

MEANING-BASED ASSESSMENT OF TYPOLOGY IN CREATIVE DESIGN

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1. Introduction

Many definitions have been provided in regard to the notion of creativity. For example, creativity has been defined as a cognitive process of original problem solving through which original products are generated. Creativity is frequently associated with the ability to restructure familiar problems to produce outstanding inventions or discoveries, with the capacity to appreciate reality from unorthodox perspectives, explore and generate a large number of ideas, or produce statistically infrequent and high quality objects, which are remarkable and valuable. Guilford [1981] defined creativity in terms of originality, fluency, flexibility, and elaboration. Sarkar and Chakrabarti [2008] analyzed over 160 definitions and confirmed that a common view of creativity is that it occurs by means of a process in which the outcomes are novel and valuable.

Creativity is essential for the development of design products. The recent decades have witnessed an increase of interest in issues related to creativity in design. One of the reasons is that design is an activity concerned with the solving of ill-defined problems, which by definition are complex, ambiguous, unstructured, and characterized by incompletely defined goals. Problems of this kind are non-routine, and therefore cannot be solved by applying routine or automatic algorithms. Since it is not possible to know a priori what kind of information will be needed to arrive at a successful solution, design problems have the potential for encouraging the development of creative solutions.

Creativity is therefore recognized as central for design. Accordingly, design outcomes should be not only original, novel, and unexpected, but also valuable and useful. Creativity has also been analyzed in relation to the design process, in the course of which innovative and exploratory activities take place. In the design process, creative cognitive procedures are decisive for the generation of new concepts and the production of new objects. Critical aspects characterizing a creative design process include generalizing, transferring knowledge between remote domains, and considering a problem as a whole rather than as composed of small details.

2. Self assessment of creativity in design

The issue of whether self-assessment is a valid and legitimate approach has remained controversial despite a great many studies devoted to this problem in a variety of domains, such as education, statistics and literature, and psychology. However, it was barely studied in regard to creativity in design. One of the few studies devoted to self-assessment of creativity in design showed that the students' evaluations and those of the experts were correlated positively and significantly in regard to the major variables of fluency, flexibility and overall creativity [Casakin and Kreitler 2011]. The findings support the validity of self-assessed creativity with specific restrictions and the advisability of including it in the set of assessments of creativity.

3. Typology and design

Typologies in design represent categories in thinking. Typologies like categories enable making sense of our daily life. They help to readily recognize and clarify both the commonly shared aspects and the differences between a range of objects, and classify them into groups. In this manner typologies enable reducing the complexity of objects, and understanding them according to relevant and well-structured characteristics. Since the 18th century, during the Age of Enlightenment, till the early 20th century the construct of typology served for the comparative study of abstract models in different domains, such as physics, theology, medicine, and literature [Mauro 1985].

In the architectural field, the construct of typology was firstly used in the Enlightenment for understanding the origins of the shelter as a first type of dwelling. By the end of the 18th century, Quatremre de Quincy developed his views on type, which were based on the idea of origin, transformation, and invention. and presented them in his work *Encyclopedie Methodique* [1825]. Since then, typology has influenced architectural thinking in both practice and education. After the Modern Movement came to an end, it has become a main issue of discussion that received full consideration in the architectural domain agenda until the present times [e.g., Rossi 1982].

In architectural design, typology is considered as a method for analysing and classifying a variety of buildings into representative categories, and as a design tool [Franck and Schneekloth 1994]. The level of abstraction of typological knowledge plays an important role in the production of conceptual designs. This is particularly important in the early stages of the design process, when design ideas are fuzzy and goals are not yet completely defined. Its remarkable power for representing well-structured knowledge in an abstract way makes typology a powerful aid for design problem-solving [Casakin and Dai 2002]. Another advantage of typological knowledge is that it enables to discard irrelevant and complex design information, in order to concentrate on important and simple features. In this way, it helps to apply practical and operative knowledge to the problem at hand.

Designers frequently use visual displays, such as drawings and photographs as means for promoting visual thinking in exploring a variety of design solutions. In this sense, typology enables the representation of visual information in a cognitively economical way. Thus, the possibility of combining schematic knowledge by means of visual representations turns typology into an efficient tool for design problem solving. In this process, the creation of novel designs can be guided by the use of typological knowledge. Rather than imposing existing solutions in a prescriptive way, this cognitive tool helps in combining or relating disconnected ideas and clarifying fuzzy ones [Casakin and Dai 2002]. Although typology seems to play a critical role in the solving of design problems, so far its contribution to design creativity has not been investigated.

4. The assessment of meaning: The theory and the system

The present study is grounded in the theory and of meaning and a methodology of assessment it has generated [Kreitler and Kreitler 1990]. Meaning is an approach for applying cognitive contents for defining, expressing and communicating meanings for a diversity of purposes, e.g., comprehension, communication, identifying inputs, problem solving, etc. Meaning consists of meaning units defined in terms of two major components: 'the referent' which is the input, or the subject to which meaning is assigned, and 'the meaning value' which is the cognitive contents designed to express the meaning of the referent. Examples of meaning units can be "apartment – is designed by architects", "pencil – serves for drawing", "keyboard – is made of plastic". In these meaning units, 'apartment', 'pencil', and 'keyboard' are the referents and 'is designed by architects', 'serves for drawing', and 'is made of plastic' are the meaning values, respectively. Each meaning unit may be characterized in terms of variables of the five following types: (a) meaning dimensions – which are concerned with the contents of the meaning values (e.g., structure, sensory qualities), (b) types of relation – which characterize the closeness of the relation between the referent and the meaning value (e.g., comparative, exemplifying, metaphoric-symbolic), (c) forms of relation – which focus on the logical-formal properties of the relation between the referent and the meaning value (e.g., positive, obligatory, partial), (d) shifts in referents – which characterize the relations of the present referent to the initial input or previous referents (e.g., identical, modified, combined), and (e) forms of expression – which are concerned with the media of expression of the referent and/or the meaning value (e.g., verbal, graphic, motional). For

example, when the input is Dwelling and a student's response is Dwelling – part of urban culture, the coding is: Meaning dimension: Contextual allocation, Type of relation: attributive, Form of relation: Declarative positive, Shift of referent: Identical to input, and Form of expression: Verbal. The meaning system consists of the whole set of the meaning variables.

Each of the five sets of meaning variables is comprehensive in itself and self-sufficient with regard to the other sets. Coding a meaning unit implies characterizing it in terms of one variable from each set. Thus, when a group of meaning units is characterized according to meaning variables, and the frequencies of meaning variables used in characterizing these meaning units are counted, five independent groups of frequencies are obtained: one for meaning dimensions, one for types of relation, one for forms of relation, one for shifts of referent, and one for forms of expression. Each of these five groups of frequencies amounts to the same total but consists of different meaning variables.

Each individual uses a certain selected part of the meaning system that represents his/her specific tendencies to apply the meaning system in information processing. Thus, while specific meaning variables are used with high frequency, others may be used with medium or low frequency. The frequencies with which an individual tends to use each meaning variable are assessed by means of the Meaning Test, which provides the individual's meaning profile (See Method).

The fundamental function of meaning is input identification. This function was found to provide the contents and processes that allow assigning meaning to inputs, and carrying out different cognitive acts. Previous studies demonstrated that each meaning variable represents a certain set of contents and processes. For example, the meaning dimension Sensory Qualities represents the set of contents signifying sensations and experiences (e.g., humid and dark) and the processes involved in dealing cognitively with sensations and experiences (e.g., seeing, hearing). In additional studies it was found that each type of cognitive act can be matched to a specific pattern of meaning variables representing a description of the contents and processes involved in its performance. For example, meaning variables for planning included structure, temporal qualities, and causes and antecedents [Kreitler and Kreitler 1986a]. If the individual's meaning profile is characterized by a satisfactory amount of the meaning variables included in the pattern corresponding to the particular cognitive act, then he/she will be able to perform well the specific cognitive act. Meaning variables were also shown to constitute correlates of personality traits and emotional tendencies [Kreitler and Kreitler 1990].

4.1 Meaning variables, typology, and creative design

This study is based on the view that meaning plays an important role in regard to the use of typology in design, and that the meaning system provides a useful tool for assessing this role in a comprehensive and systematic manner. Several considerations have led to the hypothesis that the meaning system represents the suitable tool for assessing typology in design problem solving. One main consideration is supported by prior findings on the role of meaning variables in various cognitive functions, such as planning, exploration, and problem solving [Kreitler and Kreitler 1986b]. Comprehending a typology seemed to us to require the involvement of meaning variables, just as the other mentioned cognitive acts do. Another consideration is that typological thinking includes various cognitions in regard to design problem solving, whereby each cognition is likely to be a function of information processing tendencies, as has been shown in previous studies related to other cognitions. A third consideration was that the meaning system would enable to coordinate the variety of issues identified in the use of typology, viz. cognitions, meanings, and personality correlates.

It is proposed that the frequently assessed aspects of typological knowledge can be readily represented in terms of the meaning system. In the present study we used the system of meaning for characterizing typologies and exploring their relation to creativity. For this purpose only one set of meaning variables was used, namely, meaning dimensions that focus on the contents. In the system of meaning there are 22 major meaning dimensions, each of which represents one specific kind of contents, such as the function of the referent, its locational qualities, its temporal qualities, to whom it belongs and what are its major constituent parts. A tool for assessing the Dimensional Profile of Typologies was constructed by using the labels of the meaning dimensions for characterizing features of typology in design. The responses of the students to this questionnaire were expected to enable identifying the major aspects

of cognitions related to typology in design. This procedure was expected to provide information about the cognitive processes that may be considered as playing a role in creative design problem solving.

5. Research goals

The first objective of this investigation was to identify the meaning dimensions of components of typological knowledge in design as perceived by students, and to study their factorial structure. The factorial organization of the meaning variables representing different aspects of typology was expected to provide insight into the dynamics of typology comprehension and its effects. The second goal was to explore the role of the identified factors as predictors of design creativity, as perceived by both design teachers and students. The relation of the meaning variables representing typology to evaluations of creativity in design was expected to provide insight about the likely contribution of typologies to design creativity.

6. Method

6.1 Participants

Fifty eight architectural students in their fourth year of studies (34 men and 24 women) participated in the study. They were recruited as volunteers from a design studio course in a university in Mar del Plata, Argentina. Students were unaware of the goals of the study, and did not have prior knowledge about the design task.

6.2 Instruments

6.2.1 Design task

The design task presented to the students called for designing a ten floor high-rise building located in a central area of the city. It was specified that the design should take into account several environmental and contextual aspects, such as the urban development of the area, history, morphology of existing buildings, public spaces, orientation, and views. Additionally, the design was required to consider (i) the internal organization of each individual dwelling, and the distribution of the dwellings in the floors of the building; (ii) the pipe and draining system for services, i.e., kitchens and bathrooms; (iii) the façade system, i.e., openings and balconies; (iv) the structural system i.e., beams and columns; and (v) the circulation system, i.e., passages, corridors, staircases, and lifts. Students were requested to design the high-rise building by integrating and coordinating the different noted systems. After the completion of the task students and the three design teachers were requested to assess the creativity of the design process, and the creativity of the final design outcome.

6.2.2 Questionnaires

All students completed the Dimensional Profile of Typologies. It consisted of 35 items, each of which represented one of the meaning dimensions, phrased as a description of typology in general terms as well as in terms of one or more examples (See examples of items in Table 1). The questionnaire forms part of a set of similar questionnaires of meaning focusing on the dimensional structure of a construct, e.g., the self, the body, sexuality and dyadic relations [Kreitler and Kreitler 1990]. The respondents were asked to rate the importance of each descriptor by checking one of the following four responses: very important, important, not so important, not at all important, scored as 4 to 1 respectively. Each respondent got a profile representing his or her responses in terms of the 35 items of the questionnaire. The internal consistency for the questionnaire was $\alpha = .77$

In addition, there was a questionnaire for students and for teachers designed to assess the students' creativity in the design task. The questionnaire consisted of 27 items rated on a 5-point Likert scale from 1 (very little) to 5 (very much). Examples of items are: Search for unusual ideas to solve the design problem; Develop practical solutions. The instrument examined aspects related to the design process, and the design product. A creativity index was constructed based on the average of all the items. Each student got creativity scores for the design process and for the design product, as well as

an overall index of creativity – by the teachers and by self-assessment. The internal consistency of assessment by teachers was $\alpha = .71$ for the design process, $\alpha = .76$ for the design outcome, and $\alpha = .78$ for the general index of creativity. The corresponding values for the assessment by students were $\alpha = .70$, $\alpha = .74$, and $\alpha = .75$.

6.3 Procedure

Students worked on the project in the design studio during twelve weeks. They were assigned one session per week, each lasting four hours. In the first part of the design process, students were requested to analyze examples of typological buildings from the literature and reality, that resembled the design problem. They studied with special interest the different architectural systems characteristic of each building, such as spatial organization, circulation, facades, etc. Furthermore, they visited the physical site where the building was to be placed, and were requested to analyze different aspects of the area to be considered during the design task, that included urban, architectural, historical, cultural, social, and economic aspects.

The second part of the design task was devoted to the design of the high-rise building. A fundamental requirement was to use existing building typologies as a basic tool guiding design problem solving. The final presentation of each project consisted of a description of major design intentions, a panel containing graphic material with plans, sections, facades, and perspective drawings, and a mock-up of the high-rise building.

A week after the design task was ended, participants completed in the design studio the Dimensional Profile of Typologies and the questionnaire for the assessment of creativity. During the testing and the coding of the questionnaire none of the subjects, test administrators, or experimenters were aware of the research questions.

7. Results and discussion

The first stage of data analysis consisted in factor analysing the responses of the students to the 35 different variables of the Dimensional Profile of Typologies (See Table 1). Four valid factors resulted, as indicated by their eigenvalues (>1.00) and the percents of variance for which they accounted ($>5.00\%$). The obtained factors are described as follows: The first factor accounts for 20.52% of the variance and was labeled Appearance. The second factor accounts for 11.27% of the variance and was labeled Function. The third factor accounts for 7.05% of the variance and was labeled History. The fourth factor, the weakest, accounts only for 5.68% of the variance, and was labeled Conceptual. From the factor analyses it is possible to learn that the appearance and the function of the typology are the most salient aspects considered by design students. This means that in order to be helpful in design, a typology should represent not only sensory features that may evoke certain feelings or emotions, but that it has also to represent functional considerations that should provide critical information with regard to its structure and component parts, the manner in which it operates, what can be done with it, how it can help to attain design goals, etc.

Table 1. Results of the factor analysis of the students' responses to the Dimensional Profile of Typologies

Variables	Factor1	Factor2	Factor3	Factor4
The sensory characteristics of the typology: sound qualities	.749	-.103	.068	.007
To whom or to what it belongs	.686	-.013	.048	.066
The sensory characteristics of the typology: its form	.685	.135	-.045	.283
People who deal with typologies or are concerned with them in some way	.663	-.031	.373	.118
Feelings and emotions that the typology can represent or express	.649	.344	.198	.012
The tectonic of the typology (how weight/load is transmitted to the ground)	.628	.121	-.185	.390
The materials of which it is made	.608	-.068	-.182	.281
The sensory characteristics of the typology: visual qualities of its spaces	.606	.022	-.044	.094

Feelings and emotions that the typology can evoke	.563	.158	.070	.043
Dimensions of the typology	.556	.348	.188	-.118
To which senses it can appeal, which sense organs are affected by it	.500	-.034	-.061	.332
The sensory characteristics of the typology: tactile qualities of the facade	.497	.204	-.352	-.162
How it looks, what are its overall visual characteristics	.477	.282	.112	-.090
The structure of the typology, how its parts are arranged or organized	.033	.734	-.083	.038
Results, consequences and implications of the existence of typologies	-.014	.727	.157	.040
The manner of operation of a typology, how it functions	-.037	.688	.025	.104
The function of the typology, its purpose	.086	.583	.258	.087
Actions that can be done with it or to it	.180	.534	-.003	.414
What are the parts of the typology	.357	.530	.053	.186
Judgments, evaluations or opinions the typology can represent or express	.097	.505	.369	-.047
Actions and operations that it can represent or communicate	-.027	.459	.421	-.069
The state of the typology	.326	.394	-.118	-.079
Thoughts, associations and memories that it can evoke	.354	.386	-.016	.289
The development of typology –how was in the past, how will be in the future	-.113	-.024	.604	-.142
Temporal characteristics of typologies, for how long do they exist	.346	-.262	.585	.147
Types and kinds of typologies	-.143	.171	.584	.233
Reasons for the existence of the idea of typology	-.153	.332	.583	.125
What kind of thing it is, to which general category it belongs	.042	-.019	.554	.239
People or objects affected by typologies	.299	.217	.508	-.021
Quantity and number of the typology, how many there are	.108	.282	.507	-.268
Actions that it can do	.169	.355	.366	-.181
Thoughts, ideas, or conceptions that the typology can evoke or inspire	.238	.151	.017	.679
Conceptions and ideas that a typology can represent or express	-.015	-.113	.299	.621
The location in which it is placed, its spatial characteristics	.065	.193	.038	.617
Judgments, evaluations and opinions about the typology	.258	.001	-.037	.318
Eigenvalue	7.204	3.945	2.470	1.989
% of variance accounted for	20.582	11.270	7.058	5.683

The numbers in the cells are saturations of the variables on each of the factors. The highest saturations that are considered for defining the factor are typed in bold.

The factor analysis was performed according to the principal components rotated varimax procedure after Kaiser normalization.

In the second stage of data analysis, the relations between the four factors resulting from the factor analyses based on students' responses, and the evaluation of design creativity by studio teachers were analyzed by means of regressions. The dependent variables were the assessment by the teachers of the students' creative process, the creative solution, and an index of their general creativity.. The predictors or independent variables were the four factors of typology based on the Dimensional Profile of Typologies completed by students. The first regression was of the typology factors on the general creativity evaluation by the teachers. The results are highly significant and show that, of the four factors, only one was related to creativity and this is factor 1: Appearance of typology. Its relation to creativity is negative, which means that the more importance is assigned by the students to Appearance of the typology the lower is the creativity of the students, as assessed by the teachers. This finding was confirmed by the second and third regressions of the typology factors on the creativity product and creativity process, respectively (See Tables 2-4).

Table 2. Regression analysis of the factors of the students on the teachers' evaluation of general creativity

	Sum of squares	Degrees of freedom	Mean squares	F	Sigificance
Regression	6.301	4	1.575	1.408	.243 ^a
Residual	61.528	55	1.119		
Total	67.829	59			

^a R Square .093. Standardized Beta coefficients: -.295 for first factor, $t = -2.063$, $p < .05$; .144 for second factor, $t = .958$, n.s.; -.159 for third factor, $t = -1.134$, n.s.; .110 for fourth factor, $t = .792$, n.s

Table 3. Regression analysis of the factors of the students on the teachers' evaluation of creativity of design process

	Sum of squares	Degrees of freedom	Mean squares	F	Sigificance
Regression	6.444	4	1.611	1.545	.202 ^a
Residual	57.365	55	1.043		
Total	63.809	59			

^a R Square .101. Standardized Beta coefficients: -.299 for first factor, $t = -2.104$, $p < .05$; .148 for second factor, $t = .989$, n.s.; -.169 for third factor, $t = -1.212$, n.s.; .146 for fourth factor, $t = 1.059$, n.s

Table 4. Regression analysis of the factors of the students on the teachers' evaluation of creativity of design product

	Sum of squares	Degrees of freedom	Mean squares	F	Sigificance
Regression	6.812	4	1.703	1.406	.244 ^a
Residual	66.607	55	1.211		
Total	73.419	59			

^a R Square .093. Standardized Beta coefficients: -.302 for first factor, $t = -2.115$, $p < .05$; .132 for second factor, $t = .878$, n.s.; -.146 for third factor, $t = -1.044$, n.s.; .076 for fourth factor, $t = .548$, n.s

These results suggest that the sensory characteristics of typology, and in particular the visual ones such as how the typology looks, its technics, materials, dimensions, etc. play a negative role in regard to design creativity. This does not come as a surprise considering that the external features are superficial indicators that appear not to evoke creativity and act rather as its inhibitors.

In the third step, similar regression analyses were carried out for analyzing the relation between the four factors and self-assessment of design creativity by students. Although results for all three dependent variables were mostly not significant, one factor tended to be related to the self assessment creativity product and this is factor 2: Function in typology (See Tables 5-7).

Table 5. Regression analysis of the factors of the students on the student's evaluation of general creativity

	Sum of squares	Degrees of freedom	Mean squares	F	Sigificance
Regression	.690	4	.173	.885	.479 ^a
Residual	10.730	55	.195		
Total	11.420	59			

^a R Square .060. Standardized Beta coefficients: .008 for first factor, $t = .058$, n.s.; .129 for second factor, $t = .402$, n.s.; .176 for third factor, $t = 1.234$, n.s.; -.076 for fourth factor, $t = -.540$, n.s

The findings that referred to the evaluations of creativity by the students showed that the students who evaluated their design products as highly creative differed from those who evaluated their designs as low in creativity in the importance accorded to the factor of the typology's function. Thus, those who viewed the typology's function as important evaluated their designs as more creative than those who

evaluated the typology's function as less important. These findings indicate that the students who view their design products as more creative, evaluate the importance of typology as consisting in their functionality.

Table 6. Regression analysis of the factors of the students on the student's evaluation of creativity of design process

	Sum of squares	Degrees of freedom	Mean squares	F	Significance
Regression	.633	4	.158	.789	.537 ^a
Residual	11.017	55	.200		
Total	11.649	59			

^a R Square .233. Standardized Beta coefficients: .017 for first factor, t = .119, n.s.; -.034 for second factor, t = -.222, n.s; .235 for third factor, t = 1.645, n.s; -.115 for fourth factor, t = -.814, n.s

Table 7. Regression analysis of the factors of the students on the student's evaluation of creativity of design product

	Sum of squares	Degrees of freedom	Mean squares	F	Significance
Regression	1.345	4	.336	1.352	.263 ^a
Residual	13.682	55	.249		
Total	15.028	59			

^a R Square .090. Standardized Beta coefficients: .000 for first factor, t = -.003, n.s; .255 for second factor, t = 1.695, *p* <.09; .099 for third factor, t = .709, n.s; -.226 for fourth factor, t = .822, n.s

8. Conclusions

The investigation dealt with the study of typology in design and its relation to creativity in design students. A focus was set on comparing teachers and students. The Meaning Theory served as a comprehensive context for assessing the role of typology in architectural design. The findings showed that it is possible to assess typology in design in regard to the meaning dimensions, and predict its contributions to design creativity.

In architectural design, typology plays a fundamental role in the analysis and organization of different building such as libraries, dwelling, or commercial centers into main categories. An important feature of this tool is that it can shed light onto the similarities and differences between a range of buildings, and classifying them into groups. Moreover, it contributes to reducing the complexity of artifacts, and enables understanding them by means of relevant and well-structured characteristics. However, there are several problems concerning the application of typologies. First, typologies have many aspects. This is certainly an advantage, but it could also be a disadvantage. Without relying on some systematic or theoretically based tool it is barely possible to know if one has covered all or most of the aspects of typologies. The questionnaire of the Dimensional Profile of Typologies is a tool that helps to resolve this problem, This tool represents the major aspects of typologies according to a theoretically-based system of dimensions representing a broad range of major cognitive processes. The system of meaning is a basic theory well validated through a great number of empirical studies. Hence, a tool constructed in line with the content categories of the system of meaning can be considered as a cognitively relevant and comprehensive instrument representing the major aspects of typologies.

Secondly, the questionnaire of the Dimensional Profile of Typologies represents many aspects. Focusing on all or even most of them would render the application of typologies difficult and sometimes even overwhelming. Hence, what one usually does is to select several aspects. The selection is mostly random, unsystematic and not necessarily conducive to the goal of the teacher or the person who applies the typology. Findings of our study contribute to reducing this difficulty. The factor analysis of the responses in the Dimensional Profile of Typologies indicates clusters of the aspects in the profile so that it is easier to refer to them and apply them. The clusters we found focused

on the Appearance, the Function, the History and the Conceptual facets of the typology. This grouping is based on the responses of students. Therefore, it is advisable to refer to this grouping when one deals with students or applies typologies in the teaching setup. However, when other kinds of samples are dealt with, such as experts or marketing professionals, it may be advisable to check which kinds of clusters would result from a factor analysis of their dimensional responses. The differences we obtained between students and teachers in other aspects of the study are a reminder that one may need to confirm the findings each time anew when the sample changes.

Another important focus of our study was the relation of the factors based on the Dimensional Profile of Typologies and creativity. This part of the study was designed to demonstrate that the uses made of the the Dimensionl Profile of Typologies depends on the goal of the application. Our application was designed to investigate the relation between the factors of the typologies and creativity. There were two major findings. The first finding was that the students who evaluated typologies primarily in terms of appearance, were evaluated by the teachers as less creative. The second finding was that the students who evaluated typologies mainly in terms of their function, evaluated themselves as more creative. The two findings show that the viewpoints of teachers and students about what is conducive to creativity differ a lot. This gap in attitudes may be responsible for difficulties in teaching. It is therefore recommended that before applying typologies in education it is necessary to discuss the differences in approach and to reach a rapprochement of viewpoints between teachers and students so as to render the educational process useful, efficient and enjoyable.

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