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"What is Design?" An Open-Ended Inquiry Among Design Students

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Abstract: An elementary question seems to appear quite incessantly on experience, both as a design student and practicing pedagogue of design: What is design? This often resurfaced during conversation with fellow students, drawing some uncertainty on how to approach and define design. These uncertainties can limit the scope through which students might fully engage with the design process, and hence, their creative scope in design teaching and learning might be limited. Despite vast amounts of research showing professional design views, very little thought has been given to how students perceive the term 'design' within the umbrella of school education. Unless a window to such insight is opened, design teaching methods cannot be improved. This research explores the way design students conceptualize the word "design" through an open-ended inquiry that understands their views, challenges, and influences. Qualitative methods such as interviews and thematic analysis are used to grasp common themes and divergent views and shape the understanding of design by the students. Findings will prove useful in understanding how design is taught within academic institutions, and they contribute toward excellence in design pedagogy and curriculum development. The paper demonstrated the need to fill gaps amongst the students to be done by a more structured form of teaching design students. Findings can form interesting follow-up research on curriculum development improvements and the subsequent long-term effects on design learning.

Keywords: Curriculum development; Design pedagogy; Divergent views; Understanding design; Student perspectives; SPA Vijayawada; Open-ended inquiry

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1. Introduction

The question of the nature of design is one that is perennial in the paradigm of design education. By the end of this process, students often become confused over an elemental uncertainty about what design really encompasses. This confusion is compounded by the unique characteristics and values of the School of Planning and Architecture Vijayawada, which influence student perspectives in distinct ways. On that basis, this study attempts to open up the dialogue on student understanding, which helps establish the issues that students face and the conceptual frameworks used to contribute towards improving design pedagogy. Design pedagogy is

broad and fluid, embracing a wide scope of creative fields: architecture, product, graphic, industrial, interior, and interaction design. Knowing how design students understand the founding question, "What is design?" can reveal information about how they experience their education and development as students.

2. Background

Design has come to be defined in many disciplines, cultural contexts, and technological advances, but established definitions remain, and importantly, a missing element is an understanding of how design students understand what design is in a learning environment. Out of the extant literature, student voices have been underrepresented. Broadly speaking, most literature lacks professional points of view. This paper bridges that gap by concentrating on the results of students of the School of Planning and Architecture Vijayawada, while critically analyzing their knowledge. This is against the context of design through different disciplines contemporary frameworks and previous studies. Understanding such perspectives is crucial to developing pedagogical practices and to making sure that design education remains relevant to what students see and experience.

2.1. Aim and objectives

The present study inquires into the question "What is design?" through an open-ended inquiry among students in the School of Planning and Architecture Vijayawada. The particular interest in this study is:

(1) To gather different definitions and interpretations of design by students.
(2) To examine the universal trends as well as the divergent views, which are also the product of the responses given by the students.
(3) To study the potential implications that these findings carry with them for design education, pedagogy and design curriculum design.

Each of the above steps leads to the former directly as it provides insight into a student's perception that can fill teaching methods and curricula with sensitivity to the needs prevalent in modern design education.

2.2. Scope and limitations

This study would focus particularly on design students from the School of Planning and Architecture Vijayawada, at the undergraduate as well as at the postgraduate level. Even though this study is designed to produce a cross-section of views, it may not be comprehensive enough to capture all of the viewpoints of design students since there are too many cultural, contextual, and institutional factors that make a student's view on design unique. Recruitment problems and biased self-reporting are also potential hazards with this study. Since reliance is placed on the collection of qualitative data, there is a threat to subjectivity. This is likely to be surmountable through rigorous methods of analyzing and validating the data. Future studies can be extended to include other institutions and may have implications for other educational settings.

2.3. Understand with a 5W 1H inquiry

The scope and clarity of the study have been framed using a 5Ws + 1H approach, as outlined in **Table 1**, to provide a structured understanding of the research context.

Table 1. 5Ws + 1H Matrix Table for more simple understanding of the topic

Element	Details
Who?	Students of the School of Planning and Architecture Vijayawada.
What?	Understanding students' perceptions and experiences on the question "What is design?"
Where?	This study will be carried out at the School of Planning and Architecture Vijayawada. Institute of National Importance, Ministry of Education, Government of India.
When?	It will be carried out in the ongoing running odd semester, 2024.
Why?	Fill the gap in understanding how students think about design with supporting educators in enhancing their teaching methods.
How?	Students will respond to an open-ended question through Google Forms. Responses are analyzed for common themes then cross-checked to validate with participants.

5Ws + 1H Matrix Table are the six basic questions that ask about matters relating to the selected topic. Answering them is going to prove to be very useful for understanding the subject matter. The man who created 5Ws Sakichi Toyoda (1867–1930) invented 5Ws and applied it to Toyota which he established.

2.4. Theoretical background

There are plenty of studies about design. Cross, from the design studies tradition and focusing on the ability of design, argues that major features of design include resolving ill-defined problems, adopting solution-focusing strategies, employing abductive/productive/appositional thinking, and using non-verbal, graphic/spatial modelling media, as described by the complexities of cognitive processes present in design [1]. According to noted design theorist J. Heskett, Design is when designers design a design to produce a design, a statement that emphasizes the recursive nature of design processes as well as the complexities one encounters in finding the meaning of the term in different contexts of usage [2].

Dr. Per Galle, member of the Royal Danish Academy of Architecture Design Conservation in the Department of Architecture and Design, defines design as the act of creatively proposing an idea, so as to enable yourself or others to make an artifact according to the idea, insisting on creativity in developing artifacts [3]. Cohering with this ideal, influential designer and educator Victor Papanek submitted in Design for the Real World that Design is the conscious effort to impose meaningful order, designifying responsible designers should consider the social and environmental impacts of the designer's work, not only as a responsibility to design but as a means to create positive alteration [4].

A philosopher, named Rristo Hilpinen, who has done a great amount of work on artifacts, articulates that an artifact is an object (not necessarily material) that has been intentionally made or produced for a certain purpose, which frames design as a deliberate act of creation [5]. According to Don Norman, one of the founders of user-centred design, Design is a process of creating an object or service that solves a problem, and it is all about usability and user experience while designing [6].

The most prominent academic in design and planning, Peter G. Rowe, defines it as the synthesis of knowledge in a form that can be made and used, such that design is not only aesthetic but also incorporates various forms of knowledge to produce functional artifacts [7]. Co-founder of IDEO and one of the pioneers of interaction design, Bill Moggridge, states that design is the creation of a plan or convention for the construction of an object or a system, reflecting the systematic approach that, by nature, exists in the design process [8].

Richard Buchanan highly repute figure in design studies and philosophy-says that design is the human

capacity to shape and make artifacts that are meaningful within specific contexts, integrating practical and theoretical knowledge in the process of design. Dieter Rams, Braun's leading designer between 1962 and 1995, shares an opinion that a good design should be innovative; make a product useful, aesthetic, understandable; good design is unobtrusive, honest and long-lasting, thought through to the last detail, ecologically friendly. Rams' main thesis is that good design is as little design as possible [9].

Marina Pankina is a Doctor of Cultural Studies, Professor, Chair of Cultural Studies and Design, Ural Federal University, Yekaterinburg, Russia, who described Design as a type of projecting and creative practice that appeared simultaneously with the beginning of mass production. Its projecting function is based on the need to solve a problem, to open new opportunities to organize people's everyday life, and to satisfy their needs [10]. What is more important here, not an object but a living space for human beings, the realization of their needs and creative ideas. Design isn't only a creation of material objects of varying shapes and sizes. It is, according to the American designer and anthropologist Viktor Papanek, conscious and intuitive efforts to establish a meaningful order [11]. Some of the landmark qualitative research and surveys recently conducted synthesize the most critical findings about design pedagogy in terms of explorations on student perspectives, conceptual diversity, and educational influence that define these readings.

Semi-structured interviews were performed with industrial design students, as Ulusan et al. reported, to find the conceptual foundations of the ability to design [12]. The results can be of great use in revealing how the students perceive and develop their design capabilities at entire stage of their education and amplify thematic analysis, which makes it possible to understand the patterns within the constructive learning experience that contribute to the emerging understanding of design. Similar in approach, Baha et al. also report an instrumental case study where how the match of personal and professional interest drives the articulation of students' personal principles and visions of "good design," further gets integrated with academic and professional practice [13]. Corazzo's phenomenographic analysis explained the different conceptions students of graphic design held about their discipline [14]. The paper finds a range of interpretations, viewing design as an application of skill to understanding it as a transformative practice that reflects the wide scope of challenges designers and designers in training face nowadays. Such analysis provides a starting point for thinking about how novel curriculum models might better accommodate the range of interpretations students are likely to have. Gray, among others, has developed research issues on how strategies and conditions in studios can influence design education [15]. Results suggest that some activities-better still, collaborative works, critiques, and mentorship-confer a more notable influence on how students learn as well as their perceptions of design. Brunner pointed out the increased usage of digital tools in design thinking and recommended that curricula be advanced to reflect better integration with technology to align more with existing industry conduct [16]. Together, the studies will give attention to what is required in qualitative methods of design education research, like interviews and phenomenographic analyses. They express a holistic view of the differences brought by educational contexts and reflective practice, identity, and development in the interpretations and experiences of design students. These will enable educators to more radically tailor the alignment of curriculum to shifting student views and prepare them for the complexities of the design professions suitably.

3. Methodology

The primary approach used to analyze the qualitative data in this research is thematic analysis. According to Braun et al., thematic analysis is a method for "identifying, analyzing and reporting patterns (themes) within

data" [17]. With this method, there will be an in-depth exploration that will be conducted with the insights acquired from the participants about the meaning they give to design. The research process is visually summarized in **Figure 1**, which illustrates the stages of sampling, data gathering, and analysis.

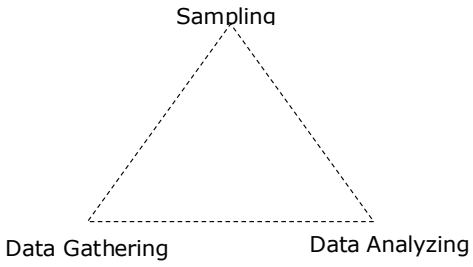

Figure 1. Representation of Methodology from the above text by the author.

The thematic analysis includes the following significant steps: Attride-Stirling describes six steps for the generation of thematic networks: "Code material, identify themes, construct thematic networks, describe and explore thematic networks, interpret patterns" [18]. Thomas et al., another author, describe the three stages of the process: free line-by-line coding of primary study findings, organization of these "free codes" into related areas that will construct "descriptive themes," and development of "analytical themes" [19]. In that, he proposes a six-step process: "Familiarizing yourself with the data, generating initial codes, identifying themes, constructing thematic networks, integration and interpretation" [20].

Despite differences in terms and number of steps by authors, thematic analysis remains the same in its core: it codes data and categorizes the codes into inclusive themes that give an overall view of the subject. In this regard, any segment of the data that points out "what is designed" will be labelled with an initial code. The initial codes will then be sorted into subsets and, in turn, organized into sets, eventually leading to wider themes. The distribution of samples from undergraduate and postgraduate students is illustrated in **Figure 2**.

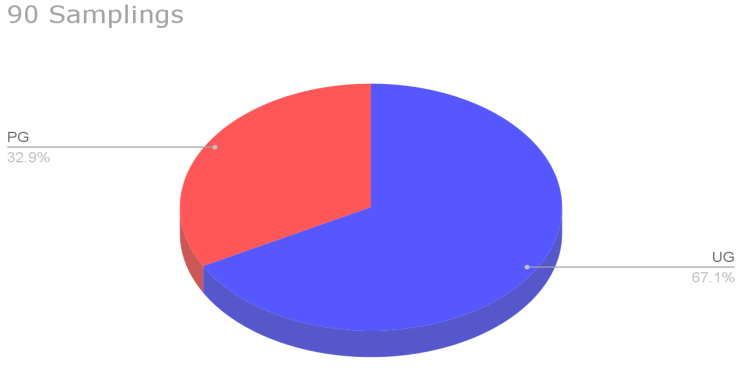

Figure 2. Representation of Samplings from UG and PG.

The process of categorizing is based mainly on the establishment of similarities of meanings and logical relations. Between the elements. These relations and similarities, once established, come under In other words, one level higher. They are classified on the basis of their cores rather than boundaries.

4. Process and findings

4.1. Initial codes

Following the procedures, after getting oriented with the data, from the data 90 initial codes are generated from the definitions provided by the students. A few of the initial codes are given below for easy reference and the rest are not included here as that would be too many. A few examples of the initial codes derived from student responses are listed in **Table 2**, representing key themes in their definitions of design.

Table 2. Initial codes generated from the samples

	Design definitions from the students (Samples)	Initial codes
1	Use of at least one shape or curve, or pattern. Sometimes, design gives an impression of what an existing structure looks like.	Aesthetic Appeal
2	Your feeling is putting in action	User-Centered Design
3	Design is a solution that is aesthetically pleasing and functional; it's about making things feel right, usable, and meaningful.	Functionality
4	The process of planning and creating objects	Creative Process
5	Design is the way of organizing in an aesthetically appealing way of anything useful. The design becomes crucial context because it affects the product usability or the experience of service or the way something is exhibited.	Contextual Relevance
6	Design makes our boring common aspects of daily used products by adding characteristic features and needed alterations required by the specific user. It also is the means by which economical, environmental, and social sustainability can be attained.	Sustainability
7	Design is what the mind resonates with.	Imagination and Reality
8	Design is like a combination of elements in any form; it is created, executed, and used in different aspects.	Integration of Elements
9	It is a way you compose something according to your needs and are backed up with scientific methods and practicality.	Planning and Organization
10	Art, science, and functionality.	Interdisciplinary Nature
11	Design is a creative process that entails organizing and producing environments, systems, or products to meet demands and solve issues.	Creative Process
12	Design is a process involving the stakeholders and nature as a whole part and not separating users and nature.	Holistic Perspective
13	Creative way to solve problems.	Problem Solving
14	Something curated for usage.	Curatorial Approach
15	For me, it's a creation of something by keeping in mind the end user and crafting the experience for them through meaningful product. Design is a thought in which we craft our experience.	User-Centered Design
16	It's a thing that gives uniqueness or special structure to something; sometimes it's a need for that, or sometimes it is to convey a message.	Expressive Communication
17	Anything that is for comfort and aesthetics.	Aesthetic Appeal

4.2. Subsets

From the 90 initial codes, 08 subsets and other subsets have one code each based on similarities of meanings and logical relations. The initial codes were grouped based on thematic similarities, resulting in the subsets shown in **Table 3**. The subsets are as follows.

Table 3. Subsets generated from the initial codes with the count

	Subset	Codes	Count
1	Creative Process	Creative Process, Exploration and Innovation, Everyday Practice	12
2	User-Centered Design	User-Centered Design	7
3	Aesthetic Appeal	Aesthetic Appeal	6
4	Problem Solving	Problem Solving	8
5	Subjectivity	Subjectivity	5
6	Functionality	Functionality	3
7	Creative Expression	Creative Expression	3
8	Planning and Organization	Planning and Organization	2
9	Interdisciplinary Nature	Interdisciplinary Nature	2
10	Integration of Elements	Integration of Elements	1
11	Contextual Relevance	Contextual Relevance	1
12	Sustainability	Sustainability	1
13	Imagination and Reality	Imagination and Reality	1
14	Curatorial Approach	Curatorial Approach	1
15	Expressive Communication	Expressive Communication	1
16	Holistic Perspective	Holistic Perspective	1
17	Evolving Solutions	Evolving Solutions	1
18	Universal Design	Universal Design	1
19	Tangible Solutions	Tangible Solutions	1
20	Empathetic Design	Empathetic Design	1
21	Comprehensive Design	Comprehensive Design	1
22	Convenience	Convenience	1
23	Principles and Regulations	Principles and Regulations	1
24	Versatility and Productivity	Versatility and Productivity	1
25	Improvement	Improvement	1
26	Process Orientation	Process Orientation	1
27	Planning and Purpose	Planning and Purpose	1
28	Functional Analysis	Functional Analysis	1

Figure 3 shows the distribution of the 28 subsets, derived from the initial codes, with each subset reflecting thematic groupings as shown in **Table 3**.

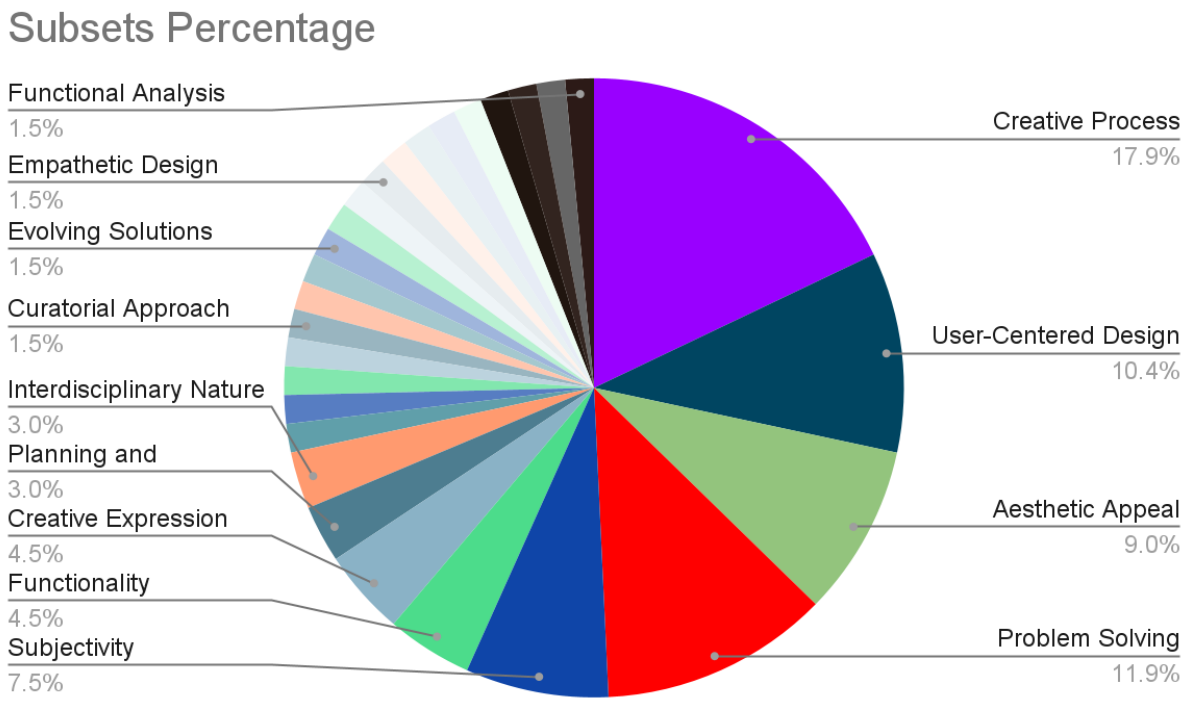

Figure 3. 28 subsets percentage from initial codes.

4.3. Observation

The analysis of student perspectives on design definitions reveals that only 40% of students possess a clear understanding of design, with problem-solving recognized by merely 12%. In contrast, 18% acknowledge the significance of the creative process, while user-centered design is noted by only 10%. Other concepts, such as subjectivity, functionality, creative expression, interdisciplinary approaches, and planning, contribute to the remaining understanding. It can be observed that problem solving has surprisingly constituted a very small proportion, that of 12%, in the articulations of students. This reflects a gap between the central place problem-solving occupies in design and the way students see it functioning in the study of design. Ideally, problem-solving should form a prominent constituent in design study, reflecting its centrality in defining what design is all about. This low recognition indicates that students do not understand the value of solving issues through design, which is a core principle of the discipline.

5. Hypothesis testing framework

Hypothesis testing is a statistical technique whereby inferences are made or conclusions are drawn regarding a population based on sample data. It allows one to conclude whether or not there is sufficient evidence for the rejection of a proposed assumption, called the null hypothesis (H0), in favour of some alternative, the alternative hypothesis (Ha) [21].

Based on observations, we are particularly interested in finding out if there is indeed a significant gap between whether or not students recognise problem-solving in design versus its expected prominence.

(1) Objective: To test whether the observed proportion of students (12%) who recognize problem-solving as

a core element of design differs significantly from the hypothesized ideal proportion.

(2) Extracts accentuating problem solving in design: From **Table 4**, we can pull out the statements or definitions that directly or indirectly refer to problem-solving as a core aspect of design.

Table 4. Literature reference for expected proportion

1	Cross (1990)	"Major features of design include resolving ill-defined problems." State problem-solving explicitly.
2	Don Norman (2013)	"Design is a process of creating an object or service that solves a problem." State problem-solving explicitly.
3	Marina Pankina (2020)	"Design's projecting function is based on the need to solve a problem." Directly refers to the solving of a problem.
4	Victor Papanek (1985)	"Design is the conscious effort to impose meaningful order." Makes the implication of problem-solving as part of responsible design implicit
5	Peter G. Rowe (1991)	"Design is the synthesis of knowledge to produce functional artifacts." Makes the implication of solving functionality problems implicit
6	Marina Pankina (2020, second mention)	"The need to open new opportunities to organize people's everyday life and satisfy their needs." The indirect connotation is problem-solving for satisfying needs.
Quantification of Problem-Solving References: Direct Mention: 3 sources (Cross, Norman, Pankina). Indirect Mention: 3 supplementary sources (Papanek, Rowe, Pankina). Total References to Problem-Solving: 6 out of 12 sources (50 %).		

The hypothesis test will determine whether the observed proportion of students recognizing problem-solving in design (12%) is significantly different from an ideal expected proportion (50%). The null hypothesis (H0) is that the observed proportion equals the ideal one; the alternative hypothesis (Ha) suggests a significant difference. This is a one-sample Z-test for proportions because it compares an observed proportion to a standard value, size of the sample is sufficiently large. The significance level (α) is usually taken to be 0.05; the critical z-value is approximately ± 1.96. The calculated z-score is approximately -7.21. Therefore, we reject the null hypothesis and accept the alternative hypothesis (H_1). The test statistic, Z, is computed using the formula as follows (**Figure 4**) [22]:

$$Z = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}}$$

Where,

P^ is the observed proportion (0.12)

P_0 is the expected proportion (0.50)

and n is the sample size (90).

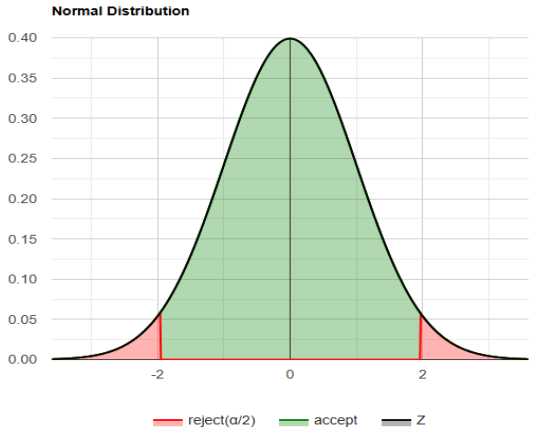

Figure 4. Significance level of a hypothesis test.

6. Conclusion

With results from the hypothesis test, we can conclude that indeed there is a difference between the perception of design as problem-solving with that of the perception presented in existing literature with the sample of design students. In this study, 12% of design students (of a sample size of 90) rated problem-solving as a key part of design. This differs significantly from the 50% proportion suggested in the literature, which implies a much broader, perhaps more conventional, recognition of problem-solving as central to the process of design. Through a z-test, the calculated z-score is -7.21, which is considerably greater than the critical z-value of ± 1.96. This resulted in a p-value much smaller than 0.05, leading us to reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1): that there is a significant difference between the two proportions.

This study, therefore, concludes that the perception of design as problem-solving among the sample of design students is significantly lower than what is suggested by the literature. This finding serves to highlight the need for further exploration into how design students conceptualize the role of problem-solving in their practice and suggests potential implications for design education and pedagogy. Results in this study highlight the contextual basis of establishing design thinking, using the specific learning environments and the cultures prevailing among the students, which are often more contextualized and nuanced than typical or broad conceptualizations of the design process found in the literature.

Disclosure statement

The authors declare no conflict of interest.

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