On Context, Concepts and Research: An Approach in Basic Design

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\textbf{Abstract:} World Design Organization re-defines the practice of industrial design as a “strategic problem solving process that is used to develop products, systems, services and experiences”. Such an expansion of the field makes product an intangible thing that depends more on research and necessitates re-elaboration of education. Within this context, the focus of this study is the place of research in basic design education in industrial design. The study investigates basic design students’ product development and research processes during 2015-2016 academic year. The so-called problem definitions reflects a transition from a defined product, to a product that the student defines and constructs. As the scale of construction expanded, the impact of research also expanded. Within the study, the students’ approach to problem definitions are analysed with their final products and research processes.

\textbf{Keywords:} Research, Basic design, Education

1. Introduction

As a rational process, design has been positioning on a scientific ground since the end of Second World War. Design education, which has been institutionalised with the Bauhaus, tried to combine design with industry on the basis of craft and art at the beginning and led a practice-based approach. The main aim of the Bauhaus was correct integration of art and industry. The graduates were conferred the title of “master”, and the motto of the school was “collective ascension to contribute crafts”. Design was assessed with a scientific approach just after the Second World War. The design schools founded in this time period, such as Ulm Hochschule für Gestaltung, moved the ground of design practice from art to research with their new curriculums supported with science courses. Consequently, the new apprehension of design as a science defined “designer” as a “coordinator” rather than a “maker”.

Today, even the concept of “product” is re-defined. The conventional concept of tangible product is transformed into services, systems, discourses and interactions. Such an appraisal necessitates more research as well as new approaches in design education. Under such circumstances, definition of a product is only available with research.
Design education starts with abstract concepts. Enhancing creativity and developing creative products are bound with this abstract foundation. While the education in the first year is based on strictly defined problems, in the latter years the problem definitions are gradually broadened and the students are provided with more autonomy. The first year focuses more on form, while in the following years the stakeholders and interactions are considered more in the design process.

Traditionally, the Bauhaus experience was based on “material” to be converted, “form”, and “design” practice that would convert the material into a meaningful entity. The practice of “making” which combines material and form, was only a part of design (Bredendieck, 1962). The main emphasis of basic design course was on explorations of “material” and “form”, rather than the “design” component (Lloyd Jones, 1969).

Buchanan (2001), defines the external elements of products as form, functions, materials and manner. The common opinion is that, basic design education is a “form” oriented introduction to design profession. Nonetheless, to provide “material” information and the notion of “function” with an education of “manner” is the aim of the basic design course. However, the changing definition of design needs the development of an apprehension beyond tangible product definitions and form investigations. Consequently the notions of form, material, function and research in basic design education is expanded.

On the other hand, in a visual basic education aiming to develop creativity, using abstract definitions in order to remove mental blocks of the students is a common method. The attempt to re-establish the outside world by using the already existent visual data, hinders the development of independent thinking skills necessary for creative behavior. For this reason, research appears as a delicate element that associates abstract definitions and material world in basic design education and creative process.

New definitions of design and product necessitates new research-based approaches in design education. Such an approach not only provides a scientific ground for design, but also facilitates creativity in the design process. For this reason, two project development processes are examined. In the first project, the design problem, consequently the product and the function are clearly defined. However in the second project, the problem definition focussed more on manner rather than a defined product. Such an abstract definition of the object to be designed necessitated a research-based process where “function” needed to be set up and formulated. In the first project, research is in the form of three dimensional explorations imbedded in design process. In the second project, the research scale is kept larger so that the students are provided with more autonomy. Such autonomy is regarded to support creativity and is expected to breed innovative products.

2. On Design Research

Design is the process in which cognitive skills as well as physical abilities function holistically to reach to fruition. In fact, the processes operated during design act become the subject of many studies in the field. In this context, the first attempts to define design as a science, were made in the light of positivist paradigm on which modern science is based (Çelikel, 2005). The rationalisation endeavour, rooted in enlightenment, corresponded to scientific design or design science in design discipline.

According to Cross (2001), particularly in 1960s, the scientification of design research was embodied in design methods. However, it was mentioned that the linear problem solving process that scientific method of research offers, is not appropriate for everyday design problems. Rittel defined this disparity as “wicked problem” (Churchman, 1967). The wicked problems are ill structured problems.
that many stakeholders and decision makers are involved and contribute to the complexity of the problem. Similarly, Buchanan (1992) referred to the ambiguity of the wicked problem. He discussed the wicked problem in the scope of universality of design and the role of designer emphasizing different constructs named “categories” and “placements”. Categories are concrete meanings embedded in theory, as placements are defined more flexible when it comes to application. However they have boundaries as well. Placements create possibilities and new ideas dependent on designer’s experience and individual placements. In case of wicked problems, designers perform these placements, instead of scientific methods to identify the problem in design universe. On that note it is criticized that different probable cases in design field, that needs to be identified, cannot be addressed with specified standard problem solving methods. Schön (1983) approved these critics by emphasizing the inherent reflective practices of designer in the case of instable and ambiguous problem situations. He claimed that the knowledge is embedded in the action, and is tacit. Even though it is claimed that we act consciously, the tacit judgements and knowledge is processed on the background referring to unconsciousness. Thus, beside technical rationality, he referred to flexible research methods and strategies emphasized knowing-in-action reflecting the tacit knowledge of designer. Also, instead of the design science that explains design of the artifacts as analysis and synthesis of basic elements, Buchanan (2007) offered design inquiry strategy that explore the interaction of the designer and other stakeholders experience. This strategy both focuses on designers’ communication and creative power (rhetoric) and making and designing in terms of use and production (productive science) (Image 1) (Buchanan, 2007).

![Figure 1. The strategy of productive science (Buchanan, 2007: 60)](Image 1)
3. On Basic Design Education

In general, the aim of educational practice is to provide knowledge, skills and sensitivity. Similarly, design education curriculum consists of courses that develop design knowledge, artistic skills and technical background (Demirbaş, Demirkan, 2003). In first year’s curriculum of every university art and design department, regardless of the fields of specialization, there is always a course called basic design which deals with the grammar of visual language. This visual language is the basis of design creation and a designer must be equipped with the knowledge of principles, rules and concepts of visual organization in order to enhance his capability in visual organization (Wong, 1993).

Fundamentally the course aims recognition of visual sophistication (Zelanski, Fisher, 1996), awakening awareness by enhancing visual sensitivity (Akbulut, 2010) and to present basic design knowledge.

Basic design course stands on three basis as theory, practice and pedagogy. The frame of the curriculum that involves basic elements and principles constitutes the theoretical basis. The practical basis is the way this theoretical base is treated. In such an action-based course, practice is the state of movement for intellection. The main aim of the practice is to enhance the knowledge of materials and technical skills. Knowledge is transformed into action by “learning by doing”. On the other hand, the pedagogical base helps the student to create models of professional course of conduct and his/her own scale of values, removing mental blocks by developing creativity and abstract thinking (Akbulut, 2014).

Until 20th century, transfer of knowledge and experience from master to apprentice, known as the “Beaux-Arts System”, was the common practice in most art and design schools (Arkun Kocadere, Özgen, 2012). The need for a foundation course in professional design education, was put forward in the Bauhaus. The experience of Bauhaus stands on three basis as the “material” to be transformed, the process of “forming” and the practice of “design” which transforms material into a meaningful entity by means of forming (Bredendieck, 1962). Basic design course, which is named as “Vorkurs” aimed to explore these elements by focusing more on “material” and “form” rather than “design” (Lloyd Jones, 1969). The emphasis on the “design” component was observed after the first year.

The curriculum of basic design roughly consists of elements of design, principles of visual perception and composition, principles of design and three dimensional concepts. The framework is elaborated in three steps. While in the first step the basic skills are aimed to develop, the second step tries to raise a professional conduct. The third step, which is the hardest and the most important step, deals with the formation of the student’s own value judgements by means of discussions, studio critiques, presentations and jury evaluations (Denel, 1998).
On the base of Bauhaus, the four external components of the product is determined to be form, function, material and manner. However, experience and interaction focused internal view aims to reach usable, desirable, and useful products (Buchanan, 2001). Basic design education leads the students to research more on the basis of external components. The main emphasis of the course appears as exploration of “form” depending on “function”, “manner” and “material”. The internal components as “usability”, “desirability” and “usefulness” are regarded as secondary elements that will be supported with theoretical courses (as ergonomics, production techniques, marketing etc.) in the forthcoming years.

4. Method

The study was carried out in Gazi University Department Industrial Design with Basic Design freshmen students in 2015-2016 academic year. The same students were interviewed during their second year education in 2016-2017 academic year as well. The population is 37 consisting of 32 female, 5 male students whose ages range from 18 to 25 (average 20,5). The study focused on the research processes of different projects. While in the first project, the product to be designed and the steps of the process are clearly stated in problem definition; in the second project, the product to be designed is left to the student’s inquiry on manner and use. In both of the projects, the notion of research is elaborated in different ways.

The final project of the first semester was oriented on form investigations. The students were provided with a problem definition in which function, material and manner were extensively defined. At the end of 4 weeks, the students were expected to construct their project in a jury performance. The problem definition is as follows:

Design of a lighting unit

Step 1:

Create a “unit” by folding white, translucent and transparent sheet elements.

By combining the units with linear elements (either wire, wooden stick or rope), create a structure (at least 30 cm. high). The structure should reflect design principles.

Materials: sheet elements; white paper varieties, acetate, lexan ...

linear elements; wire, wooden stick, rope
Step 2:

Design a “lighting unit” by using the elements you created. Your design should work with two bulbs at most.

Please take into consideration the installation, usage, packaging and storage scenarios and the product’s relation with electric appliances.

Give a name to your design and present it in a package out of corrugated cardboard.

**Packaging:** The product will be packed in modules. The package should contain all the contents (including bulb and lighting fixtures).

**Installation:** The product will be installed during the jury performance.

**Storage:** Consider the shelf space conditions for the package.

The problem definition aimed to direct students to form-oriented research. The students accumulated knowledge about the potentials of materials by trial and error. Material component also served to enhance hand skills and good craftsmanship. The jury performance in the final step aimed to experience interaction (Figure 3). The form’s accordance with different manners (packaging, installation and storage) and user interaction can be regarded as a projection of the product’s external and internal views.
The second project was research oriented 4 weeks’ work for the second semester of basic design course. Rather than emphasizing a defined “object”, the project aimed the students to “define the object”. For this reason, the problem definition emphasized only the function. As the starting point of the project, the students were provided with a “manner” and “function”, rather than “product” and “form”. One of the major aims of the project was to break the students’ dependency on already existent product examples.

**Design of a counter**

Design a “day counter” specialized for different user groups/occasions/fields. The product should aid monitoring certain acts repeating on the basis of day/week/month. The item should serve both as a countdown tool and a diary.

The students were expected to conduct a research process reaching the definition of the product due diligence. Vagueness in product definition brought variety in final products. As another result of this vagueness, the students generally depended on their experiences and attestations in product.
development process. The project emphasized the interaction between action and environment, in other words, rhetoric. (Figure 4) The students not only evaluated the plastic values of the form they created, but also the product’s usability, usefulness and desirability.

Coincidentally, the same students encountered with a lighting unit project in the second year design studio course. The second year project did not describe the steps and limitations of the project. On the contrary, presented an open-ended definition as “design a portable/wearable lighting unit”. After completing the project, the students were given a survey sheet in which they are asked to compare the processes they led in these three projects. The responses to these surveys are evaluated on the basis of:

- Determining the keywords of students for each project
- Rating of these keywords.

The results are presented in Table 1.
Table 1. Process evaluation by keywords (Data analysis method: Thematic coding)

| Paper Lighting | Day counter | Wearable / Mobile Lighting |
|----------------|-------------|----------------------------|
| **Form (63)**  | User group (14) | Ergonomics (22) |
| • Origami (12) |  | • Ergonomic (15) |
| • No glue (9)  |  | • Usability (4) |
| • Module (7)   |  | • Security |
| • Unit (6)     |  | • Accessibility |
| • Assemblage (5) |  | • Understandable product language |
| • Folding (5)  |  |  |
| • From part to whole (6) |  |  |
| • Basic design elements and principles (Contrast, transparency, repetition, hierarchy, rhythm, balance) (3) |  |  |
| • Form (2)     |  |  |
| • 3D (2)       |  |  |
| • Cutting (2)  |  |  |
| • Durability (2) |  |  |
| • Punching     |  |  |
| • Junction piece |  |  |
| **Material (31)** |  |  |
| • Kind of papers (11) |  |  |
| • Material (research) (6) |  |  |
| • Acetate (4) |  |  |
| • Lexan (3)    |  |  |
| • Potential of paper (3) |  |  |
| • Constraint on material (2) |  |  |
| • Foam core |  |  |
| • Galvanized wire |  |  |
| • Cardboard |  |  |
| • Relationship between light and material |  |  |
| **Manner (14)** |  |  |
| • Use scenario (7) |  |  |
| **Project content (12)** |  |  |
| **Function (8)** |  |  |
| **Need (6)** |  |  |
| **Representation (6)** |  |  |
| • Prototype (2) |  |  |
| • Representation (2) |  |  |
| • Sketch (2) |  |  |
| **Research (6)** |  |  |
| • Research (4) |  |  |
| • Product Analysis (2) |  |  |
| **Form (5)** |  |  |
| **Manner (4)** |  |  |
| • Ease of use (2) |  |  |
| • Use scenario |  |  |
| • Relevant product |  |  |
| **Material (3)** |  |  |
| **Process (2)** |  |  |
| **Technical information** |  |  |
|  |  |  |
| **Ergonomics (22)** |  |  |
|  |  |  |
| **User group (13)** |  |  |
| **Need (12)** |  |  |
| • Need Analysis (8) |  |  |
| • Need-based design (4) |  |  |
| **Manner (11)** |  |  |
| • Use scenario (10) |  |  |
| • User interaction |  |  |
| **Form (9)** |  |  |
| • Form (7) |  |  |
| • Flexibility |  |  |
| • Lightness |  |  |
| **Representation (7)** |  |  |
| • Representation (3) |  |  |
| • Prototype (2) |  |  |
| • Exploded perspective |  |  |
| • Sketch |  |  |
| **Material (6)** |  |  |
| • Material (3) |  |  |
| • Led (2) |  |  |
| • Polycarbonate |  |  |
| **Production method (6)** |  |  |
| **Research (5)** |  |  |
| • Research (3) |  |  |
| • Product analysis (2) |  |  |
| **Technical Information (5)** |  |  |
The general overview of each project is presented in Figure 5.
Figure 5. Summary of process evaluation of 3 projects
Table 2. Research method evaluation by nominal scale

|                      | Paper Lighting                                      | Day Counter                                      | Wearable/Mobile Lighting                        |
|----------------------|-----------------------------------------------------|-------------------------------------------------|------------------------------------------------|
| **Interview**        | 7 participant mentioned that in research they made interview with: User group 6 Expert 1 | 20 participant mentioned that in research they made interview with: User group 16 Expert 12 | 23 participant mentioned that in research they made interview with: User group 18 Expert 12 |
| **Internet**         | 36 participants made internet research for: Generally image and video based research for product or production method | 36 participants made internet research for: Generally image and video based research for product or production method. Also target group behaviours and routines are researched through internet. | 34 participants made internet research for: Generally image and video based research for product or production method. Also target group behaviours and routines are researched through internet. |
| **Book/Printed material** | 9 participants made research through brochure/catalogue/guide, 2 of among lighting book or origami book. 1 participant did not specify the material | 10 participants made research through printed resources that include project content information | 6 participants made research among printed materials but they did not mention materials that are used to make research |
| **Market research**  | 29 participant state that they made market research at: Shops 28 Place of use 2 For generally the form, material packaging of product analysis. | 14 participant state that they performed market research at: Shops 10 Place of use 5 To find sample products. | 27 participant state that they made market research at: Shops 24 Place of use 3 To analyse the existing solutions, mechanism and to gather technical information from shops and also from technical services. |
Figure 6. Summary of Research method evaluation

Table 3. Comparison of first year projects and second year project in terms of process and output by statements

| Paper lighting and day counter | Wearable mobile lighting |
|-------------------------------|--------------------------|
| Improvement of research abilities | Improvement of product experience and representation abilities |
| Comprehension of basic design principles | Both comprehension and implementation of basic design and technical and technological knowledge |
| Prototype that students use in their daily lives (Final products) | Incomplete and developable products |
| Material experience | Material assumption |
| Hands on experience (form based process) | Sketch based process |
| Research based product development | Available product and need analysis and based product development |
| Unidentified user groups (At later stages the user become identified) | Identified target group |
| Basic design principles and given brief were concerned | Ergonomics and technical knowledge in particular production methods were concerned |
| The starting points are material and manner | The starting point is the available products on market |
| The decreasing level of constraints on project | No constraint |
| The focus is on the form | Ideas are in the forefront |
| Material and target group research | Marketing and user group research |
| No electronic or mechanic parts is emancipative | The electronic components make us stick to the technical knowledge that shape the process. |
5. Conclusion

The existence of design depends on rational and scientific foundations. The most important component of this scientific foundation, namely research, take place in design studios at a considerable rate. However in basic design studio, the concept of research is generally reduced to form generation exercises. Yet, increasing research in basic design also supports creativity.

The study aims to understand the role of research on design process beginning from verbal expression to conceptual design. The notion of research is examined within the framework of the three project development processes. The findings of the research are evaluated on Buchanan’s (2001) conceptions of the product’s internal and external views. During the first encounter in basic design, the concept of design research is reduced to collecting product visuals. However research refers to form, function, material and manner components at basic design level.

In the first project, research is limited to recognizing similar products and materials, and is imbedded in project development process. In short, the process can be summarized as learning and researching by doing. The process approaches Buchanan’s (2007) conception of “generative science”.

The second project is more research based, allowing the student to determine the boundaries of the product. The lack of a strict definition of the product necessitated research on manner. With respect to the first project, the process is more research based, allowing the student to determine the boundaries of the product. The lack of a strict definition of the product necessitated research on manner. With respect to the first project, the process is more research based. As only the “function” was defined at the beginning, “need” had to be defined and specialized by the student. In the process, “form” is not the beginning point, but the outcome. The notion of “need” instigated the students to focus on their personal experiences and observations. Such a process refers to the understanding of “rhetoric” (Buchanan, 2007)

Research based understanding serves for the enhancement of creativity as removal of mental blocks is bound to research. On the contrary, while strictly defined problems narrows the vision of the product, vaguely defined design problems enhances creativity by emphasizing research. As a result, promoting research more during basic design education, helps removing of mental blocks and augments creativity.

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