong foundation for the overall arc of SRL development, but there are likely important nuances in the knowledge, skills, and dispositions learners display as they internalize SRL processes (Alexander 2003). Such nuances should be explored so that educators can most effectively and efficiently propel students in their pursuit of effective SRL (Kramarski 2018). In particular, our findings regarding how art and design professors promote failure and reflection suggest that much more could be learned about how SRL dispositions evolve and are internalized across the course of development. Further, our work suggests there is much to be learned by expanding SRL research beyond traditional STEM and K-12 contexts, examining professional education in other creative disciplines such as writing, music, theater, and dance.

Expert performance

Finally, there is a clear need to continue the work started by Zimmerman (2006) and Ericsson (2015) on the role of SRL in expert performance. Such work requires moving researchers out of educational settings and into the realm of practice (Schon 1984; Hall and Stevens 1994). If one of the goals of SRL instruction is the more effective acquisition of expert performance, and if such acquisition involves changing roles for knowledge, skills (e.g., the role of metacognitive experiences in monitoring), and dispositions (e.g., taking different perspectives on work) in SRL processing, then more research is needed with experts in practice, so that researchers better understand the long-term goals of education. Creativity, and creative performance, are two unique and promising foci for such work, as illustrated by our study. It is clear that more research is needed in higher education contexts focused upon the development of expert, creative performance, such as other professional degree programs such as in law and social work (Rubenstein et al. 2018).

Limitations

We focused on interviews with art and design professors, and conducted observations of professors interacting with students, but did not interview students or assess their learning outcomes. Therefore, we are not able to claim that these pedagogical techniques effectively fostered students' SRL or their creative expertise. Our focus was on how the professors thought about and enacted SRL instruction (Kistner et al. 2010; Kramarski 2018), and how their work informed conceptualizations of SRL processing and performance.

We do not have data regarding how many professors engaged in each of these practices, or how many professors made statements like those quoted here. This is the nature of using grounded theory methodology to analyze ethnographic data: the methodology does not result in data that can be used to make distributional claims. We observed complex, real-world classroom settings, and as a result, one would not expect all pedagogical practices to appear in all studio class observations. Our interviews were unstructured, so one would not expect all pedagogical beliefs to appear in all interviews. However, our methodology required that each emergent theme be observed at both universities, and in both an art discipline and a design discipline at each university. As a result, each theme occurred at least four times, and each theme was found in a broad range of settings. This methodology indicates that the emergent themes are not unique to any one professor or discipline. In addition, the high validation interview scores for each theme provide support for our claims that these findings are representative of art and design pedagogy.

As with all qualitative research, in this study we do not make claims of causality (Lichtman 2012). Rather, the strength of qualitative research is its potential to provide thick descriptions of provocative and informative cases and contexts (Levitt et al. 2018). Studies of art and design are largely absent from educational literature (cf. Powers 2017), and therefore with a relative dearth of conceptual or empirical findings to guide our work in this context, we utilized qualitative research as a way to deeply engage with, and explore, the interview and observation data. Our chosen methodology incorporated relatively rigorous methods, in the context of qualitative studies, that are designed to result in the emergence of theoretical frameworks that provide explanations of observational data, and of the experience of our participants. That said, further research is needed to determine whether our findings prove informative for investigating SRL in other contexts, both similar to and different than our art and design institutions. Nonetheless, we believe our work, along with similar efforts in other domains and contexts, has the potential to lead to productive changes to SRL theory and research, which can then be investigated via quantitative methods to investigate questions of causality and generalizability.

Conclusion

The evolving contexts of work and citizenry in the 21st century will require people who have learned to engage creatively with the content knowledge of their chosen discipline or field (National Education Association 2014; OECD 2013). Teaching people in ways that lead to creative learning outcomes remains a challenge in kindergarten through higher education. Schools of art and design have specialized in such instruction, and our investigation revealed that self-regulated learning and performance play a critical role in fostering the kinds of creative performance necessary for success in these fields. Our analyses revealed

numerous direct and indirect ways art and design professors fostered SRL, and the role of self-regulation in creative performance. These analyses also revealed the importance of examining SRL in a broader variety of academic contexts than has been done previously, including higher-order processing and ill-structured tasks. Such work can reveal productive directions for future refinement and revision of SRL theory and practice.

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