

A study of the synergetic approach in pedagogical psychology through research on the self-organisational structure and processes in the field of technical objects and painting

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ABSTRACT: In the article, the author deals with problems regarding the broadening of the possibilities of a modern approach that targets making students' thinking more active when lecturing on special engineering courses. For the first time, an attempt is made to discover the latent associative connection of the hierarchical character between technical objects and works of fine art, as well as their self-organisational processes. Considerable attention is focused on a practical implementation of the reasonable associations between technical objects and works of fine art. Recommendations are given by the author relative to attracting the sensual perceptions of the theory of knowledge to the creative work.

INTRODUCTION

It is well-known that emotional thinking presuming the process of turning over in one's mind images, which leads, eventually, to the insight in the search for the idea of the best technical solution. In addition, felicitous associations that are being used when delivering lectures on technical disciplines help to reinforce and make active students' thinking [1-3]. This forestalls a strict consideration of complicated processes, and provides a possibility to convey more information and in fewer words than the traditional theoretical approach.

The expediency of putting into pedagogical practice the above mentioned associative approach to activate students' thinking can be coordinated with the well known statement from

Einstein that real science and real music need the homogeneous power of abstract thoughts. As this takes place, the sciences and the arts may not necessarily interchange with one another, but rather complement each other to make more active the process of cognition.

The reasonable associative connections that exhibit the most promise for attracting the wide range of arts considered in a previous paper are supplemented with new ones based on the common character structure of technical objects and works of art [3]. The self-organisational processes in the mentioned fields are considered as an attempt to achieve the synergetic approach in pedagogical psychology and founded on an interdisciplinary investigation of the processes in those systems that are heterogeneous in their nature.

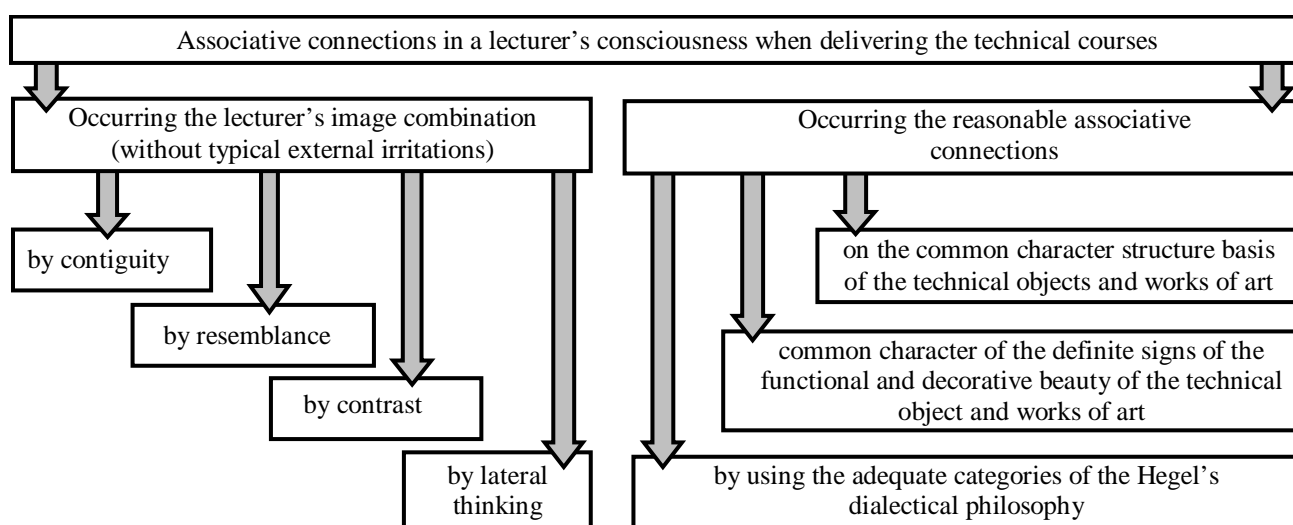


Figure 1: Classification of associative connections when making students' images more active.

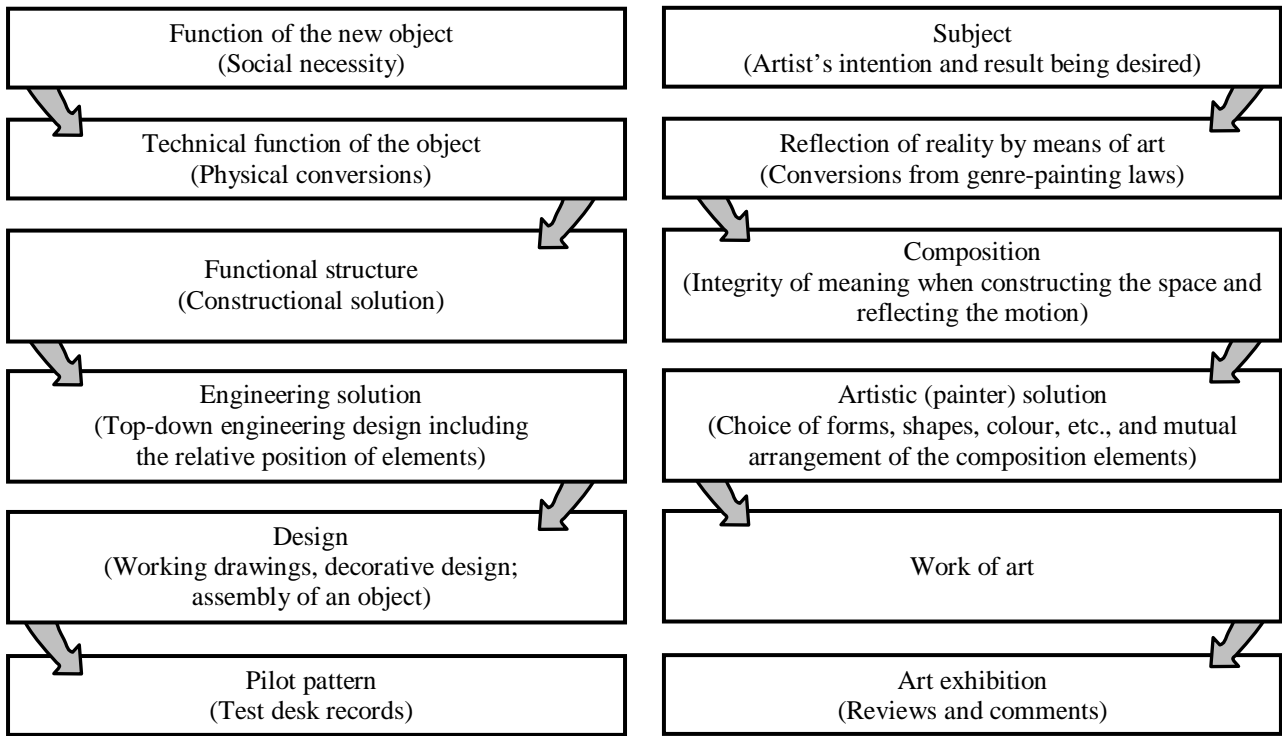


Figure 2: Comparative descriptive hierarchy as applied to principal notions of technical objects (at left) and art works (at right).

FEASIBLE ASSOCIATIVE CONNECTIONS OCCURRING IN A LECTURER'S CONSCIOUSNESS WHEN DELIVERING TECHNICAL COURSES

The specified classification of reasonable associations described firstly in a previous paper is shown in Figure 1 [3]. A selection of the above stated approaches to generate activity in the audience is considered in Figures 2 and 3 in some detail.

Figure 2 illustrates an original approach based on a formal comparison of a generalised technical object with an art work

within the context of their descriptive hierarchy. Specific examples that corroborate the initial finding are presented in the next section using painting masterpieces.

Figure 3 shows a generalised approach to analysing the complex electromechanical transient processes in electrical systems that contain synchronous and asynchronous machines by utilising dialectical laws and categories [4]. Furthermore, the latter allow one to develop the associative connections between philosophy and such works of art as music, which are distinguished by their lack of a visible form [3].

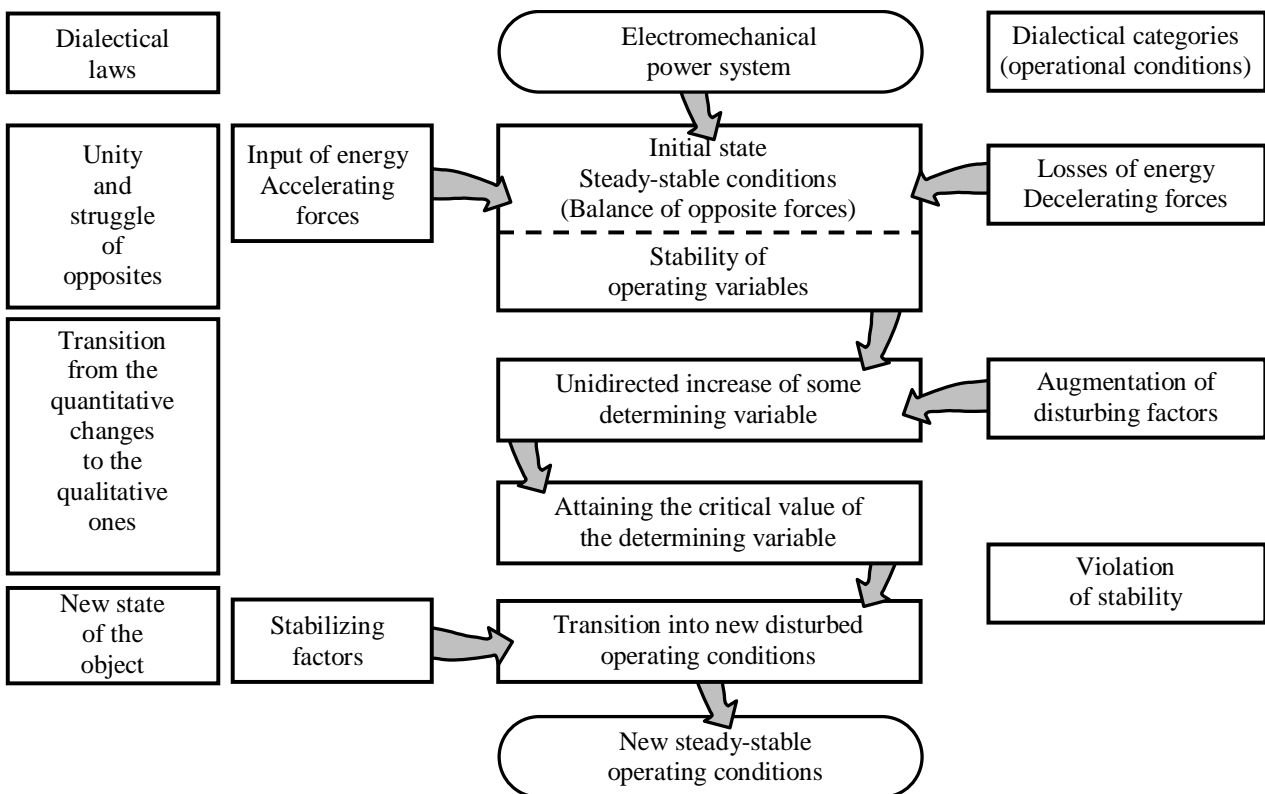


Figure 3: Processes in an electromechanical system in the light of dialectical philosophy.

COMMON CHARACTERISTICS IN THE ASSOCIATIVE PERCEPTION OF TECHNICAL OBJECTS AND WORKS OF FINE ART

It should be noted that Figure 2 does not reflect the stage of the object aesthetic appearance (decorative design). The most expedient and functionally perfect technical objects are notable for their outward beauty, eg following the opinion of outstanding aircraft designers: *the beautiful plane flies well*. A similar situation is inherent in well-known towers.

Terms like structure, construction and composition, which characterise technical objects and works of fine arts, are related to the family of allied notions. The distinction between the above mentioned notions follows from characteristics of their separate parts and ties. *Structure* consists of those elements that are connected as a natural result. For *composition*, the latter one determines the constructional ties (analogies and contrasts of colour, distinguishes the main coloured *spot*, object and spatial harmony).

Upon examining the peculiarities of the functional structure of a technical object, it is conceivable to make use of *reasonable* associations in the sphere of painting on the basis of the temporal, spatial and other likenesses. By way of illustration, it can be shown that the composition picturing the Bible's parable about the prodigal son (Luke 15:21) by the greatest master of European art, Rembrandt van Rijn, presents the action developed with space and time (*The Return of the Prodigal Son*, St Petersburg, Hermitage). In reality (following the Gospel), the eldest son was not present at the meeting between the prodigal son and his old father (see Figure 4).

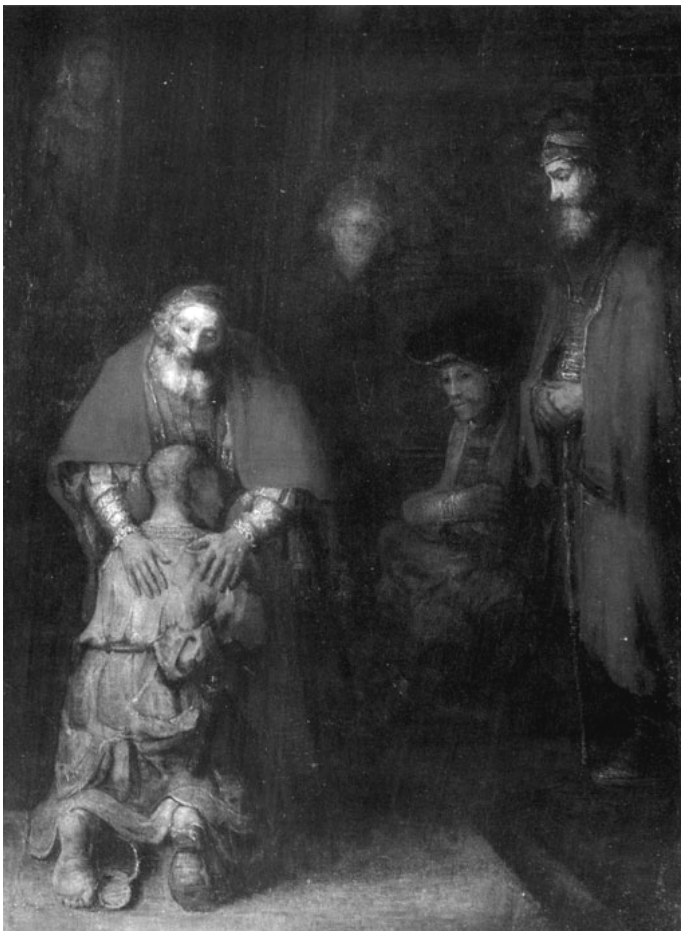


Figure 4: Reproduction of the canvas, *The Return of the Prodigal Son* (1665).

Other distinctive associations are illustrated in Figures 5 and 6. In particular, regarding constructional connections, the latter can be reflected in the painting by combining some objects or characters into groups. For example, the painting *The Last Supper* by Leonardo da Vinci (1495-1498) represents three not evident groups of apostles united with the Gospel's plot. Each group is characterised by its own topic being *read* by the use of their gestures and facial expressions. Christ's gesture (the stretched out arms) ties together the right and left groups. In specific cases, the clusters of people in the painting, as shown in Figure 5, are separated (*Last Supper* by Tintoretto (c.1559), Venice, Church, St Trovaso).

The ties between the elements of the objects in the works of fine art are realised by way of analogous colour variations or line forms: vertical (El Greco), generalised plasticity of motion and postures of people, trees, architecture, etc (Giotto di Bondone), rounded and vertical forms (Rubens) [5]. As this takes place, analogies intensify the contrasts.

Negative feedback from a technical object can be interpreted, as applied to works of fine art, in the form of the tie between the picture (direct connection with the reality) and the object of representation (reality) being used to improve the picture or criticising its execution. Hence, it may be affirmed that emotional feedback in a drawing is the analogue of negative feedback typical for technical objects.

Some functional criteria of technical objects, particularly the speed of their working elements, can be reflected on the picture plane. In this case, when presenting, for instance, the running of the four-legged animals there are definite difficulties destroying the beauty of the integral impression. The latter one is kept in the canvas of Theodore Géricault's *Epsom Downs Derby* (Paris, Louvre) (1821). The mentioned effect (see Figure 6) was reached by the painter, according to the French sculptor Rodin, due to the fact that the picture of the galloping horse contains only two instances from four separate stages of the motion: pushing off from the ground by horses' hind legs, sprawling the horses' bodies and forelegs (with tucked up hind legs), drawing out each horse's body and hind legs and, finally, bringing the forelegs nearer to the ground. The consecutive instantaneous snapshots create the integral impression of the horses' motion.

SYNERGETICS

The above consideration can be attributed to the field of synergetics. This new line in science, given by its founder and author of the term, H. Haken, refers to the interdisciplinary investigation region of a heterogeneous nature with complex physical systems [6]. As this takes place, the self-organisation manifests itself in a self-coordinated behaviour of the separate system elements. The latter are different in their scientific directions and formed, as a rule, by formal principles.

One can say that synergetics is a certain cooperative science, in the sense of the thinking mode, aimed at overcoming the accepted scientific classification. Hence, it follows that the objective of synergetics is to seek general conformities to the natural laws by virtue of the fact that scientific divisions are conventional, whereas nature is indivisible.

The above mentioned interdisciplinary causalities point not only at the structural unity of technical objects and paintings, but also to resemblances of their functional peculiarities.



Figure 5: Reproduction of the painting *Last Supper* by Tintoretto (c.1559).



Figure 6: Fragment of the canvas *Epsom Downs Derby* (1821).

CONCLUSIONS

This new approach in the field of cross-disciplinary cooperation, which is based on discovering the latent associative connections of a hierarchical character between technical objects and works of fine art, is put forward. The conception proposed targets making students' thinking more active during their lectures at technical universities.

An attempt to determine general conformity to natural laws, not only between objects of science, but also between objects of technology and art, being first presented in this article, is of prime interest, not only with respect to pedagogical psychology, but also from the viewpoint of broadening the application sphere of the synergetic approach.

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