

Arupa Foundation5: Cube as laboratory

The Emergence of Aesthetic Order through Active Silence

A G Rao

Abstract

This paper re-examines a series of Cube design tasks conducted with postgraduate and undergraduate students at the Industrial Design Centre (IDC), IIT Bombay, through the framework of Arupa – The Implicate Order. Originally conceived to develop three-dimensional imagination for product design, the documented outcomes are reconsidered as a Cube Laboratory for investigating Active Silence, imagination, aesthetic order and creative learning.

Analysis of eleven student solutions, together with participant reflections collected decades later, suggests that much of the creative process remained tacit. The paper proposes that these solutions can be interpreted through a recurring sequence in which metaphoric imagination initiates exploration, geometric imagination translates it into spatial form, and aesthetic order emerges through the interaction of the two. A Neusearch-based decoding of the solutions is presented to make these tacit processes explicit.

The study further examines differences in the learning trajectories of engineers and architects, highlighting the educational value of cognitive perturbation, collective active silence and multidisciplinary interaction. It is suggested that articulating these hidden processes can contribute to new pedagogies of form, design and creativity, while opening avenues for future research involving AI-assisted exploration, multisensory learning and the relationship between aesthetic order and inner order.

1.0 Introduction

This paper is the first in a planned series of studies that re-examine documented Cube Laboratory experiments conducted at the Industrial Design Centre (IDC), IIT Bombay, through the framework of **Arupa – The Implicate Order**. The present article focuses on one Cube task introduced to M.Des students to develop three-dimensional imagination, particularly in relation to product design, positive–negative form, moulded products and aesthetic sensitivity.

The task appeared deceptively simple: divide a cube into two identical halves with a visual surprise when it is opened. However, the documented solutions and later reflections suggest that the task activated deeper processes of learning. It brought into operation the inner order of the facilitator, the active silence of students, the IDC learning ecosystem, dialogues between teacher and students, and interactions among engineers and architects.

The central concern of this paper is to analyse and articulate the implicate order embedded in this educational experiment. The eleven cube solutions are not treated merely as formal outputs. They are examined as evidence of tacit processes involving metaphoric imagination, geometric imagination, aesthetic order and cognitive perturbation. Through Neusearch, the paper attempts to decode how metaphoric

possibilities were translated into physically verifiable geometric configurations and how aesthetic qualities such as rhythm, flow, symmetry, balance, identity and surprise emerged in the process.

The paper also examines how students from different backgrounds responded to the task. The feedbacks indicate that engineers, who were less prepared for open-ended visual-spatial exploration, experienced frustration, uncertainty and delayed closure, while architects appeared more comfortable with ambiguity, visualization and exploratory sketching. This interaction created conditions for Collective Active Silence and made the Cube Lab an important site for studying multidisciplinary learning.

The larger purpose of the paper is to show how implicit pedagogic knowledge embedded in a documented design experiment can be made explicit. Such articulation can contribute to future pedagogy of form, design and creativity, and may also open possibilities for New Age Learning, involving AI, VR, tactile interfaces, multisensory exploration and multidisciplinary participation.

2.0 Background

The present task, was introduced to Mdes 82-84 batch, to develop 3D Imagination in the product zone. Engineers in India at that time were exposed to assembly drawings, which demanded 3D imagination in Education and Industry, but there was no specific training input. Few engineers in practice developed such skills on their own.

Experience of developing original products and moulds to make them was totally lacking. Industries mostly bought 'partly used moulds' from abroad. A company where I was a consultant, had bought 'die casting moulds' for a 16mm projector from their collaborator, RCA, USA [1]

3.0. Active Silence

With the above background, we look at how the 'Cube Lab' has functioned, in addressing the 'Inner order and Active silence' operating in the Teacher or facilitator' to start with, followed by factors shaping the 'Inner order' of students.

3.1 Inner order of Facilitator

It was a single teacher situation with 12+students.

- **Strategy for 'Framing the problem'**

3D Imagination in terms of positive and negative forms is an important skill for 'moulded products'. Our challenge was to engage both graduate engineers and architects in developing '3D imagination and aesthetic sensitivity' with the same task. I had developed a strategy to create new tasks. I used to look for **surprising creative solutions** relevant to product design. Try to extract 'beauty or arupa' in the surprising solution. Articulate a general problem statement which would have the potential to bring out similar solutions.

- **Seeing the implicate order in the problem: programme as metaphor**

'Inner order' or 'preparedness' plays a significant role to arrive at such problem framing. In early seventies, we were lucky to get an 'in person exposure' to Prof.

Sugiura Kohei, a living legend of Hfg, Ulm. He visited IDC on invitation of prof. Sudhakar Nadkarni(SN) who was a 'Ulmer' and Head of IDC. Sugi (our fond short name given by SN) introduced his vision of design. He said 'design should be like a programme.' It inspired me to write an article on 'programme as a metaphor' later based on Sugi's concept [2].

- **Problem Discovery**

An elegant way of dividing a 'cube' to yield two identical parts reported in a Design Magazine captured my attention. Each half had an 'aesthetic identity'. This became my new discovery. How to state the problem to bring it to a programme level became my challenge, which led to the problem statement: **Divide a cube into two identical halves with a 'visual surprise' when it is opened.**

'Visual surprise' created an 'Intrigue'- the unknown, undefined problem, open for exploration. It gave the energy required to activate '*Active Silence*' in students, bringing the aesthetic order into picture, which is discussed further.

3.2 Inner order of the students

Active Silence operating at student level can be mostly seen at 3 levels, Eco-system for Learning at IDC and dialogues with me as well as their 'reflections' given in the feed backs.

3.3 Eco system for collective Learning

The task happened in 'one day class in a week' throughout semester', which had two effects. During the class-day, students worked together. But there was no continuity to build up the enhanced energy induced by others like in a ritual [3], which we can see as '**Collective Active Silence**'. But students could meet me(instructor) out of the class room hours, even over a 'Tea', which was an advantage. Added to this, several other events happening around, mentioned below contributed to the charged atmosphere.

- Ravi Mokashi's Bauhaus like Episode of 'T becomes old', Task' (from his feedback)

The cube exercise was more tangible and definite unlike the earlier assignment in making the letter form "T" old.

I often refer this task to my students even today.

Questioning the concept of "oldness" takes deep reflection in the first instance. It pushes the envelop further when one has to reflect upon oldness in an abstract sign such as T.

Representations in the form of T as a ruin, old dead creepers coiled around the letter form 'T' You name it and every member of the class had done some representation of Oldness around the "T" - - But to be told 'that is not "Oldness in the letter form T" - so what is Oldness.

After exhausting all first ideas, I hit upon the idea of ageing my “T” by sticking a cutout of the letter form on the floor in the class and allowing its natural wear and tear with people unknowingly walking and trampling over it in the class.

After three days, I informed my idea to some of my classmates who seemed amused.

I pulled off the wornout letter “T” from the floor and stuck it on my artwork sheet for submission.

- **Theatre Session** The particular batch also had the first theatre workshop for students at IDC, which was conducted by Prof. Kamalakar Sontakke, well known in Theatre circles in Mumbai, *which brought a new energy to shape the ‘Inner Order’ of students. It further built the ‘collective active silence’.* Seeing a video made on their participation in the theatre session had a significant effect on some students, as they were seeing themselves in action from outside, for the first time.
- Engineers seeing 14 solutions for the same product design problem had an ‘Eye-opening’ experience in **Prof. Gui Bonsiepe’s** class in a parallel assignment.
- Dynamic interactions among classmates, between architects and engineers.
- Particular batch, coming with different backgrounds (class with 7 Mech+ 1 Met +1 Chem + 1 Civil, engineers +3 Architects) was highly determined to learn design, psychologically prepared.
- IDC eco-system was also invigorated with UNDP programme in Operation, at that time. *Prof.Sugiura Kohei conducted a workshop on children’s book design for practicing visual designers during the same period as part of UNDP programme, . Product design students were able to see the results and talk to the participants.*
- *The cube task outputs, got noticed by other faculty members. Stepped cube solution was selected by Prof.Nadkarni, for new year card of IDC, later.*

3.4 Dialogues

- Many engineering students initially experienced stress because the task violated their expectation that every problem would have just one correct answer.
- *Teacher’s dialogue response as seen from one feedback*

You (Prof. Rao) were always so open ended in your discussions with us. We always sought and approached you for a word of approval of our ideas. More often than not came away more unsure after long discussions with you and for not getting a firm confirmation.

“Rao ne kya bola...?” Explore some more alternatives was an anticipated rue.
– ravi mokashi

For the students who are used to the ides that teacher knows the solutions, it became a training session to tolerate:

‘Uncertainty, incompleteness, delayed closure, incubation’.

- **A dialogue with Dilipan**

I recall a dialogue with Dilipan who was stuck and came to me for a discussion.

D: Sir, I don't know what to do?

Me: What is the most beautiful thing you like. Try to recall an image!

D took some time

D: I like temples! Temple steps at the pond look 'beautiful' to me

Me: O.K, Good, can you see steps in your cube half.

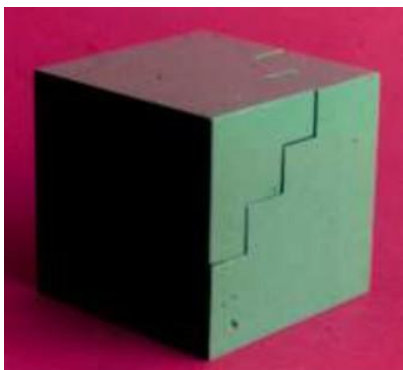
D came out with interesting cube halves {4,1,2,3,4}. He discovered a flow and continuity of steps, which gave an identity to each part. They were no more, mere halves of the cube, but independent objects with an identity of their own.

4.0 Solutions and Feedbacks

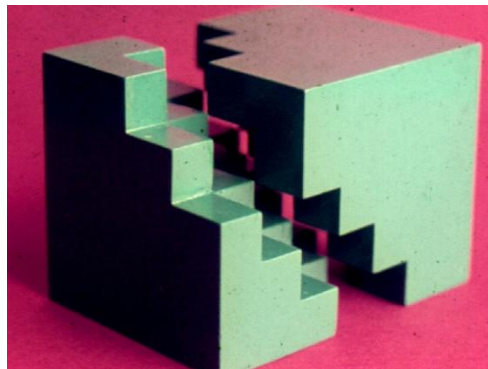
Solutions arrived at for the Cube task form visual reference for further discussions

4.1 Cube Steps

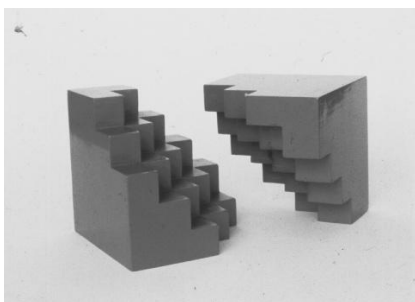
student: Dilipan



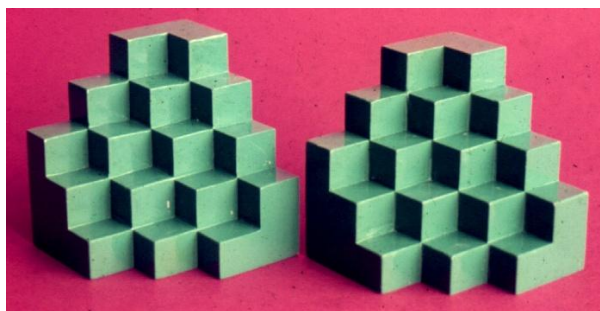
4.1.1



4.1.2



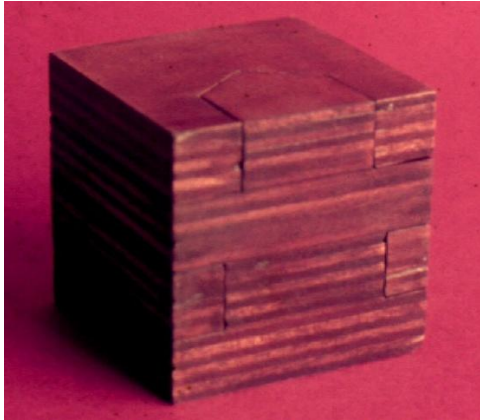
4.1.3



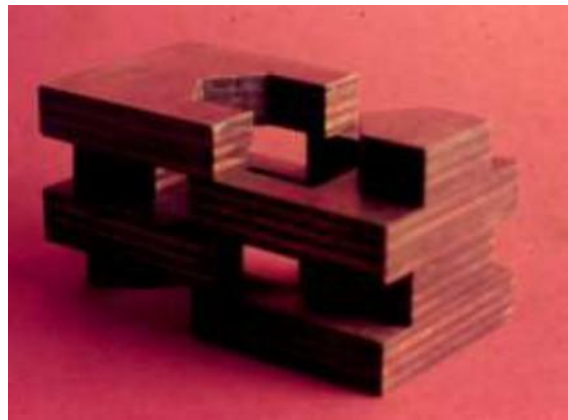
4.1.4

4.2 Human Cube

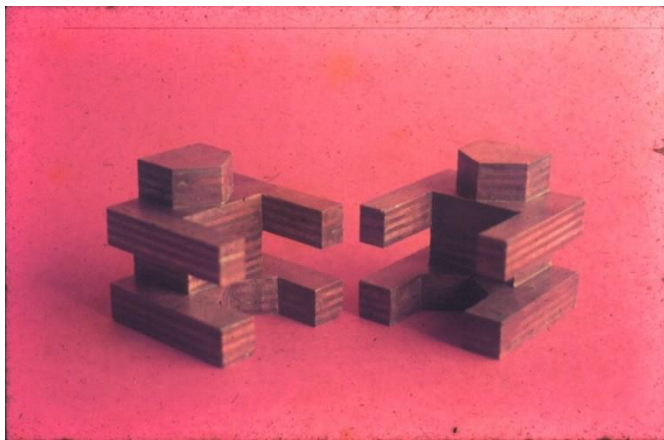
student : Jayesh Panchal



4.2.1



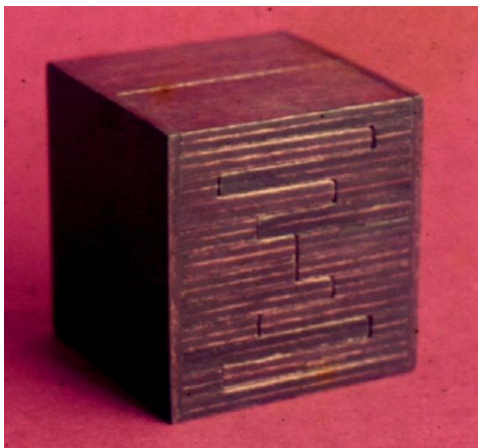
4.2.2



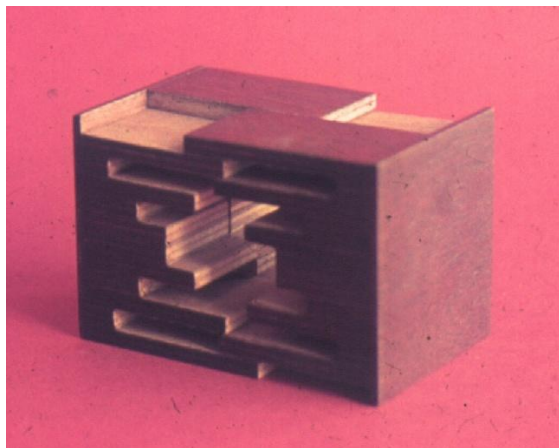
4.2.3

4.3 Layers in Harmony

Student: Jhumkee/ Sengupta, Chandravalee



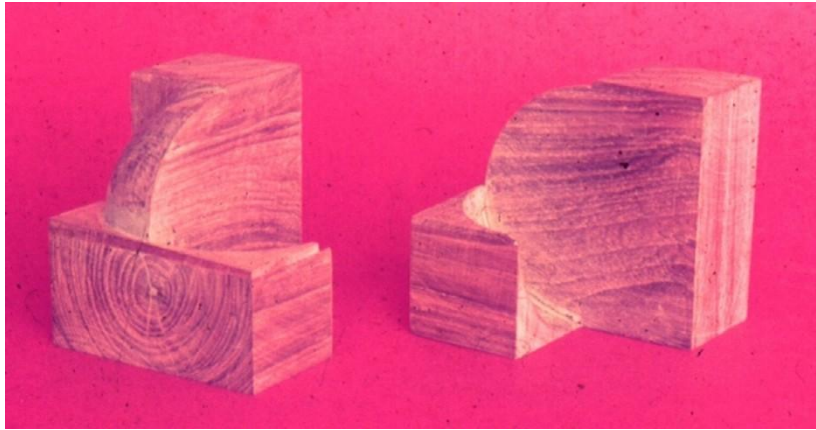
4.3.1



4.3.2

4.4 Sphere Cut

student: Vasanth Mehar



4.4.1

4.5 Half Rounds (+or-)

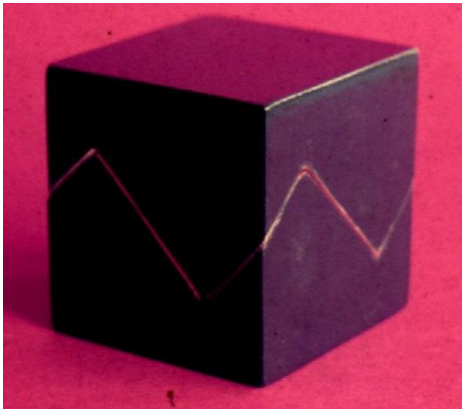
Student: not recorded



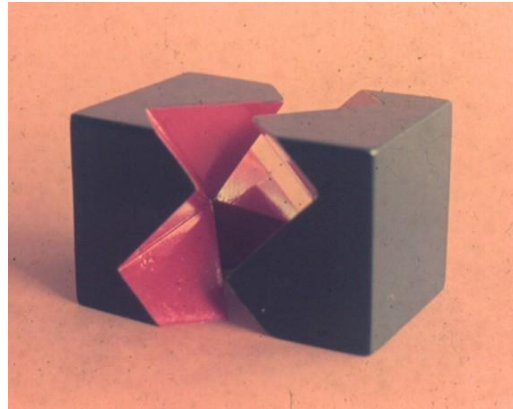
4.5.1

4.6 Flower with Folds

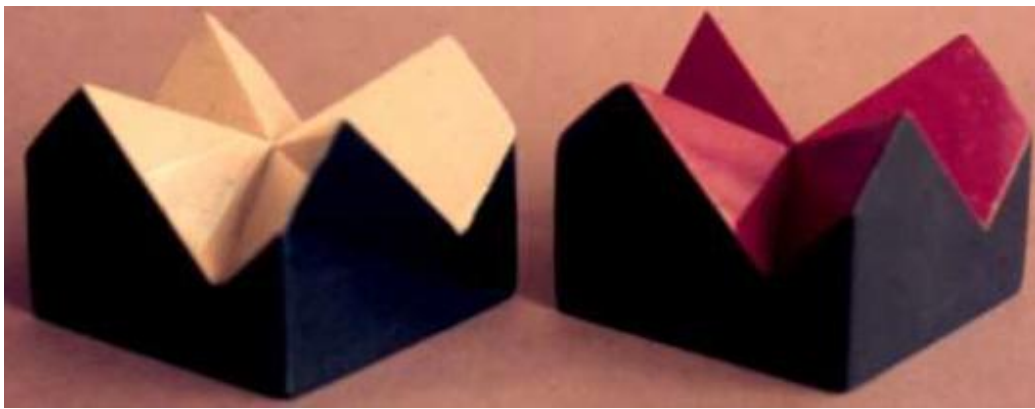
Student: not recorded



4.6.1



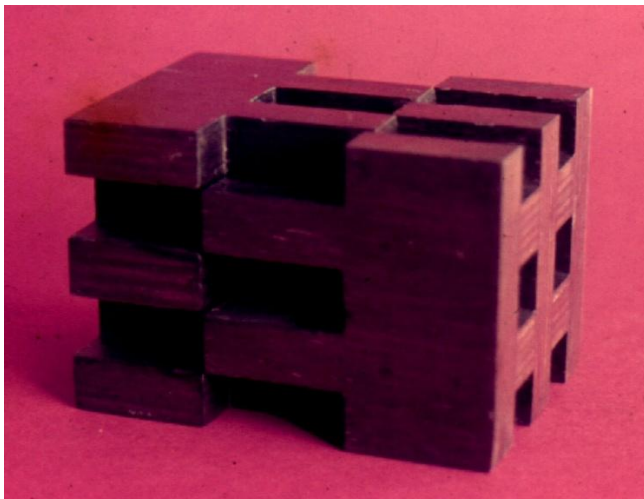
4.6.2



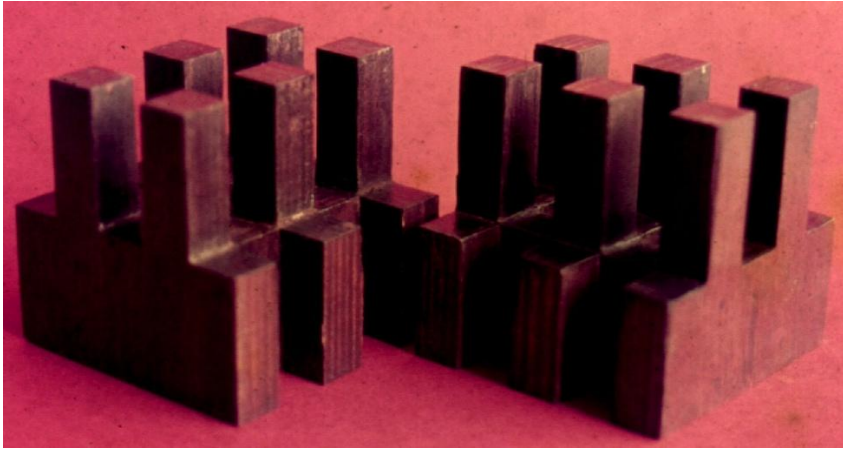
4.6.3

4.7 Six Pillars

student : not recorded



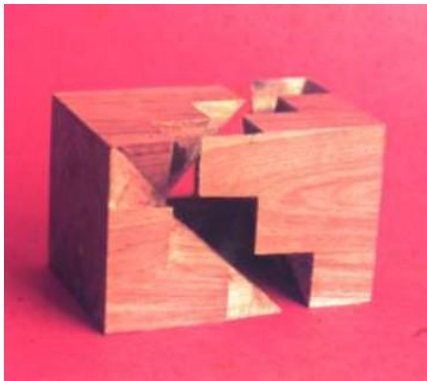
4.7.1



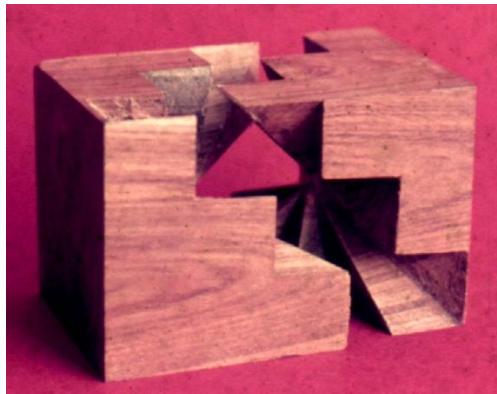
4.7.2

4.8. Up-Down Zigzag Folds

Student: not recorded



4.8.1



4.8.2

4.9 Triangular Pillars Two

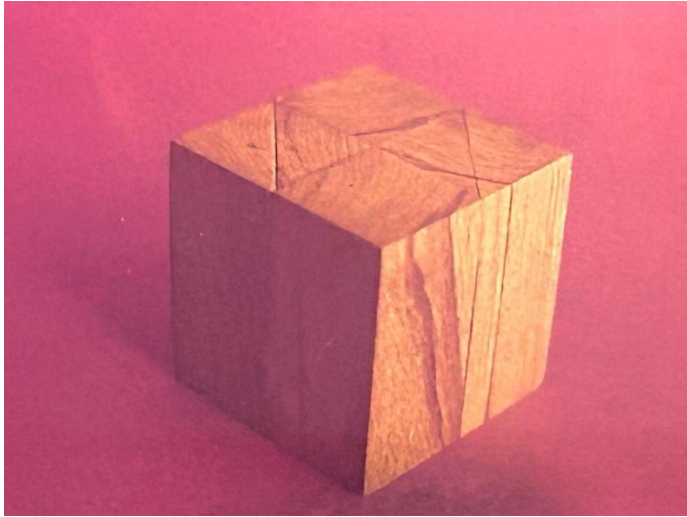
student: Vyas, Pradyumna



4.9.1



4.9.2



4.9.3

4.10 Steps in a Well

Student: Ravi Mokashi

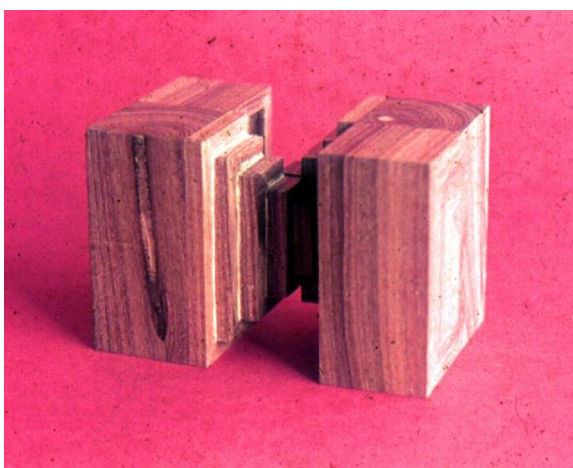
4.10.1



4.10.1



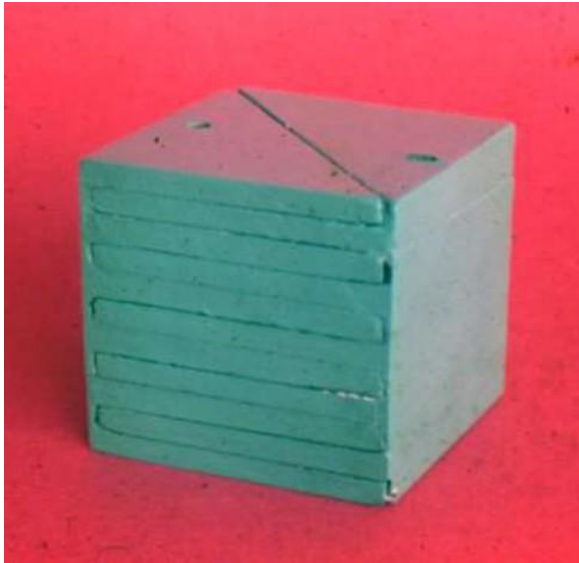
4.10.2



4.10.3

4.11 Triangular Layers

Student: Sudhakar.D



- **Students ID 82-84:**

Dilipan.R

Ghosh.S
Meher, Vasant
Mistry, Sandeep
Mokashi, Ravi
Munshi, MA
Panchal Jayesh
Parikh, Sunil
Rao, Kodali,
Sen, Indrani
Sengupta, Chandravalee (Jhumkee)
Sudhakar D
Vyas, Pradyumna

4.12 Feedbacks

4.12.1 Jhumkee

(Sengupta, Chandrabalee) has built a name in Interaction design.

Feedback:

-
- I remember it being incredibly difficult
 - Fresh out of the rigidity of an engineering education, I remember the head hurting as I tried to break the walls built in my mind and tried to push my mind into realms of imagination on and visualization it had not been to in a long time if at all.
 - For me, it was not fun at all, because of the tension and stress that prevailed.-----

- Frankly I remember, just looking to get the assignment done somehow. So, for me, there was no grand idea or inspiration behind - it was really less of an idea, and more of an MVP solution. I feel we were introduced to it rather early, when the walls of the mind of those of us who were engineers, had not yet broken.
- Other's ideas, especially those of the non-engineers were quite a blessing and shone a torch to the possibility that a solution can exist.
- I don't remember there being any appreciation, because I didn't think my solution was anything spectacular. As far as feedback, or critique, I do not recall any, though I know there was some – I particularly remember discussing with Sandeep Mistry, who had come in with the most open mind of us all and I remember being in awe of his thinking.
- Yes, that it (increase in confidence) certainly did. I don't think it was confidence in any identifiable skill, but an overall sense of a benchmark achieved and completion of a challenge, in a space in which I had chosen to work.
- comment on other's cubes : Sandeep Mistry who I mentioned earlier - I thought his work and thinking was way ahead of the rest of us, at the time. I also remember thinking Ravi Mokashi was taking it well in his stride, despite being an Engineer too. I remember Dilipan being very diligent but also one of the most rigid of us all in his thinking, at the time.
- On the earlier task, 'T becomes old' :
 - I remember that was a much more enjoyable task! In hindsight, I feel an interim task in 3D before the cube task, that gently moved us towards 3-D visualization may have been more helpful to do the Cube Task.

4.12.2 Ravi Mokashi

(Ravi.M, currently, is a senior professor, and Dean at IITG and well known as 'Educationist' in India)

Feedback

The 'Cube' has prodded me to articulate my thoughts on an emotional and reflective note beyond the specific questions you pose. Please bear with me.

Qs 1. Pl identify the piece U have done and pieces others have done if U remember

2. Ur personal experience of doing the task

On reflection and hindsight, I think I struggled with visualization and representation of hidden surfaces. Directly working on clay or thermocol for initial ideations was preferable rather than working through sketches which proved to be my limitation. One was constantly seeking reassurances from classmates to know if I was doing right. Interactions with Dilipan, Vasant Meher and Prasham(?) (an architect, who joined the program but subsequently, after a couple of months, discontinued) helped me to navigate an initial couple of months. I guess, Prof. Sontakke's theatre workshop greatly helped to free us of inhibitions and taboos, when the whole batch cohesively integrated and that collective strength proved to be the strength of the batch over the two years.

For me personally, exploratory open-ended format of basic education in Design was a first of its kind experience in learning. Prof. Bonsippe assignment was a good teaser in design conceptualization – The clamp assignment integrating form and function - with 14 different solutions in the class assignment exposed us to creative problem solving that made us realise that in Design there is no one correct answer.

3. Was it a fun or tension prevailed

While we engineers in the batch, were struggling to discover ourselves. Our architect friends in class were a source of awe and inspiration because of their strengths in drawing and visualization skills. We started enjoying our individuality after the initial couple of months.

4. Can u recall how U got the idea?

It was a collaborative effort over discussions with Dilipan and rough hands on modelling with thermocol before the final one in wood was made with some help with workmanship in the wood workshop.

5. Did other's solutions triggered Ur idea

Yes, I remember some excellent ideas from Sandeep. Others had progressed ahead in class, and I had to catch up. Nagi was a big support, helping me crystalize my idea. Used to have a lot of interactions with Vasant Meher – while some of his ideas were out of the box and provoked thinking, I often struggled with knowing if I had really understood him.

But he introduced me to the poet Muktibhod and his hindi poetry.

6. What was the feed back, critique, appreciation from ur class mates and friends

A sigh of relief. Whew!! It is done

7. Any discussion with teacher(agr) U remember :You (Prof. Rao) were always so open ended in your discussions with us. We always sought and approached you for a word of approval of our ideas. More often than not came away more unsure after long discussions with you and for not getting a firm confirmation.

“Rao ne kya bola...?” Explore some more alternatives was an anticipated rue.

Today, I feel these were the most enriching take away as an approach in design education – to be able to deal with ambiguity – it certainly is a journey for an individual in self-discovery and deep inner reflection. It takes incubation time in Design for ideas to fructify. But this reflection takes time and tempering. At that immediate moment of doing the assignment one is left a bit frustrated

8. Feel free any narrative, incident, story around ur task.

The cube exercise was more tangible and definite unlike the earlier assignment in making the letter form “T” old.

I often refer this task to my students even today.

Questioning the concept of “oldness” takes deep reflection in the first instance. It pushes the envelope further when one has to reflect upon oldness in an abstract sign such as T.

Representations in the form of T as a ruin, old dead creepers coiled around the letter form ‘T’ You name it and every member of the class had done some representation of Oldness around the “T” - - But to be told ‘that is not “Oldness in the letter form T” – so what is Oldness.

After exhausting all first ideas, I hit upon the idea of ageing my “T” by sticking a cutout of the letter form on the floor in the class and allowing its natural wear and tear with people unknowingly walking and trampling over it in the class.

After three days, I informed my idea to some of my classmates who seemed amused. I pulled off the wornout letter “T” from the floor and stuck it on my artwork sheet for submission.

9. Did it increase ur confidence after U came out with a new solution.

Assignments such as these helped us to free our minds and explore more openly. We had discovered our groove. One good thing of our batch was we were appreciative of each others work, critique was constructive and we were comfortable accepting each

others unique strengths for what we were rather than competing with each other. There was little trampling over each other’s egos.

10. Do U have any comment on other’s cubes

I vaguely remember Jayesh, Sandeep and also Ghosh working on some novel ideas. But I Can’t place their work now.

Other than the cube exercise, We were always curious and envious of some of the juniors assignments in semantics – akshara assignment, Familiness of forms - the peanut form family...

Our school furniture project with Prof. Helmut of Germany was q good learning. Kirti’s wearable Chair assignment with the juniors was very exciting

Kohie Sugira’s Childrens book design project was inspirational and an eye opener

11. Had the T becomes 2D task done earlier in this course any effect?

Oh yes definitely. We were more open and relaxed doing our assignments now.

I still remember Prof. Kirti walking into our studio, and out of curiosity looking with a smile at some of our non-academic jotting – a poem or two that I had penned and put on the softboard; sketches and color explorations put up by the others. Vasant meher’s hindi poems...

The Design vocabulary poster that was subsequently printed during the ‘Ulm and after’ conference was hilarious – we had so much of spunk in our everyday lingo.

I must say IDC organised some of its best conference in the late 80’s – early 90’s.-

Arthaya; Product Semantics, Ulm and After; Bamboo National Design Workshop....

Among others

I see this was a forerunner and laid the foundation in Design enquiry and Design research. It was led by the faculty, who by now had directed their unique niche areas and domains of enquiry.

IDC went on to gain International recognitions as among the leading Design schools in this part of the globe. Each of our teachers championed their efforts towards this.

I look up to each of my Design teachers and thank them for transforming my life and career.

12. Do supplement if U have any pics of your solution or others.



4.13 Overall feed back

We missed out in collecting any written, reflective feed backs when the task was done. Only a brief survey with the students a year later on the above task indicated that some of them had used metaphors like

- Positive and negative pyramids
- Little toy-cubes of different colours which she used to play
- Positive and negative black and white masses
- temple like configuration.
- Steps going up and down

5.0 Cube Lab in Operation

The Information above equips us to examine the Cube Lab through the framework of Arupa.

The challenge is to analyse and discover the implicate order to shape a methodology.

The task generated eleven successful solutions to a deceptively simple problem: divide a cube into two identical halves and create a visual surprise when the cube is opened. Students eventually arrived at solutions through sketching, model making and experimentation.

However, the creative process remained tacit. The embedded tacit knowledge in students reaching the '11cube solutions', in IDC-ecosystem, at that time, is a potential source for further study of the patterns of thinking, types of imagination they exercised, unknown aesthetic order which prevailed and its effect on their 'inner order'. Making such patterns explicit can bring out a methodology for future pedagogy of Form and design. Insights gained in modes of learning of 'architects and engineers, together' can lead to Identifying research to usher in 'New age learning with multi-disciplinary back grounds.'

5.1 Metaphoric Imagination to Geometric imagination with aesthetic order

The students had previously experienced metaphoric imagination through the task "T becomes Old", in which metaphors played a generative role in 2D-Visual space. But a general exposure to Synectic mode Imaginations through questions like

What is like 'fuse' in Nature?

or

If trees in a forest were a library, what would be books?

were humorously provocative to trigger metaphoric thinking.

When students started the Cube task, engineers tried to take clues from these inputs. But being new to demands of '3D Geometric imagination' required in the task, they were frustrated as seen in the feedbacks.

Metaphoric Imagination is a process of 'seeing as', involving "seeing one manifested form(rupa) as another". Arupa the Implicate is the connecting bridge. Such perception in 'Active Silence' is the initiating factor. Let us take 'Cube half being seen as flower' as an example. 'Flower look' in the cube-half is a result of experiencing 'Arupa the implicate' with perception and aesthetic order. Its manifestation requires 'Geometric Imagination'. The ability to create within the constraints of 'reciprocity and assembly without void' is what a student is acquiring when a convincing solution is reached. Geometric Imagination operates in the field of material reality in which the propositions can be physically verified for further iterations. Expertise in 3D design is acquiring such expertise/skill in 'Geometric imagination' to optimise iteration process.

Success of Metaphoric Imagination in cube task is in the 'degree of surprise' achieved in each half attaining its own identity due to 'semantic or syntactic' based 'aesthetic order' with qualities like Rhythm, flow, symmetry and balance.

With this framework we can examine Neusearch process of reaching a convincing solution like Cube steps(pics 4.1.1,2.3,4). As the data indicates that the student started with a metaphoric imagination by looking at the beauty of steps in a temple. With his abilities and iterative processes, like sketches, 3d mock ups to bring out identical half cubes with rhythm, flow, symmetry and balance. We, as on lookers, perceive small cubes configured with aesthetic order. The solution captures attention and surprise.

Another level of surprise is with a mathematical deduction of the impossibility of small units being cubes, as the total of small cube units in a grid of 5x5x5 turns out to be 125. An even number of small units are required to make two identical halves. The apparent paradox is resolved when one discovers that the units are not cubes but cuboids. The

naming of the solution or claim of small units being cubes was *neither done by the student who created them, but caused by* the visual perception of the units.

The Neusearch process can result in a structured table for all 11 solutions

No.	Solution	Metaphoric Source	Geometric Traits	Aesthetic Order
1	Cube Steps	Temple steps	Repeated stepped layers, reciprocity, symmetry	Rhythm, balance, flow, surprise
2	Human Cube	Human figure	Bilateral symmetry, projecting and recessed volumes, reciprocal limbs	Identity, balance, surprise
3	Layers in Harmony	Musical layers / stratified composition	Parallel layered divisions, controlled variation, reciprocity	Rhythm, flow, balance
4	Sphere Cut	Sphere within cube	Curved positive–negative relationship within cubic constraint	Unity, contrast, surprise
5	Half Rounds (+/-)	Waves	Repeated convex–concave reciprocities	Rhythm, flow, balance
6	Flower with Folds	Flower	Radial organisation, reciprocal petals	Unity, coherence, surprise
7	Six Pillars	Pillars / Sthambhas	Repeated vertical elements, clustered symmetry	Rhythm, balance, symmetry
8	Up–Down Zigzag Folds	Zigzag movement / origami form	Alternating directional planes, reciprocal folds	Rhythm, flow, surprise
9	Triangular Pillars Two	Crystal cluster / triangular pillars	Repeated triangular prisms, axial grouping	Identity, Balance, flow, surprise
10	Steps in a Well	Stepwell	Descending cavity, layered negative space	Balance, flow, surprise
11	Triangular Layers	Claws / crystalline strata	Layered triangular profiles, progressive transformation	Unity, balance

Above table indicates a similar pattern in all with an aesthetic order in operation, leading to a conclusion that

Design Learning involves finding new metaphors, mapping them in the required domain, using Geometric Imagination to translate physical realities with aesthetic order with qualities like rhythm, flow, symmetry and balance.

5.2 Engineers, Architects and Cognitive Perturbation

The feedbacks suggest that students from different backgrounds responded differently to the Cube Task. Architects generally appeared more comfortable with ambiguity, visualization and exploratory sketching. For many engineers, however, the task

demanded movement beyond familiar modes of analytical thinking into a domain where no single correct answer existed.

This transition often produced frustration, uncertainty and delayed closure. Yet it was precisely this *cognitive perturbation* that seems to have contributed to the lasting impact of the exercise. Several engineers recalled the experience decades later and described it as an important stage in learning to *tolerate ambiguity, engage with imagination and develop confidence in open-ended enquiry*.

This has two implications in Neusearch Mode

- An observation that some of the most memorable solutions emerged from engineers who initially appeared uncomfortable with the task. This suggests that creative jump may occur when individuals are required to operate beyond their habitual cognitive boundaries. From the perspective of Arupa, the significance of Cube Lab may therefore be the solutions produced, have a potential to transform the '*inner order*' of the learner. The emergence of aesthetic order appears to be accompanied by a corresponding transformation in perception, confidence and ways of thinking. This remains an important area for further investigation.
- '*Collective Active Silence*' can get induced in learning when students from different disciplines participate under a conducive eco system. This finding has enormous bearing for future educational set ups in New Age Learning. Clubbing disciplines like Medicine, Law, Management, Forestry, Design, Architecture, Music,.. in multi-sense, AI, VR assisted learning can open-up exciting possibilities for Future.

6.0 Conclusion and Future Directions

The Cube Lab demonstrates that a simple geometric task can become a laboratory for studying imagination, aesthetic order, Active Silence and inner order in learning. The eleven solutions show that students did not merely divide a cube into two identical halves. They entered a process in which metaphoric imagination-initiated possibilities, Geometric Imagination translated them into physically verifiable form, and aesthetic order emerged through rhythm, flow, symmetry, balance, identity and surprise.

The study also brings out the importance of the learning ecosystem. The IDC environment, the instructor's open-ended dialogues, earlier exposure to metaphoric tasks such as "T becomes Old", theatre experiences, peer interactions, and the presence of engineers and architects together helped create conditions for Collective Active Silence. For many engineers, the task produced cognitive perturbation because it moved them beyond familiar analytical modes into an open-ended domain where no single correct answer existed. This perturbation appears to have contributed to confidence, tolerance of ambiguity and transformation in ways of thinking.

From the perspective of Arupa, the Cube Lab can be viewed as an attempt to articulate the Implicate Order embedded in a documented educational experiment. Neusearch makes it possible to decode patterns that remained tacit during the original process.

The analysis of the Cube Steps solution, including the visual perception of cubes later decoded as cuboids, shows how aesthetic surprise is achieved by innovative geometric order.

The present study is only a first step. Further Cube Lab investigations can explore how parting lines on a closed cube may suggest hidden configurations, how forms may be reconstructed through touch alone, and how visually impaired learners may approach the same problem. Blind perception, tactile reconstruction, multisensory exploration and AI- or VR-assisted environments may open new directions for design research.

The Cube Lab therefore points in two directions. At one level, it contributes to the pedagogy of form, design and creativity by making tacit processes more explicit. At another level, it suggests a platform for New Age Learning, where learners from different disciplines such as design, architecture, engineering, medicine, law, management, forestry and music may engage with imagination, physical verification, aesthetic order and inner transformation through shared exploratory tasks.

References

- [1] Rao, A. G. (2016). *Design projects: 16 mm projector speaker voltage regulator*. <https://www.agrao.in/images/Projects/16mmProjectorSpeakerVoltageRegulator.pdf>
- [2] Rao, A. G. (1989). *Programme as a metaphor for structured creativity in design*. <https://www.agrao.in/articles-papers-and-talks/19-programme-as-as-metaphor-for-structured-creativity-in-design>
- [3] Rao, A. G. (2025). *Layers in creative thinking I: Arupa – The implicate order of myth*. <https://www.agrao.in/articles-papers-and-talks/162-layers-in-creative-thinking-1-arupa-the-implicate-order-of-myth>
- [4] Arnheim, R. (1974). *Art and visual perception: A psychology of the creative eye* (Rev. ed.). University of California Press.
- [5] Gordon, W. J. J. (1961). *Synectics: The development of creative capacity*. Harper & Row.
- [6] Koestler, A. (1964). *The act of creation*. Hutchinson.
- [7] Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. University of Chicago Press.
- [8] Polanyi, M. (1966). *The tacit dimension*. Routledge & Kegan Paul.
- [9] Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.