

A model of psychological reconstruction of the creative process



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It is shown that, despite repeated attempts to create a general theory of invention, the resulting methods for solving creative problems proved to be ineffective. The paper considers a model of psychological reconstruction of the creative process, which comprises a set of steps, including those implemented at an unconscious level. Favorable and unfavorable factors affecting the creative process are defined.

Keywords: innovation, psychology of creativity, creative process, intuition, insight.

Introduction

The ever-increasing pace of technological progress has led to the need to overcome challenges associated with the development of new technologies and engineering systems. A large number of professionals involved in innovation processes often use ineffective methods to solve creative problems. Currently, the total number of such methods exceeds three hundred, which includes both widely-known and little-known ones [1]. This diversity is not a good sign, it is rather indicative of their imperfection and attempts by many researchers, scholars and educators to formulate another method which is, in their opinion, the most effective one.

There is a number of papers [2–4] showing that many attempts to develop an invention theory failed. This is due to the fact that the process of invention has three separate starting points: «...thoughts, objects to be conceived and an individual human spirit that cognizes objects in the mental and physical world and mulls over them» [2]. The phenomenon of creativity is complex; the process of thinking is of key importance in this phenomenon and cannot be ignored.

Psychological Reconstruction of the Creative Process

In his paper, [5] Reginald T. Townsend, a British psychologist, describes an autostereochronocyclegraph, a remarkable invention of a witty bricklayer named Gilbreth.

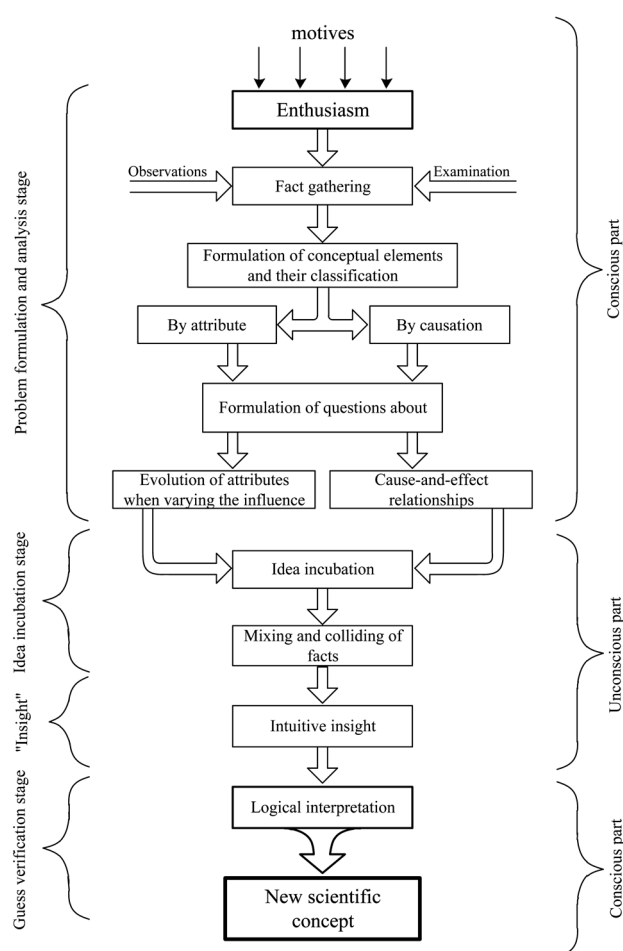
This device enabled visualization of complex and highly appropriate motions of the most skilled workers, which were resolved into their elements in a motion-picture film, thus offering a model to follow. However, reproducing the most complex movements using cinematographic models is tremendously more simple than a psychological reconstruction, even though in a highly idealized form, of the creative process in the mental sphere. This conclusion is true when one tries to reconstruct the thought process at the stages of idea incubation and intuitive insight which are components of a more general sequence of steps of the creative process, starting from the motivation all the way to formulating a new scientific concept.

The creative process can be represented as the following sequence of steps (figure).

1. The first prerequisite for any creative process is enthusiasm, thirst for knowledge that must be satisfied. Enthusiasm can be powered by motives, regardless of whether they meet with approval or disapproval among the public.

These motives may include love of nature, the pursuit of truth, vanity, the need for recognition, curiosity, the desire to be useful to society, etc. But in any case, motives for creativity have to be passionate and enable the overcoming of the obstacles that may be faced along the path of creative practice.

At the stage of fact gathering, the mind is still sterile, no matter how high its potential creative energy is, if it has not been pre-fertilized by facts gathered through observation and examination. The extent of knowledge required for



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creative problem solving varies among individuals. For creating broad generalizing concepts, some researchers need encyclopedic knowledge. Others who are involved in more in-depth studies but in a relatively narrow field need less information. However, experience shows that «an excess of knowledge not directly related to the problem to be solved may even be an obstacle» [6].

2. Formulation of conceptual elements and their classification according to their respective characteristics (attributes) and cause (etiology). In fact, this stage is actually the identification of the class of the subject the study is focused on. Accurate identification of the class will prevent one, as far as possible, from taking the wrong path when searching for an acceptable solution, since «the lame man who keeps the right road outstrips the runner who takes a wrong one» (Francis Bacon).
3. Formulation of new questions about:
 - evolution of the object's characteristics in the course of time (conceptual element types that precede them, and those types in which they are likely to pass into);
 - mediation of cause-and-effect relationships (antecedents that preceded the immediate cause and consequents that most likely result from this cause).
4. Idea incubation. As many scholars (B. M. Teplov, L. S. Vygotsky, N. P. Bekhtereva, R. Sternberg, H. Selye and others) have pointed out, at this stage the researcher may be unconscious of that.

Experienced creative professionals know that if a logical analysis of a problem fails to produce the desired result, the problem should be temporarily abandoned for «maturing» through unconscious comparison thereof with a wealth of gained experience.

5. Mixing and colliding of facts. At this stage, the researcher has, in addition to his fancies and imagination, a dual flow of rapidly alternating thoughts or alternating attention. «Ideas rose in crowds; I felt them collide until pairs interlocked, so to speak, making a stable combination», wrote Henri Poincare, a French mathematician, physicist and philosopher. An example of alternating attention is Edison's discovery of a method for recording the human speech: «My own discovery that this could be done came to me almost accidentally while conducting experiments for an entirely different purpose. I was busy with a device intended to automatically transfer Morse characters».

Undoubtedly, some signs or other are often in the air predicting that the solution is at hand. In his book «The Art of Thought» [7], G. Wallace describes this feeling as «an intimation that immediately precedes the illumination».

6. Intuitive insight. Although prepared by preceding stages, the insight cannot be derived from them using formal logic but results from unconscious thought.

Intuitive insight is usually followed by the feeling of joy and release. The fatigue and frustration previously accumulated then disappear at once.

7. Logical interpretation of the intuitive solution found is the final step of the creative process. It results in a new scientific concept, new knowledge.

Favorable and unfavorable factors affecting the creative process

Up to now, there is a lack of understanding of the processes of unconscious thought, but some researchers took the trouble to investigate factors that contribute to or impede the development of their intuitive thinking (I. I. Lapshin, N. P. Bekhtereva, G. Wallace, H. Poincare, A. Einstein and others).

Their findings identify a set of factors that may enhance or inhibit intuition.

The favorable factors include:

- clear formulation of problems; although it is said that «a good question already contains half of the answer», at the early stage of research it is very difficult, if at all possible, to formulate the problem in precise terms, so the problem may not lend itself to a precise formulation until sufficient data has been accumulated;
- keeping all thoughts focused on finding a solution to the problem, which is achieved by using conscious efforts, gathering experimental material, examining the relevant literature in related areas, thinking constantly about the problem without any distraction;
- discussion of ideas with colleagues, which is the most effective external incentive to think creatively, especially if such a discussion is informal;

- mental associations that arise from thinking about interrelated subjects, which stimulates generation of associative ideas;
- short memos to record any new promising ideas that come into the mind at work, during leisure time, when taking a walk, etc.;
- «maturing» of the idea in the subconscious (deferred decision) which is used after all efforts to promote associative thinking have been exhausted, in which case there is no point in «grinding out» a solution through perseverance;
- liberation is used after an individual has saturated himself/herself with all kinds of material needed to identify a new relationship, by moving away from the familiar environment of the laboratory or office, i. e. going out for a walk or taking a rest in a different environment.

The unfavorable factors include:

- mental and physical exhaustion;
- minor day-to-day and psychological irritants (noise, concern about domestic or financial problems, depression, spite, working out of necessity);
- teaching elementary courses;
- administrative duties with all ensuing petty problems of interpersonal relationships;
- extra-scientific hobbies that matter pretty much for a successful researcher, family obligations, cultural and sporting activities in a «moderate dose», are definitely incentives, but too intense and time-consuming extra-scientific interests (especially politics and business) run counter to an absolute commitment to creativity;
- poor organization of teamwork.

Conclusions

Thus, the complete creative process includes:

- the stage of problem formulation and analysis, which can be implemented through conscious thought;
- the stage of idea incubation and insight, which cannot be implemented through conscious analysis and, therefore, cannot be taught directly;

- the stage of intuitive guess verification through logical interpretation thereof carried out via conscious thought.

Therefore, the complete creative process involves a set of steps to be solved through logical thinking, and some steps to be solved intuitively, at an unconscious level. This important conclusion determines the strategy for inculcating in students a culture of technical creativity, based on a thorough understanding of the creative process, the potential of known methodological approaches and techniques and experience for solving divergent problems.

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Модель психологической реконструкции творческого процесса

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Показано, что, несмотря на многочисленные попытки создания общей теории изобретательства, разработанные на их основе методики решения творческих задач оказывались малоэффективными. Рассмотрена модель психологической реконструкции творческого процесса, включающая совокупность этапов, в том числе решаемых на бессознательном уровне. Сформулированы благоприятные и неблагоприятные факторы, сопровождающие творческий процесс.

Ключевые слова: инновации, психология творчества, творческий процесс, интуиция, озарение.

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