

Processes of Artistic Creativity: The Case of Isabelle Hayeur

Jude Leclerc (jude.leclerc@umontreal.ca)

Frédéric Gosselin (frederic.gosselin@umontreal.ca)

Department of Psychology, University of Montreal
C.P. 6128, Succ. Centre-Ville, Montreal, QC, H3C 3J7, Canada

Abstract

What are the problems faced by artists in real-life contexts? By what processes do they solve these problems? In this paper, work on scientific discovery (e.g., Klahr, 2000; Kulkarni & Simon, 1988; Langley, Simon, Bradshaw, & Zytkow, 1987) and a situated perspective on creative cognition (e.g., Csikszentmihalyi, 1988, 1999; Nersessian, 2004) are brought together into a unifying framework for studying the processes of artistic creativity in real-life. Within this framework, artistic creativity is viewed as *situated problem solving*. We illustrated our approach by applying it to Isabelle Hayeur, a successful Canadian visual artist.

Introduction

In this paper, work on scientific discovery and a situated perspective on creative cognition are brought together into a framework for studying the processes of artistic creativity. Everybody is interested in art, but up until now few have examined the problem-solving processes that provide support for the artistic process and the production of works of art; almost no one has looked at real-life artistic practices.

We begin by reviewing work on scientific discovery processes. We then present a current definition of creativity that parallels work on situated and distributed cognition. We then go on to describe part of an ongoing field study we are conducting, a study of creative artistic processes in a contemporary visual arts practice, within our framework. Finally, we discuss the potential of this approach for future studies of artistic creativity.

Artistic Practice and Creativity as Situated Problem Solving

Artistic Creativity as Problem Solving

There is now a tradition of studying creativity from a problem-solving viewpoint (e.g., Klahr, 2000; Kulkarni & Simon, 1988; Langley, Simon, Bradshaw, & Zytkow, 1987; Newell, Shaw, & Simon, 1962). The processes of scientific discovery, especially, have been studied from this perspective.

In an excellent review, Klahr and Simon (1999) present the four major approaches of these studies: historical, laboratory, direct observation, and computational. What Klahr and Simon note is that all these approaches to the study of scientific creativity have led to convergent findings about discovery processes.

Klahr and Simon propose that by using the concepts and vocabulary of human problem-solving theory "we may be

able ... to converge toward a common account of discovery in many areas of human endeavor: practical, scientific and artistic, occurring both in everyday life and in specialized technical and professional domains" (p.524). Here, these concepts and vocabulary are those of problem spaces – states, operators and goals –, heuristic rules, weak and strong search methods – hill-climbing, means-end analysis, planning (Newell & Simon, 1972). Discovery is thus viewed as a search process in a problem-solving space, composed of goals, rules and other aspects of the task and situation.

Up until now, artistic creativity had almost never been studied from a problem-solving perspective. There are a few exceptions (e.g., Weisberg, 1993), but a lot of groundwork still needs to be done. So far, the studies of artistic creativity based on this approach have mainly addressed creative processes in relatively general terms; they have not produced specific descriptions of problem spaces and heuristics in specific artistic practices.

Search Spaces in Scientific Discovery *Search spaces* or *problem spaces* are abstract – representational, conceptual – spaces explored by a ‘problem solver’ during the problem-solving process. In the case of scientific discovery, scientists have been found to work in two, three, four, and even in search spaces of greater dimensionality (e.g., Klahr & Dunbar, 1988; Kulkarni & Simon, 1988; Schunn & Klahr, 1995; Thagard, 1998; Wolf & Beskin, 1996; see also Klahr & Simon 1999; Klahr, 2000). The traditional two-space view of scientific discovery has its origins in Simon and Lea's (1974) work on problem solving and rule induction; it was first proposed by Klahr and Dunbar (1988). According to this model, in the process of scientific discovery, search happens in two coordinated spaces: (1) the hypothesis space, and (2) the experiment space. Thus, scientific discovery involves generating new hypothesis and experiments; then these experiments serve to evaluate the hypothesis and further generate new ones. This can be considered a problem-solving process.

Similarly, we may ask: what problem space is explored by an artist in the course of the artistic work and practice? In what problem space, and by what processes, is this search conducted? And, of course, there is the possibility that the artist is working through multiple search spaces, corresponding to diverse subproblems involved in artistic creativity.

Artistic Creativity as Situated Activity

According to Csikszentmihalyi (1999), “For creativity to occur, a set of rules and practices must be transmitted from the domain to the individual. The individual must then

produce a novel variation in the content of the domain. The variation then must be selected by the field [the social organization of the domain] for inclusion in the domain” (p. 315; see also Feldman, Csikszentmihalyi, & Gardner, 1994).

From this point of view, creative cognition is not just “in the head” (Norman, 1993a), it is a computational process involving domain and field, as well as the individual. The parallels with situated or distributed approaches to cognition are obvious (e.g., Hutchins, 1995; Nersessian, Kurz-Milcke, Newstetter, & Davies, 2003; Thagard, 1999). Nersessian et al. (2003), for example, studied innovation – creativity – in biomedical engineering research laboratories as a situated and distributed process. The view of creativity as situated, contextual, points toward individual, field, and domain-specific studies of creativity (Csikszentmihalyi, 1988, 1999; Li, 1997; Mace & Ward, 2002).

A lot of recent work in cognitive science explores the situated nature of cognition and action (e.g., Clancey, 1997; Hutchins, 1995; see Nersessian, 2004; Norman, 1993b). Nersessian summarizes the challenges posed to traditional cognitive science by this *environmental perspective* with three interrelated questions: “1) What are the bounds of the cognitive system? 2) What is the nature of the processing employed in cognition? and 3) What kinds of representations – internal and external – are used in cognitive processing?” This perspective effectively poses challenges to cognitive science; the same challenges are also implicit in current models of creativity.

Thus, as with the problem-solving approach, situated and distributed cognition approaches have been used to study processes of scientific discovery (e.g., Nersessian et al., 2003).

Within our framework for studying processes of artistic creativity, in accord with problem-solving theory, recent approaches to situated and distributed cognition, and with current definitions of creativity, we view artistic creativity as *situated problem solving*. We are interested in finding out what problem-solving processes are involved in artistic creativity and in situating these – computations, rules – within the larger system involved in an artistic practice.

Contemporary Visual Arts Practice: The Case of Isabelle Hayeur

To illustrate this approach, we will briefly present preliminary results obtained from the study of a contemporary Canadian visual artist’s work and practice. The main focus of this first phase of analysis is on determining the *search spaces* involved in a real-life artistic work and practice.

Isabelle Hayeur¹ is a professional Canadian artist. She is a *professional artist* in the sense of Quebec’s law on the *Professional status of artists in the visual arts, arts and crafts and literature, and their contracts with promoters* (R.S.Q., c. S-32.01); she has received multiple grants from both the Canada Council for the Arts and the Conseil des

Arts et des Lettres du Québec, and her work has been shown nationally and internationally.

Isabelle Hayeur works mainly with digital photography and video. Her digital photomontages and videos have been shown in solo and group exhibitions, and festivals, in Australia, Belgium, Canada, Chile, Croatia, Denmark, England, Estonia, France, Finland, Germany, Italy, Japan, Malaysia, Mexico, Portugal, Poland, Serbia, Spain, and the United States. She also produces Internet art projects and site-specific works. Her artistic work deals mainly with the impact of the Western model of development on the environment. Her images often display landscapes, part idyllic, part disenchanting, amid man’s interventions. Based on a major sociological survey² of Québec’s visual artists’ conditions of practice (Bellavance, Bernier, & Laplante, 2001), she can be considered representative of other successful visual artists in that context.

At the time of writing we had been conducting a field study of this artist’s creative processes and practice for a ten-month period; the study is ongoing. Kulkarni and Simon (1988) discussed the use of different kinds of data for building models of processes that span many months or years (e.g., discovery processes in science), where gathering continuous protocols is not practical; in such contexts, recourse to other kinds of data is required. Data about this artist’s creative processes were collected on-site, at the artist’s studio, through interviews, recording of her artistic activity at the computer, and photographs taken of her work space and tools. Extensive field notes were also taken. The combined data collection allows for the recording of cognitive processes involving a distributed set of activities and tools (see Clancey, 2001). All data was digitally recorded (except for the field notes); the total archived data volume amounts to close to 30 gigabytes.

Our study is at the crossroads of the observational and computational approaches to discovery and creativity processes (Klahr & Simon, 1999); we are using observational and interview data to build a computational description and model of processes of artistic creativity.

Here we will focus on the interview data. Eight semi-structured interviews were conducted over a six-month period, at the artist’s studio (Leclerc & Gosselin, 2003). We took inspiration from the traditional protocol analysis methodology (Ericsson & Simon, 1993) for eliciting verbal reports; interviews were thus conducted with the goal of producing information resembling what Ericsson and Simon call “Level 2 verbalizations”. This type of verbalization involves descriptive information; Isabelle Hayeur was therefore asked for descriptions of her activities as an artist, not for explanations. Interviews were digitally recorded and were 30 to 60 minutes long each. These were transcribed verbatim and represent a total of 74,507 words. Interviews were organized, stored, and analyzed using Atlas.ti, a computer package designed for qualitative data analysis.

¹ Her work, artist’s statement, and resume can be found on her Web site: isabelle-hayeur.com.

² This study was commissioned by Québec’s main group of professional visual artists, the *Regroupement des Artistes en Arts Visuels du Québec*.

Problem Spaces in Isabelle Hayeur's Creative Process

Viewing artistic creativity as a special case of human problem solving, we have to ask what are the problems solved by an artist? More precisely, what are the problems solved by Isabelle Hayeur? Finding what problems she solves means finding out what problem spaces she explores in the course of her artistic practice. Problem spaces are defined in terms of states, operators, goals, and constraints (Klahr & Simon, 1999, citing Newell & Simon, 1972); we have coded and analyzed our interviews in these terms.

Recently, some researchers have also started to redefine the concept of *problem space*, putting the emphasis not just on internal representations, search, and operations on these representations, but also on the physical space, and the context, involved in real-life problem-solving activity. For example, Nersessian et al. (2003), in their study of innovative practices in biomedical research laboratories, considered the “lab-as-problem-space”; the laboratory, with its resources, people, technology, equipment, etc., is thus considered as a ‘problem space’. Similarly, in contemporary visual arts practice, the artist, work space, tools, technologies, technical knowledge and skills, environment, partnerships with other artists, relations with galleries, art centers, funding agencies... constitute the problem space of an arts practice (e.g., see Figure 1). Our analysis is thus based on identifying states, goals, operators, and constraints, in this sense – in a situated artistic practice.



Figure 1: The artist's “studio-as-problem-space”

Criteria for Proposing New Search Spaces Schunn and Klahr (1996; see also Klahr, 2000) have suggested three criteria for proposing new problem spaces: (1) logical, (2) empirical, and (3) implementational. The logical criterion refers to logical coherence of the categories – spaces – proposed; spaces must be mutually exclusive. The empirical refers to the fact that there must be some activity going on in the proposed spaces. And, the implementational criterion allows precise characterization of the proposed problem spaces.

Given the preliminary nature of our research, we have relied mainly on the empirical and on the logical criteria. We have analyzed transcripts from the interviews and coded those in terms of rules (i.e., production rules), condition-action rules. And based on these rules, we have identified goals and heuristic operators³; these define the spaces searched by Isabelle Hayeur in the course of her creative process.

Artistic Practice and Career Search Spaces Following coding and analysis of the interviews, two main spaces emerged as the ones most actively searched in the course of Isabelle Hayeur's account of her creative activity: the *artistic practice space* and the *career space*. Throughout the interviews she describes both areas of activity. For example:

Interview 2

(28:30) I always plan, I plan moments where I concentrate on my [artistic] production. And there are moments where I put together my artist's dossiers; it is rather dull, but it has to be done. I put together those dossiers [for submission calls]. *You see, there really is the creative work, you know what this is, and there is also everything surrounding that, which takes about half my time* [italics added]⁴.

Interview 3

(29:49) I find myself putting more time on my artistic work... the artistic work, and the career.

Interview 5

(01:08) Already, I am very busy, with things related to the dissemination [of the artistic work], but which I must do, everything surrounding the artistic practice.

In the following sections, we will look at the organization and role of the artistic practice and the career search spaces.

Artistic Practice Search Space: Goals and Heuristics

Table 1 shows the main set of goals found to operate in the artistic practice space. These high-level goals shape Isabelle Hayeur's artistic practice. Heuristic operators searching through the artistic practice space apply these goals; these play a role in many heuristic rules used by Isabelle Hayeur to accomplish the tasks associated with this space.

Table 1: Artistic practice space main goals

[gR2-12; gR2-13] Doing my work as an artist seriously, full time.

[gR2-14; gR2-15] Living with less money, in order to put more time into my artistic practice (and less time into ‘bread-and-butter’ jobs).

[gR2-17; gR2-28] Having more time for my artistic practice.

³ Goals are labeled gR and rules R. A rule is given the number of the interview in which it first appeared; goals are constitutive parts of rules.

⁴ For this paper, interview excerpts, goals, and rules were translated from the French language.

[gR2-30; gR2-32] Working on my images, especially after a few weeks of not working on them.
 [gR2-31] After a long time working on my images, taking some time away from the work, doing something else.
 [gR2-33; gR-35] Putting time into my practice, taking up and continuing work on projects, planning time when I concentrate on my production.
 [gR2-38] Art must remain a calling, it must remain research; the career side must not take too much time.
 [gR2-38; gR3-06] I want my images, series, artistic work and career to succeed.
 [gR2-39] Doing art for the knowledge it brings in my own life, and for what it may teach or give to others.
 [gR3-04] Not stopping my artistic work.
 [gR3-07] Being an artist; doing this my entire life.
 [gR5-01; gR5-02] Creating strong works, strong images; saying things in a strong way, a stronger way.

[gR2-37; gR3-02; gR3-05] Taking care of the career side – everything that surrounds the creative work: searching for submission-call deadlines, new places and centers to show my work, residencies, putting together my “artist’s dossiers” according to grants and submission-call deadlines, also answering specific requests for exhibitions and, at some point, sending a set of dossiers – around ten at a time – to art centers I want to reach in a given year, etc. I put half of my total work time as an artist on these activities (when I do not have other contracts, ‘bread-and-butter’ jobs to do).
 [gR2-38] Not putting too much time on the career side; leaving aside some activities if necessary, even if I miss out on some opportunities.
 [gR3-01; gR3-06] Being entrepreneurial; sending out a lot of artist’s dossiers in order to have exhibitions.
 [gR3-01; gR3-07] Having success as an artist; being an artist my entire life.

Among the goals defining the artistic practice space, some appear to play a major role because they call upon many other goals to search the problem space. For example, gR3-07 calls on a host of activities to reach its aim (see Tables 1 & 2, [gR2-33; gR2-35; gR2-36; gR2-37; gR2-38; gR3-01, gR3-02; gR3-05; gR3-06], for an example of subgoals – heuristics – called by gR3-07).

The artistic practice space is divided further in a number of important subspaces. Among these figures the *image-generation space*. Of great importance, it is the very basis of Isabelle Hayeur’s artistic practice; this subspace includes all the knowledge and skills actually involved in the image production activity. Another subspace would be a ‘project-management’ subspace. We will not expand on these here.

The task achieved through the artistic practice problem space is the task of being an artist, of focusing on one’s artistic practice and of producing art works.

Career Search Space: Goals and Heuristics This is the main set of goals found to operate in the career space. Goals gR2-36, gR3-01, gR3-06, gR3-07, and their associated heuristic rules, are the most significant; these actually call upon every other goal and heuristic in the career space.

Table 2: Career space main goals

[gR2-01; gR2-03] Sitting on panels, juries, etc., with other artists.
 [gR2-01; gR2-02] Learning. Learning how other artists talk about their work, getting ideas about how to present your work, how art councils work, etc.
 [gR2-26; gR2-27] Being represented by a private art gallery, in order to sell my work.
 [gR2-34; gR6-01] Sending my work to art centers, galleries, and obtaining exhibitions.
 [gR2-35; gR3-05] Putting together “artist’s dossiers” – artistic projects and related documents about my practice (to be sent to art centers when there are calls for submissions).
 [gR2-36] Doing the things that make a difference in an artist’s career, in order to have a successful career.

The career space is further subdivided in two main subspaces: the dissemination and the promotion spaces. These serve to solve the ‘problem’ of making the artistic work known and seen.

Some of the career goals are related to the same rules as some of the artistic practice goals. This is because certain heuristics operators mediate activity between these two search spaces. The task achieved through the career problem space is the task of making one’s work known and seen, thereby building up a successful career.

Heuristics Coordinating Search We have found some heuristic operators, some rules, to be of special importance in Isabelle Hayeur’s creative process because they coordinate the search between the artistic practice and career spaces. Here is such a heuristic operator associated with the recurrent goal gR3-07:

[R3-07] If I want to be an artist and I want to be an artist my entire life, and I know what I have to do, then I do it immediately (i.e., gR2-33, gR2-35, gR2-36, gR2-37, gR2-38, gR3-01, gR3-02, gR3-05, gR3-06).

R3-07 coordinates a lot of activity related to the artistic practice and the career spaces. In fact, it links vocational goals, wanting to live the life of an artist, with very practical career goals and activities.

Here is another example of a heuristic operator linking artistic practice and career:

[R2-38] If I want art to remain a calling as it must, and if at a certain point I realize that the ‘career’ side takes too much of my time, then I just don’t do it, that activity (even if it means missing opportunities).

Identifying coordination between search spaces is an important part of modeling problem-solving processes; as Klahr (2000) notes, “One must ... distinguish search in a particular space from coordination among multiple spaces” (p. 215).

An Additional Search Space This additional space, the *economic space* is not directly part of Isabelle Hayeur's process of artistic creativity, although, as we will see, it is essential for it. This space could also be called the 'working for a living' or the 'bread-and-butter job' space. Table 3 shows a sample of goals from this space.

Table 3: Some economic space goals

[gR2-07] Taking small jobs, contracts, especially in my domain or related to my practice, the arts, and the art milieu.
[gR2-07] Trying to find more gratifying, better paid, and a little bit more interesting jobs.
[gR2-13] 'Bread-and-butter' jobs must not take away from my hours of artistic work.
[gR2-14; gR2-16] To live with less money, in order to need to work less (in order to have more time for my practice).
[gR2-23; gR2-24] Not putting time into searching for bread-and-butter jobs; taking what comes.
[gR2-27; gR2-28] To sell my art work, in order to spend more time on my production and less on contracts outside my practice.

Some rules related to these goals show an interaction between the artistic practice, career, and economic spaces. Here are some examples:

[R2-07] If you are an artist, and you (necessarily) need to pay for your own production (e.g., the high cost of printing large format photographs), and you have the chance to work in your own domain, then generally you accept these small jobs.

[R2-14] If I cannot live solely from my art, and I have to take 'bread-and-butter' jobs, and I do not want this to replace my hours of artistic practice, then I decide to live with less money, in order to need to work less.

[R2-28] If I sell my art work, even if just one image a month, then for each picture sold, I have one less contract to do, and I have more time for my practice.

These rules show that artistic creativity – artistic practice and career – is supported by the economic space. Search, minimal search in Isabelle Hayeur's case, in this space aims at finding the necessary resources to allow most of the artist's activity to be focused on her professional life and artistic production. The main task achieved through the economic problem space is finding (minimal) financial resources to support artistic and career related activities.

In Isabelle Hayeur's life and developmental trajectory as an artist, less and less time is spent on the economic space and more is spent on the actual artistic practice and career (see goals gR2-12, gR2-13, gR2-14, gR2-15, gR2-16, gR2-17, gR2-23, gR2-24, gR2-27, gR2-28, gR2-33, gR2-35, gR2-38, gR3-04, in Tables 1, 2, & 3). The rules that coordinate the artistic practice, career, and economic spaces aim at: (1) diminishing economic space activity, (2) maintaining career activity at a balanced level, and (3) maintaining or augmenting artistic practice activity level.

According to Bellavance, Bernier, and Laplante's (2001) survey, few professional artists manage to achieve these goals in Québec's and Canada's socio-cultural and economic context. One measure of an artist's success, at least in regard to the interplay between practice, career, and economic spaces, seems to be his or her ability to do just that, focus on the artistic life rather than just on sheer survival.

Our situated problem-solving perspective on artistic creativity has shown that two main spaces are directly involved in a contemporary visual artist's creative process: the artistic-practice-as-problem-space and the career-as-problem-space. When Nersessian (2004) describes the challenges posed by the environmental perspective to the traditional view of cognition, she mentions considerations of the boundaries of cognitive systems; according to this perspective, cognition is situated and distributed in a complex cognitive system, a system that includes environment and individual. In this first part of Isabelle Hayeur's case study, we found a number of environmental elements playing a role in the artistic practice space (e.g., the artist's studio, equipment, time and financial resources, knowledge and skills needed to produce art works, etc.) and the career space (e.g., relationships with other artists, art centers and galleries, funding agencies, etc.), and defining the complex cognitive space of her artistic creativity.

Conclusions

The project of modeling Isabelle Hayeur's processes of artistic creativity is ongoing. What was outlined here is meant as an illustration of our framework for studying real-life artistic creativity; our preliminary results suggest a well-integrated set of search spaces and processes involved in real-life, situated, artistic practice and cognition. Further work will involve collecting verbal protocols related to the image-generation search space – the actual picture producing process; we have already recorded more than 100 hours of her image-generation activity.

Within the *artistic creativity as situated problem solving* framework, it is possible to study real-life artistic practices. The product is a descriptive model of search spaces, goals, and heuristic operators involved in artistic creativity. Dasgupta (1994, see also 2003) has done something of the kind in the context of science and technological innovation. The type of studies provided by our framework may lead to computational models of historical instances of artistic creativity, as studies in science have led to computational models of historical scientific discoveries (Langley, Magnani, Cheng, Gordon, Kocabas, & Sleeman, 2001). Such studies may also serve an educational purpose by providing information about real-life processes of artistic creativity.

Acknowledgments

We thank Isabelle Hayeur for her generous participation in this research project and for graciously giving her consent to the disclosure of confidential information. This research was supported by an Excellency Scholarship from the University of Montreal awarded to Jude Leclerc, and by an NSERC

(R0010085) and an NATEQ (R0010287) grant awarded to Frédéric Gosselin.

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