Creative Processes in Five Domains: Art, Design, Scriptwriting, Music and Engineering

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Keywords Creative process · Art · Design · Scriptwriting · Music · Engineering

In this chapter, we will compare five domains of creativity: art, design, scriptwriting, music, and engineering. For each domain, we will describe a current model of the process and then present the results of observations of a class of students doing a project in a training context. Finally, we will discuss how these fields are similar or different. Before starting, we will first review the specificities and generalities of creativity.

This project was supported by the French National Research Agency (ANR), Study of the creative process in five domains (CREAPRO). Grant ANR-08-CREA-0038.

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T. Lubart et al. (eds.), *Homo Creativus*, Creativity in the Twenty First Century,
https://doi.org/10.1007/978-3-030-99674-1_5

1 Specificity–Domain Generality of Creativity

Creativity may be involved in several domains such as art, literature, science, music or everyday life. Baer (2010) argues that the skills that are necessary in one creative domain may not be the same as those that are necessary in another. He talks about "task specificity" (Baer, 1998). Some differences could even exist within one specific domain: for example, the skills necessary for making a sculpture might not be the same as those for making a painting. According to Baer, an individual might be very creative in one domain, but not necessarily in another. Following this view, the results obtained in research on general creativity might be partly wrong, or at least might not be valid in some domains.

Analysis of tasks is essential in order to identify the specific set of abilities, knowledge and traits involved in a particular activity, and the relative weights of these different factors. For example, in a creative writing task, processes such as divergent thinking, metaphor generation, accessing knowledge about story prototypes (scripts), evaluation and convergent thinking tend to be involved. The case of knowledge is especially clear: knowledge that may be useful in a particular task, such as creating a novel car design, may differ from the knowledge required in another task, such as finding new ways to increase productivity in a car assembly line. A person may have more knowledge in one domain than in another, which contributes to intra-individual differences in creativity across domains.

Creativity, and divergent thinking in particular, is relatively specific to one cognitive domain and one type of content (Baer, 1993, 1998, 1999, 2010). For example, Baer (1993, 1994) had children take part in creativity trials corresponding to different aspects: writing a poem, writing a story, making an oral presentation about a story, solving a mathematical puzzle, and making a collage. Results indicate very low correlations between dimensions ($r^2 < 5\%$). However, within a single individual, there exists some stability in performance when the trials are performed twice with a one-year interval. From the sum of his research, Baer (1998, 1999) concludes that the mechanisms underlying creativity and divergent thinking are task-specific.

Research on the domain specificity–domain generality of creativity shows that there are weak positive correlations across tasks. In studies in which people complete several creative thinking tasks from diverse domains, such as making a drawing, writing a story, proposing an idea for an advertisement and proposing solutions for societal problems, the correlations vary in general from 0.20 to 0.60, with a median value near 0.30 (Lubart & Guignard, 2004). Thus, there tends to be between 4 and 36% shared variance in creative performance across tasks, with about 10% on average. If two tasks from close domains, such as making a drawing and making a collage, are used the correlations tend to be in the 0.40 to 0.60 range. When nearly identical tasks are used, such as two story composition tasks that vary on the specified title for each of the stories, the correlations are stronger, tending toward 0.70 or 0.80 (50–60% shared variance) (Lubart & Sternberg, 1995). In an important study, Gray (1966) examined 2,400 historically eminent creative people and found that extremely few (2%) showed creative accomplishments in diverse domains, such as art and literature, and only 17% of the sample showed creative work in related domains, such as painting and sculpture.

These observations argue in favor of creativity being partially domain and task specific. There is a gradient from general creativity which may be present to a small extent in every task that involves creativity, to a second, domain level of creative ability (such as visual arts creativity, design creativity, literary creativity, scientific creativity, business creativity, etc.) to a third more detailed level within such domains (such as sub-types of artistic creativity, e.g., drawing vs painting), to a fourth final level in which the task is defined completely, and the most specific components of creativity exist. Thus, it is essential to understand the combination of sub-processes involved in each particular task in order to predict and train creativity.

At this point, we can ask what is the nature of these specificities. It will be difficult to explain which is the cause but some keys can be identified: the cognitive and conative resources solicited vary according to the creative domain, as well the material used (figurative or verbal), the domain of application (art versus science, or more specifically biology versus physical science), and the creative process.

As we have already noted, analysis of tasks is essential in order to identify the specific set of abilities, knowledge and traits involved in a particular activity, and the relative weights of these different factors. First, to simplify, one can imagine classifying a priori the various categories of jobs on a continuum, starting with those requiring a low involvement of creativity (for example, security jobs) to those requiring a high level (for example, commercial artists, designers, R & D workers), passing through job categories for which creativity would be more or less implied in professional performance (for example, manufacturing and finding improvements with assembly line workers). However, this level of description is not satisfactory, and only a specific analysis of activity will lead to the form of creativity required for each kind of work, but also to the specific combination of aptitudes, knowledge and personality traits required for training purposes.

Several authors have taken an interest in comparing the personality of creative individuals depending on the domain of application. Baer (2012) underlines the link between some specific-domain as the arts and literature tend to show correlations between creativity in mental illness whereas no link was found in sciences Thus, according to Gardner (1971), problems encountered in science and in the arts are not identical from this point of view. For example, in the case of scientists, the scientist starts by formulating a hypothesis and then by verifying it; in the case of artists, on the other hand, the stage of conceptualizing a problem is completely meshed together with the stage of solving it. Piechowski (1999) points out the fact that scientists and artists work on different materials. Scientific creativity takes place “outside” of the individual in term of physical phenomena studied by science and also in terms of interactions between researchers and the outside environment (Latour & Woolgar, 1979); hence it is easy to analyse, identify and observe scientific phenomena. Yet, this effect is due more to the very nature of science than to that of the creative process of scientists. Artistic creativity, on the other hand, is related to the subjectivity of the creator. According to Piechowski, artists work with emotions and with human complexity.

Feist (1998) has also noted some differences between artists and scientists: artists tend to be more affect-driven, unstable in emotional terms, and antisocial, whereas scientists tend to be more conscientious. Domain-based analyses are therefore essential to identifying the set of skills, knowledge, and specific traits involved in a specific kind of creativity, and the relative weight of these various factors. For example, knowledge that might be useful in a particular task, such as designing a new car, might differ from the knowledge needed for another task, such as finding new ways to increase productivity in an automobile manufacturing line. A person might have more knowledge in one domain than in another, leading to within-subject differences in creativity across domains.

During many years, artists were considered as more divergent and scientists as more convergent (Berry, 2000; Gould, 2003; Wilson, 1998). However, recent researchers considered that the debate between art and science is over because, now, they have more in common than in the past. Williamson (2011) did not observe any significant differences on the cognitive skills of 51 art and 65 science students. Furnham et al. (2011) tested this hypothesis comparing 65 science students and 42 arts students. When age, gender, Extraversion and Openness were controlled, no difference was observed for divergent thinking fluency in a task of listing the maximum of consequences to unfamiliar events. When divergent thinking was evaluated by listing the maximum uses of objects, Furnham and collaborators did not find differences between 30 students form Natural Sciences (Chemistry, Biology, Physics, Medical Sciences and Mathematics), 30 students from Social Sciences (Psychology and Economics), and 30 students from Arts (Fashion, Fine Art and Design).

Finally, creativity might be organized following multiple levels (Fig. 1). We have presented a few examples for each level, without aiming for comprehensive coverage.

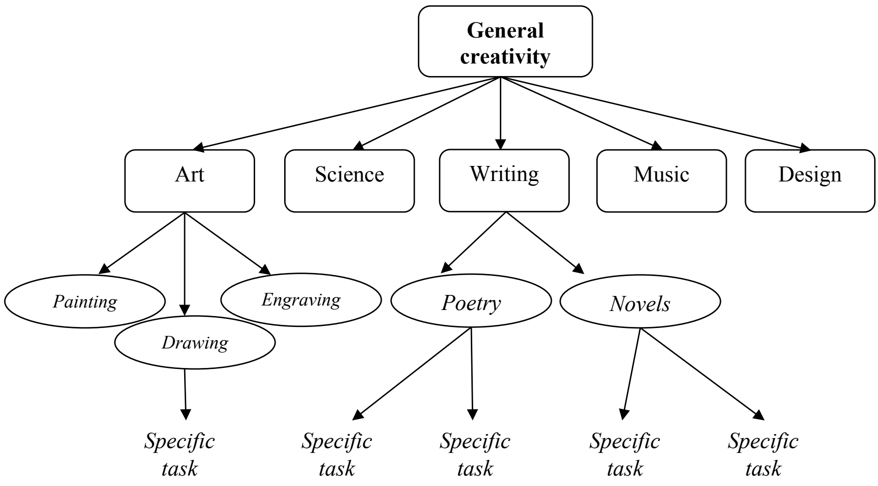

Fig. 1 Some examples of supposed "levels" of creativity

2 Specificity–Domain Generality of the Creative Process

In this section, some models of the creative process in art, design, scriptwriting, music and engineering will be presented with an example of observation in each domain. Based on the work of Glăveanu et al. (2013), who interviewed different experts in these five domains, a Creative process Report Diary (CRD, Botella et al., 2017) was constructed allowing self-observation of the creative process (Botella & Lubart, 2015). This CRD consisted of a structured self-report focused on stages of the creative process in which participants indicated their weekly progress. Thirteen stages of the creative process were considered in the CRD: definition of the problem, reflection, documentation, consideration of constraints, insight, associative thinking, divergent thinking, convergent thinking, the benefit from chance, implementation, finalization, judgment, and taking a break. All these stages were presented with a short definition (see Table 1) based on the interviews by Glăveanu et al. (2013). At each evaluation episode, students checked whether they had engaged in each stage during their project work. Each group of students completed the CRD at the end of each week while creating a production for one of their university or school classes.

Table 1 Description of the thirteen stages of the creative process used in the booklet material based on Glăveanu et al. (2013)

Stages	Description
Definition of the problem	To focus, to explore the theme, the aims, need to create, need to express, challenge
Reflection	To ask, to interact with the work, understand
Documentation	To capture and search for information, to be attentive, to always have the project in mind, to store information, to accumulate, to be impregnated, receptive, available, to observe, to show sensitivity and awareness
Consideration of constraints	To define constraints, to identify a customer's request, to set constraints for oneself and define one's rules and freedom
Insight	To have an idea, to experience the emergence, the sudden appearance of an idea
Associative thinking	Resonance, to play with forms, materials and significations, imagination, daydream, analogy
Divergent thinking	To try, modify, manipulate, and test
Convergent thinking	To crystallize, to make a prototype, to visualize and structure, to establish order, sequence, to control and organize
The benefit of chance	The luck of the environment, aleatory processes, to be open to chance, to take a walk, to accept accidents and chaos
Implementation	To transpose, make, illustrate, produce, compose, give shape, apply
Finalization	To edit, develop, complete, justify, explain one's work, exhibit
Judgement	To be self-critical, to stand back, to analyze, check the quality of a result
Taking a break	To rest, to digest an idea, to let time pass, to do something else

2.1 Art

The works of great artists such as Michelangelo, Leornardo Da Vinci, and Picasso have long been the subject of study in terms of psychological processes (Piirto, 1992). The artist must not simply aim to produce work that is more imaginative or inventive than that of others, but must create an active object that interacts with the viewer at the psychological level. In line with the multivariate approach to creativity (Lubart, 1999), research has identified certain factors that play a role in artistic creativity, such as personality traits of openness, individualism, and non-conformity (Feist, 1998). Other authors such as Silvia (2005) or Newton (2013) have highlighted the importance of emotional information processing in creative artistic work.

In terms of research on the creative process in art, Patrick (1937) conducted an early observational study on artistic phases of work. Mace and Ward (2002) proposed a specific model of the creative process of art making; based on interviews of professional artists, involving: (1) *conception* in which the artist identifies an idea or a feeling; (2) *idea development* in which the artist works to structure and restructure the idea, (3) *making* the work and idea development in which the artist transforms the idea into a “physical entity”; and (4) *finishing* the work, in which the artist evaluates the production. In addition, this model proposes several sub-stages. For instance, the second stage included structuring, enriching, restructuring and evaluating of ideas which are managed by another sub-stage called decision making. Mace and Ward proposed a cyclical model in which the end of the creative process could contribute to a new creative process; Finishing one work could generate new ideas for another, and consequently, a new creative process is engaged to explore these news possibilities. Getzels and Csikszentmihalyi (1976) found that artistic creativity is related to time spent in an exploratory phase before starting to draw. In a field study of ink painters, Yokochi and Okada (2005) observed that the painter formed a global picture with each successive element. The painter had a partial image in his head and each line drawn constrains other lines. In this way the ink paint seemed to be a set of many successive pictures where each picture needed its own art process.

To illustrate the creative process in this domain, 27 undergraduate art students in their third year at a French art university (21 females, 6 males, $m = 22.75$ years, $sd = 1.16$ years, age range: 21–25 years) had one semester—12 weeks—to create freely a work of art. This task was given by the art university and not by the research team. At the end of each week, students had to complete a page of the CRD on the stage(s) of the creative process they engaged in during that session. Most students completed the CRD in class but some of them preferred to complete it at home. The graphical representation of their creative process is presented in Fig. 2. The artistic creative process appears dynamic, as already shown in a previous study (Botella et al., 2011), with non-linear transitions between the stages, possible feedback between the stages and the option to skip a specific stage.

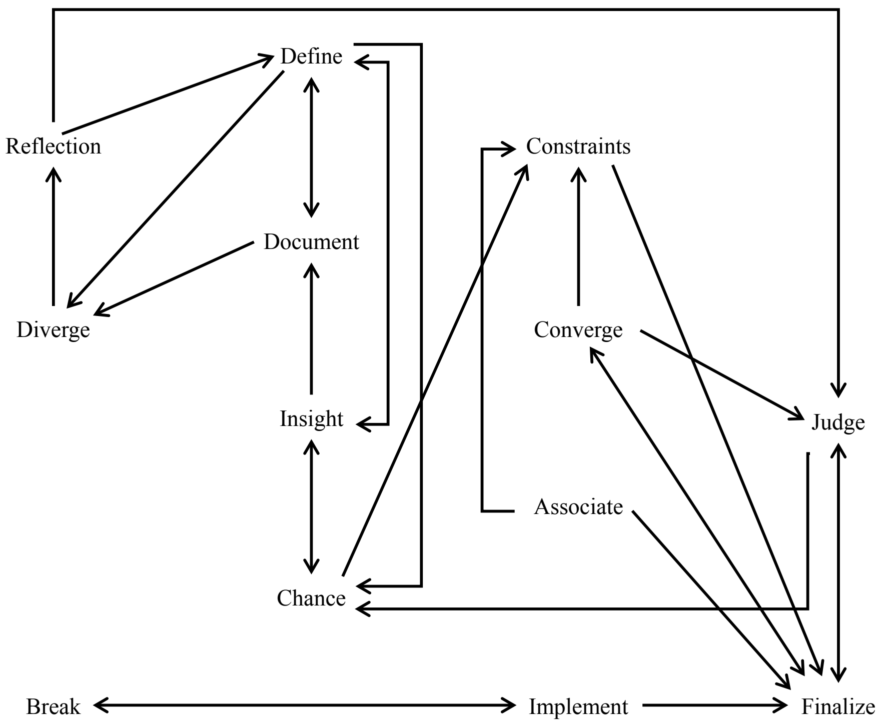

Fig. 2 A representation of the creative process in art

2.2 Design

Design, the creation of new artefacts that meet certain requirements or constraints, has been examined in several studies (Bonnardel, 2006). Design covers a range of activities such as creating household objects (e.g., kitchenware, furniture) and architectural constructions (e.g., interior design). A main characteristic of creative design tasks is that the initial state is "ill structured" (Simon, 1973, 1995). Thus, the designer's mental representation is, initially, incomplete and imprecise. The designer's mental representation evolves as problem solving progresses and the search space of potential solutions is progressively restricted until the designer reaches a design solution that is considered as satisfying with regard to certain criteria. Thus, a co-evolution of problem and solution spaces can be observed (Dorst & Cross, 2001). This specificity of design problems has also been described as based on an iterative dialectic between problem-framing and problem-solving (Rittel & Webber, 1984; Simon, 1995). The seminal study of Hayes-Roth and Hayes-Roth (1979) and later research (see Bonnardel et al., 2003; Visser, 1990) provided arguments in favour of an opportunistic organization of design activities, though they possibly include hierarchical episodes. For instance, opportunistic decisions lead to reconsidering previous decisions or postponing certain decisions. All these characteristics are also explained by a “reflective conversation” between the designer and the external representations of the artefact, consisting, for instance, in sketches or drawings (see Schön & Wiggings, 1992). Sketches allow designers to express or “externalize” their ideas and they also support visual reasoning. According to Tversky (1999), this last cognitive process establishes relationships between knowledge in long-term memory and knowledge based on perception. In addition, Goldschmidt (1991, 1994) describes two functions of sketches: they allow designers to see visual and graphical properties of their sketches (“to see that”) as well as to develop interpretative processes in order to see more than what is strictly represented (“to see as”).

Concerning, more precisely, the emergence of creativity in design, observations of real-world creative design situations suggest that new ideas are inspired by old situations pertaining or not to the same conceptual domain as the current creative context (see, for instance, Bonnardel, 2000). In line with such observations, the A-CM—Analogy and Constraint Management—model (Bonnardel, 2000, 2006) points out the role of two main cognitive processes that continuously interact during the design activity and can have opposite effects: (a) *analogy-making*, which may lead designers to extend or “open up” their “space of research” of new ideas; and (b) the *management of constraints*, which orients design problem solving and allows designers to progressively set boundaries to their research space until they find a design solution that is both new and adapted to various constraints. In line with this view, design creativity has been described as based on the activation and recombination in a new way of previous knowledge elements in order to generate new properties based on the previous ones (Ward & Sifonis, 1997; Ward et al., 1997). One of the current gaps in the literature on design is to situate the psychological mechanisms involved in design creativity with respect to those involved in artistic creativity and scientific creativity, as design appears to exist at the interface of these kinds of activities.

Twenty seven design students in their second year at a design school (18 females, 9 males, $m = 23.18$ years, $sd = 4.79$ years, age range: 20–25 years) had 7 weeks to create individually a graphic poster on a given topic: answering a brief about an event called “Green-Box”, promoting an ecological approach to packaging. They completed the CRD at least 10 times. They used the CRD typically at the design school, during classes, but had also the option of completing it at home. The graphical representation of their creative process is presented in Fig. 3. The stages are placed in the same order than the graphical representation of art students but the transitions between the stages are quite different. For example, the consideration of constraints stage came after the chance, association and convergence stages for art students, whereas for design students, this consideration of constraints stage comes after an insight or pause.

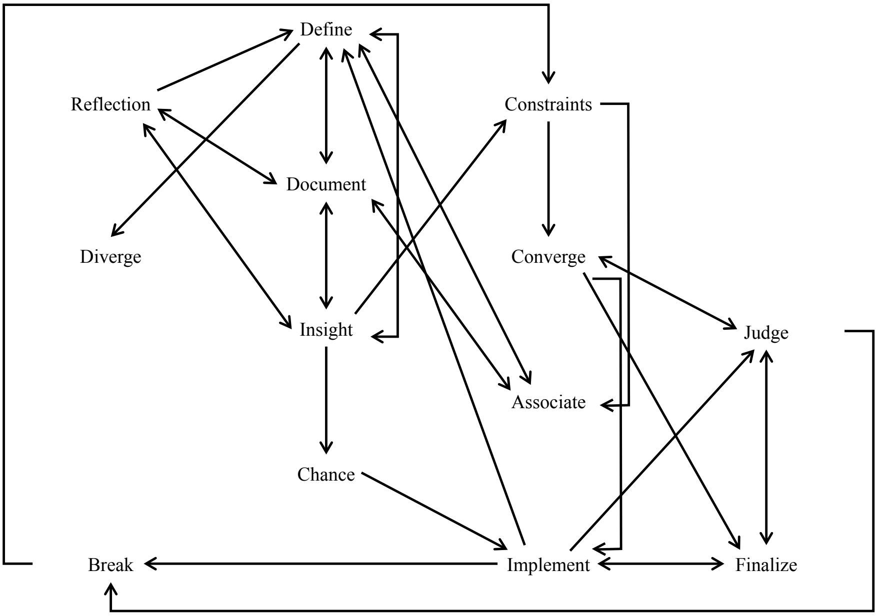

Fig. 3 A representation of the creative process in design

2.3 Literary Creation/Scriptwriting

Case studies of writers have been an important source of information in the field of text-based analyses, in particular since authors in the late nineteenth century (ex. G. Flaubert, V. Hugo) saved their working drafts. In the 1970s, *genetic criticism* developed in the literary field to explore the writing process, the generation of texts rather than the characteristics of the final document. This text-based methodology examines the author's search for relevant information on a topic, preparatory writing, the generation of the text, editing and revising. Two main strategies for literary creation have been found: (a) planned composition, in which scenario generation, notes, documentary research are essential steps and text generation is oriented; and (b) free writing, in which the text is constructed as one writes, without an explicit plan. These modes of writing can be mixed and are analyzed in terms of pre-writing, composition, pre-editing, and editing phases.

This methodology, developed and used to examine eminent authors' literary creations, has remained relatively distinct from work in psychology with novice or professional writers, Empirical studies have begun to identify the cognitive and personality characteristics associated with literary creation in "everyday" populations (see Lubart, 2009). For example, in one study the role of author's evaluations during the task of composing a short story was monitored. A relatively high level of creativity was associated with critical, evaluative thinking very early in the compositional work.

Baer (1996) has tested the impact of training for a divergent thinking task in literature. The task consists of providing as many words as possible that are related to a target word. An experimental group of 79 children took part in a specific training program, where it is suggested, for example, to think about words that rhyme with the target word. All participants, whether they took part in this training program or not (control group), were then invited to write a poem and a story. Results showed that this training exerted a great impact on writing a poem.

Research on literary creativity may extend to the task of scenario-writing. Interviews with scriptwriters have underlined the complexity of this creative process by the identification of distinct but interrelated stages starting with a stage of impregnation, followed by a formal stage of structuring and finishing with an intense period of writing and rewriting the script (Bourgeois-Bougrine et al., 2014). To illustrate this process, 6 students[1] of scriptwriting and filmmaking studies in Paris (4 females, 2 males, age range: 23 and 28 years) had 8 weeks to create a script starting from a common theme: "A 19 years old woman was found dead, murdered by eight knife stabs, in the nave of Notre Dame". The first four weeks were dedicated to collective work and run by a professional scriptwriter to help students produce several alternatives and sketch out a general plan or outline. The last 4 weeks were devoted to the individual writing of the script. The graphical representation of their creative process is presented in Fig. 4. For example, the consideration of constraints stage comes after the definition of the problem, the reflection about the project and the documentation whereas for art students, this stage comes after chance, association and convergence stages, and for design students, this stage comes after an insight or pause.

2.4 Musical Composition

The lives of eminent creative musicians such as Bach, Mozart, Beethoven have received attention for centuries, however the empirical study of creative thinking in music started only to develop during the last four decades. Most of the literature on this topic is in the field of musical education (Webster, 1990), improving assessment and theory on musical creative thinking (Barbot & Lubart, 2012). Consistent with the multivariate approach to creativity (Lubart, 1999), results on musical creativity suggest the importance of distinct but interrelated resources: notably cognitive abilities, psychological traits, and features of the environment. Among the individual factors contributing to musical creativity, musical divergent thinking plays a leading role. Intrinsic motivational orientation is related significantly to relatively high musical creativity scores (Eisenberg & Thompson, 2003), whereas extrinsic motivational orientation is related to relatively low creative performance in music composition. Among the personality traits studied by Swanner (1985), excitability, aggressiveness, independence, anxiety, self-confidence, and curiosity

[1] The small size of the sample is linked to the limited number of students enrolled. Six is in an entire cohort.

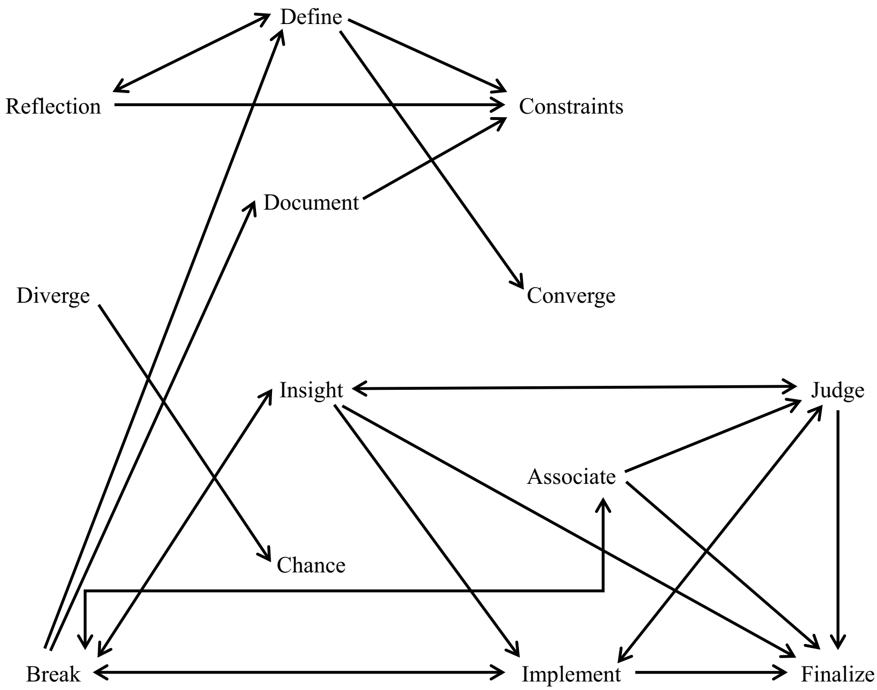

Fig. 4 A representation of the creative process in scriptwriting

were significantly related to musical creativity. From an intercultural point of view, Campbell and Teicher (1997) examined the characteristics of musical creativity in non-western countries and found that improvisation dominates the creative process and product, suggesting a potential important role of the cultural environment. Family environment also proved to be an important environmental factor for musical achievement (Zdzinski, 1992) and creativity.

The creative process in musical composition has also received attention (e.g. Carlin, 1997; Gromko, 1996; Van Ernst, 1993), especially concerning creative composition processes. Significant relations were found between problem-finding behaviors (such as exploring instrument capabilities) and the creative nature of the productions in music (see Barbot & Lubart, 2012). Traditionally, the analysis of the creative process in musical composition is based on Wallas' (1926) model which applies to all creative fields. Graf (1947) applied this model to composing music—productive mood (preparation), musical conception (incubation), sketching (illumination), and composition (verification). Kratus (1989) proposed the processes of exploration (sound experimentation with the instruments presented), development (referring to musical variations), repetition (in which the individual replays exactly the same musical segment during a process of exploration) and silence (which could relate to incubation).

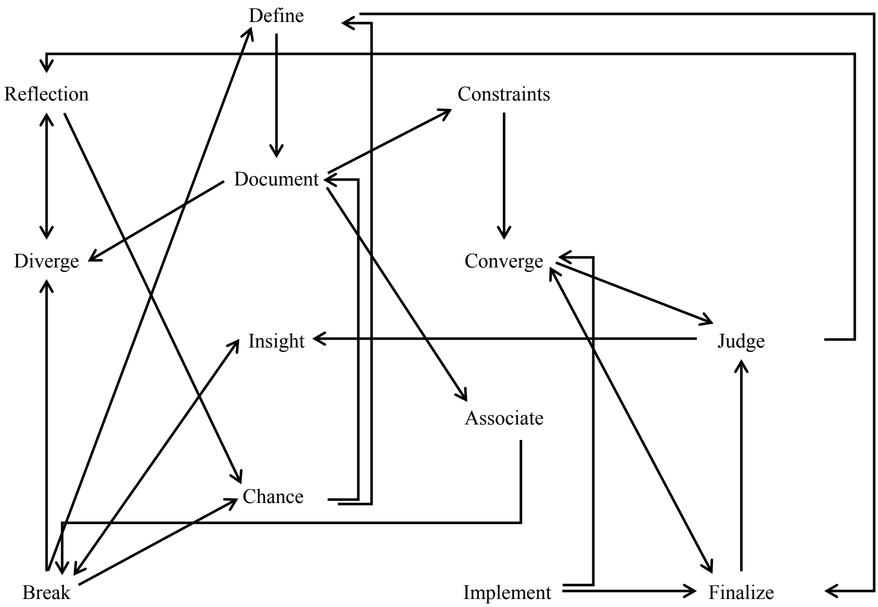

Fig. 5 A representation of the creative process in musical composition

To illustrate the creative process in this domain, 5 music students (1 female, 4 males, $m = 21.06$ years, $sd = 0.55$ years, age range: 21–22 years) had 6 weeks to create a piece of acoustic music. The graphical representation of their creative process is presented in Fig. 5. Here, the consideration of constraints stage appears after the documentation as in the literacy process but the transitions compared to other domains are different.

2.5 Engineering

Scientific creativity concerns a large number of fields, ranging from the hard sciences (physics, chemistry), to life sciences (biology, medicine) to human and social sciences (psychology, sociology). The term "scientific creativity" encompasses engineering sciences and the inventive process as well. The most in-depth work has been case studies of the notebooks of famous scientists and inventors, such as extensive studies of Charles Darwin, Thomas Edison, Albert Einstein and others. These case studies have suggested specific kinds of thinking that seem to favour the emergence of creative theories, inventions, and discoveries. Charles Darwin, for example, used a chain of analogies to lead him to the theory of evolution of species. Some of these creativity heuristic mechanisms were modelled in artificial intelligence computational systems that were able to "re-discover" basic scientific laws such as Kepler's and Bacon's fundamental discoveries. In terms of empirical laboratory observations, Ward et al. (1999) in a series of studies examined the cognitive processes involved in tasks requiring people to invent new machines from a given set of mechanical parts. This work was conducted within the creative cognition approach, described earlier, and showed how exploratory pre-inventive thought processes and generative processes for idea specification were both involved in the technical inventive process. This seminal work was conducted, however, with participants who were novices in the scientific-technical field. The tasks involved relatively simple technical constructions. The main gap in the literature on scientific-inventive creativity concerns the vast intermediate population of scientists and future scientists, spanning students in scientific-engineering schools to active scientists who have not (yet) achieved as eminent a status as Charles Darwin.

Based on research with science-engineering students and engineers, Shaw (1989, 1994) proposed a cyclical and dynamic model in five stages. In this first phase, called *immersion,* the problem is posed. Then *incubation* follows with unconscious associations of ideas in which solutions begin to form. Shaw considers that these two phases are not independent but mixed. Next, *illumination* occurs and ideas become conscious and accessible. The engineers *explain* their idea and realize a *creative synthesis* by producing it. These two stages are also mixed.

The model proposed here is dynamic; at each stage, it is possible to return to the previous stage. Furthermore, this model is circular. The *validation* of the production leads to a new creative process. According to Shaw, there are two kinds of validation: personal validation and collective validation. Personal validation consists of estimating the work and using the experience acquired during the process to generate a new creative process whereas collective validation concerns the evaluation of the production by peers, public or critics. This validation can lead to a new process only if the creator accepts the evaluation; the comments of the public must be recognized to engage a new creative process.

To illustrate the creative process in this domain, 27 engineering science students in their fifth year at an engineering school (4 females, 23 males) had 10 sessions distributed over 8 weeks. They were asked to propose six different layouts for a functional kitchen located in a campervan. From these, two were short-term implementation projects (<1 year), two were medium-term and two were long-term projects (>10 years). The layouts had to respect a set of technical constraints, defined in advance. Students completed the CRD after each session. The graphical representation of their creative process is presented in Fig. 6. Exactly as in literacy/scriptwriting field, in engineering, the consideration of constraints stage comes after the definition of the problem, the reflection about the project and the documentation (as in musical field too for this last stage), whereas this stage comes after other stages in art (chance, association and convergence) and design fields (insight or pause).

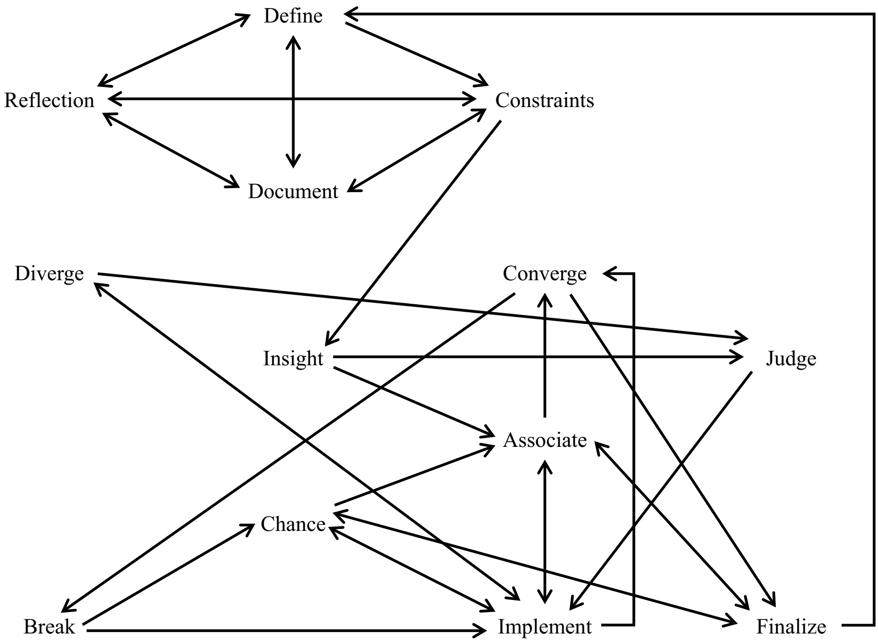

Fig. 6 A representation of the creative process in engineering

3 Comparison of All Five Domains and Conclusion

These models, and more specifically the graphical representations illustrating each creative domain, have highlighted the existence both of transitions that are common to all domains, and of transitions that are specific to each domain (see Table 2). Hence, the stages of reflection and documentation lead frequently to definition in almost all domains, and the definition stage interacts with the documentation stage. Similarly, associative thinking, convergent thinking, implementation and judgment lead mainly to a finalization stage. However, some of the stages interact with each other, such as convergent thinking that leads to judgment. Moreover, the stage of finalization interacts with judgment, such as implementation and breaks that are both linked to it by a double arrow.

Beyond these shared features, it is interesting to note the specific features of each creative domain. Whereas the definition stage leads to insight in art students and design students, it leads to reflection and consideration of the constraints in engineering and scriptwriting students. Again, in art and design students, insight leads to documentation and chance whereas it leads to judgment for engineering and scriptwriting students.

It is interesting to note that the diversity of the models described in this chapter could be due to the domain-specificity and also to the specificity of the participants. Some models were built on experts and others on students. At this point of the

Table 2 Frequency of the stages and resume of the transitions between stages of the creative processes for art, design, scriptwriting, music and engineering

	Art	Design	Scriptwriting	Music	Engineering
Definition of the problem	**Documentation**, *insight*, chance	**Documentation**, *insight*, associative and divergent thinking	*Reflection*, *constraints*, convergent thinking	**Documentation**, finalization	*Reflection*, **documentation**, *constraints*
Reflection	**Definition**, judgement	**Definition**, *documentation*, insight	**Definition**, *constraints*	Divergent thinking, chance	**Definition**, *documentation*, *constraints*
Documentation	**Definition**, *divergent thinking*	**Definition**, *reflection*, insight, *associative thinking*	**Definition**, *constraints*	*Associative* and *divergent thinking*	**Definition**, *reflection*, *constraints*
Consideration of constraints	Finalization	Associative and *convergent thinking*		*Convergent thinking*	Reflection, documentation, insight
Insight	Definition, *documentation*, *chance*	Reflection, *documentation*, constraints, *chance*	Implementation, finalization, *judgement*, *breaks*	*Breaks*	Associative thinking, *judgement*
Associative thinking	Constraints, **finalization**	Definition, Documentation	**Finalization**, judgement, breaks	Insight	Convergent thinking, implementation, **finalization**
Divergent thinking	*Reflection*		Chance	*Reflection*, constraints	Implementation, judgement,
Convergent thinking	Constraints, **finalization**, **judgement**	Implementation, **finalization**, **judgement**		**Finalization**, **judgement**	**Finalization**, break
Benefit from chance	Constraints, insight	*Implementation*		Definition, documentation	Associative thinking, *implementation*, finalization
Implementation	**Finalization, break**	Definition, **finalization**, *judgement*, **break**	**Finalization**, *judgement*, **breaks**	*Convergent thinking*, **finalization**	Associative, divergent and *convergent thinking*, chance
Finalization	**Judgement**, *convergent thinking*	Implementation, **judgement**		*Convergent thinking*, **judgement**	Definition, associative thinking, chance
Judgement	Chance, **Finalization**	Convergent thinking, **finalization**, break	*Insight*, *implementation*, **finalization**	Documentation, *insight*	*Implementation*
Taking breaks	**Implementation**	Constraints	*Definition*, documentation, *insight*, associative thinking, **implementation**	*Definition*, *insight*, divergent thinking, *chance*	*Chance*, **implementation**,

Note In bold, transitions similar in at least three domains; in italics, transitions similar in two domains; in normal text, transitions specific to each domain research, it is too early to determine if the creative process will be different according to the expertise level. Finally, the educability of creativity based on these models needs to be test in future research. Is it possible to improve the artistic creative process of participants by inviting them to follow these transitions?

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