

LEARNING TO MAKE SENSE: SKETCHNOTING IN UNDERGRADUATE DESIGN EDUCATION

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ABSTRACT

This paper outlines a pedagogical approach based on “sketchnoting” to help design students gather, synthesise, and make sense of information. The method combines theory on how people learn with theory on how designers typically think to develop a form of studying, research, and sensemaking that is useful for both the course and lifelong learning. Based on dual coding theory, the method suggests creating two representations (visual and verbal) of complex information to facilitate sensemaking. A visual note-taking system, adapted to designers’ thinking, provides a helpful bridge between disciplines with different epistemological foundations but is not without challenges. Objective evaluation of a highly personal sensemaking method is problematic, and students with a background in visual arts may be better prepared to use it. The paper will discuss these issues and relate them to the future challenges that design education must face.

Keywords: Sketchnoting, design education, dual coding, visual thinking, semi-structured interviews

1 INTRODUCTION

Designing is an unstable process that requires designers to make sense and integrate information from various sources. Faced with the wicked challenges of design, a designer must combine fragmented knowledge to create new things; in this sense, design represents an old new way of learning [1]. Sketching and modelling have long been used to collect information and think through design challenges [2]. Throughout their careers, experienced designers develop strategies for negotiating practically and cognitively with the materials they work with [3], including the means to collect and make sense of information through visual means.

However, designers in training lack the benefits of that practice, particularly first-year undergraduate students. Nevertheless, these students are still expected to make sense of complex problems and develop potential solutions. Throughout an undergraduate programme, information streams are many, unstructured, and diverse. Concepts and methods arrive from different knowledge traditions and disciplines. For instance, while working on a digital design project, a student may require inputs from Ergonomics, Cognitive Psychology, and Interaction Design; and even though the student may be able to grasp the key concepts offered by each subject, it is by integrating them while developing a solution that information becomes meaningful.

Research has shown [4] that combining verbal and non-verbal information can enhance learning and memory. Students who are presented with ideas using a combination of text and diagrams tend to grasp the material more effectively than when taught using either one of these formats alone. Furthermore, as Edward Tufte [5] argued, the most effective way to understand complex information is in relative and visual terms (through contrast, positioning, and proportions), which help to uncover meanings that would otherwise remain scattered in numerical tables.

This paper describes our experience with a pedagogical intervention combining theory on how people learn and how designers typically think [6]. The intervention was developed to help students acquire a method for synthesising and making sense of information, both for studying and as part of their future professional toolkit. The intervention is grounded on sketchnoting [7], which requires students to develop a personal system of visual notetaking as part of their evaluation.

The paper discusses data obtained throughout one semester from an undergraduate design programme structured around Project-Based Learning (PBL). In a PBL system, all courses support and participate in the core project curricular unit. In this context, integration of knowledge is vital as it is how the students are evaluated in each course. Students must demonstrate that they integrated the different sources of knowledge into a coherent design project. We combined semi-structured interviews and an online questionnaire to investigate the usefulness of sketchnoting as a method for helping students synthesise and make sense of information.

This is the problem and the underlying theory that supports our pedagogical intervention. The question is, did it work? In theory, a visual note-taking system adapted to designers' typical thinking patterns should help to connect disciplines with different epistemological foundations. Although the approach has its benefits, there are also challenges. It can be difficult to objectively evaluate a sensemaking method that is highly personal, and students who lack a background in visual arts may face difficulties when using it. Also, to what extent was the tool effective? Will students embrace it and integrate it as part of their toolkit after they leave school?

2 SKETCHNOTES AS DUAL CODING

Mike Rohde [7, p.2] defines sketchnotes as “rich visual notes” where handwriting, sketching, lettering, and diagrammatic elements such as arrows, boxes, lines, and geometric forms are combined. The technique is varied, and Rohde's method is not the only one available; nonetheless, all variations are typically based on a modular set of primitive forms (squares, circles, triangles, and lines), which practitioners can combine to create a more complex visual toolkit.

Sketchnotes are about summarising information—conveyed through lectures, talks or any other means—in one or two pages; they require highly developed listening skills to analyse, synthesise and discriminate non-essential data. Sketchnotes take advantage of dual coding [8]; hence they allow the practitioner to create a “visual map” where images and words are cross-referenced to better portray complex ideas through visual metaphors [7], [9]. As a result, visual notes reportedly improve comprehension, retention, and recall of information [10]. Sketchnoting is a note-taking method that emphasizes visual concepts and is more efficient than linear written notes, as images can condense information effectively. However, it is important to clarify that sketchnotes are personal documents and not infographics meant for a broader audience. While they may be shared with others, it is important to differentiate them from graphic recording, which focuses on visual communication for third parties and shares many similarities with sketchnoting.

Adding visuals to a verbal description clarifies an idea. However, true dual coding involves more than adding pictures to words. The visuals must have meaning and not serve as decorations. Allan Paivio's [8] research suggests that learning and memory improve when verbal and visual representations are used in tandem. For instance, when a new word is introduced, the learner often creates a mental image of the concept or object represented by the word. This mental image is then associated with the word itself, forming a dual representation that can be accessed when recalling the information. This connection between verbal and visual representations enhances the encoding and retrieval of information, making it an important component of effective learning strategies.

3 METHODS

During the initial part of the semester, three sets of first-year students enrolled in our English-language, internationally oriented undergraduate design course were taught about sketchnoting as part of the “Design Methodology” class. Although the introduction was brief, students were given additional materials to study. To improve their sketchnoting abilities, students were required to create one sketchnote per lesson. By the end of the semester, they were expected to submit a larger sketchnote that showcased how they utilized their knowledge in their project.

Crucially, the course is entirely based on PBL, which means every semester is organised around a single project to which every curricular unit contributes. As noted elsewhere [11], this course is grounded on a conception of design as an interdisciplinary endeavour and, therefore, with no fixed subject matter. Such a holistic view of design is embedded in the course's name: “Global Design.” Throughout this programme, we encourage students to re-frame design problems interdisciplinarily rather than expecting them to respond mechanically to a brief. Although some influential views on design education downplay the importance of drawing skills [12], we believe that the capacity to externalise ideas through sketching plays a vital role in thinking through a design problem.

Nonetheless, it is true that the type of drawing skills which students acquire before entering our course is not ideal since students focus on observation and realistic rendition of reality (i.e., academic drawing) instead of focusing on concept representation (i.e., sketching).

To gain a baseline understanding of our students (and their drawing skills) before the pedagogical intervention, we asked them to respond to a short survey and obtained N=70 responses (out of a universe of 75 students). From this survey, we learned that most respondents (60%) were Portuguese nationals, although some students came from Nigeria, Germany, South Africa, Israel, Mozambique, and Brazil. An overwhelming majority of the sample were female (77%), and the majority were 18 years of age. Regarding their academic background¹, 70% of students came from the Arts domain, and 13% came from the Sciences. This implies most of them had a few years' worth of artistic education and, therefore, of drawing. However, only ~25% admitted to drawing "very often" or "always" (see Table 1 below).

Table 1. Breakdown of the self-reported drawing habits of students before the pedagogical intervention after answering the question "How frequently do I draw."

Never	Rarely	Sometimes	Very Often	Always
n/a	22,9%	51,4%	22,9%	2,9%

After the intervention, we interviewed two design students, and analysed the interviews using thematic analysis. The online questionnaire was distributed to all first-year design students (resulting in N=44 responses) and included Likert-scale-type questions. The data collected from the two methods were complementary, aiming to generate insights into the students' experience with sketchnoting. The data analysis involved descriptive statistics and thematic analysis, allowing for a comprehensive understanding of the data.

3.1 Data Collection and analysis

3.1.1 Data Collection

We conducted semi-structured interviews with the participants (N=2) to better understand their perspectives on using sketchnotes to make sense of lectures. The interviews were conducted in person, lasted approximately 30 minutes each, and were audio-recorded with the participant's permission. In addition, the interviews were transcribed verbatim for analysis. Furthermore, we sent an online questionnaire to all first-year design students (N=44) to gather their opinions on the usefulness of sketchnotes in making sense of lectures.

3.1.2 Data Analysis

Thematic analysis was used to analyse the semi-structured interviews with the two design students. The analysis involved familiarising with the data, generating initial codes, searching for themes, reviewing and refining themes, and defining and naming themes. The analysis was conducted by two researchers independently, and any discrepancies in the analysis were discussed and resolved. The online questionnaire data was analysed using descriptive statistics, including frequencies and percentages, to summarise the participants' responses.

4 RESULTS AND DISCUSSION

4.1 Interviews

For the interviews, we asked students open-ended questions about their design process and how they managed information during the first semester. It is clear (and encouraging) to notice that first-year students reflect on their design process. Paraphrasing Schön [3], we can say they reflect on action. For instance, students revealed a concern about the role of research in the design process and the difficulties of overcoming creative blocks. Also, one student mentioned how the course changed her way of looking at the world increasing her curiosity: *"it's so interesting to see things that people don't even realise."*

¹ In Portugal, when they turn 15, students in public high schools are divided into four knowledge areas: Sciences and Technologies, Socio-Economic Sciences, Humanities and Languages, and Visual Arts.

The semester project emerged as the anchor that allowed them to make sense of the input from the semester's curricular units. The project acts as a filter; if the information cannot be applied to the project or used to support idea generation, it is discarded. For instance, a student mentioned that he *"was trying to see how I could take anything from her [another teacher's] class and add it to my project."* This could be a concerning insight; during a university course, students should grow in curiosity and knowledge about the world. Knowledge should not be a means to an end but something with inherent value (even if not immediately applicable), and learning is worthwhile. On the other hand, we can argue that a design project works almost like a synthesising apparatus, a pedagogical experience that encourages students to work through and make sense of information. The role of the teacher could be a key aspect here, as one student mentioned, *"sometimes thanks to the teacher, I find something even better. Something which I would not have if I did not have her guidance."*

Sketchnoting was highlighted as a helpful memory aid; one of the interviewees mentioned that *"sketchnoting is better for me because when I see it I can remember what the drawing was about."* While another student stated: *"I did start using sketchnotes and it did actually help me go through where I started actually writing notes alongside the drawings. And I realised as I would go through my sketch notes, and notice 'oh, this was a little drawing I did in this class because of this'. And so, I started doing memory associations with it. So, it helped with recall."*

However, there were no explicit references to the role of sketchnoting in combining disparate information into a coherent whole. Both students were surprised at what the teachers expected from their sketches. In secondary school, drawing meant technique, skill, and artful renditions of visible reality. Some students appear to be formatted by this perspective and are worried about creating impressive renderings instead of considering sketching as a thinking tool.

4.2 Questionnaire

A significant majority (77,3%) of students reported having prior experience with drawing. However, this does not imply that sketchnoting is easier for individuals with prior artistic skills; in fact, both interviewees stated that their prior experience with drawing focused on artistic perfection rather than using drawing as a tool to think. Which somewhat limited their willingness to take on sketchnoting.

Most students considered sketchnoting useful to make sense of or understand the course lectures (54,5%) and helpful to summarise the information from multiple lectures (59,1%). Here the interviews help us interpret this data: students' approach sketchnoting primarily as a memory aid, that is, to remember the course material. However, *remembering* is only the base level of learning outcomes; the subsequent levels include understanding, applying, analysing, evaluating, and creating [13].

This suggests that students disregard the role of notetaking as a thinking tool. Notes are the building blocks of deeper thoughts [14]; they support the burden of reasoning and reflection the same way Lego blocks support a Lego model. A designer sketches a great deal before moving on to CAD; likewise, writers work on their notebooks before tackling a first draft. Of course, a personal note-taking system helps capture information; but notes are not an end in themselves. Instead, their added value supports more profound, integrated, and creative ideas.

When we connect different pieces of information through personal notes, we create a web of knowledge that allows us to see relationships and patterns. This can lead to aha moments [15] and creative breakthroughs as we make unexpected connections between seemingly disparate concepts. Experts work like this, focusing on the process, not the end goals; first-year students, on the other hand, appear to be entirely focused on the outcome. They are defensive and perfectionists and resist showing their work in progress to their teachers.

The data supports this observation. Notice that, while most students recognise the usefulness of sketchnoting, only 31,8% report an intention to keep using it. Furthermore, most students (75%) only used sketchnotes in mandatory exercises, which indicates that design students do not recognise the value of using this tool regularly. Perhaps because students perceive sketchnoting as time-consuming and challenging, and they may need to acknowledge the long-term benefits of using sketchnotes beyond their coursework.

5 CONCLUSIONS

Students recognised the usefulness of sketchnoting for summarising course material and aiding memory. Still, they tended to approach notetaking to retain information rather than as a tool for deeper thinking and creative insight. That is concerning because notetaking can help students develop insights and

connections between concepts. Additionally, the fact that most students only used sketchnotes for mandatory exercises suggests they do not recognise the value of sketchnoting as a regular practice. Educators should aim to help students understand the benefits of sketchnoting beyond their coursework and encourage them to use this technique for integrated, interconnected, and creative thinking. Another takeaway concerns the broader methodological implications regarding how students understand the design process and the role of tools within it. On the one hand, students understand that tools such as sketchnoting are effective in helping them acquire knowledge; on the other hand, they report they will not appropriate the practice or use it in the future. Whether this perception will change is open for discussion, and future assessment will need to be carried out to understand the roots of the contradiction. For the time being, we may speculate that one of the reasons explaining the student's reluctance to embrace visual notes fully is the way they understand drawing as an end goal rather than a tool. That is to say, they are not focused on the process but on a satisfactory outcome that must be aesthetically pleasing. This view has perhaps been entrenched in their minds and heavily reinforced by their artistic training in secondary school, where drawing is not treated as an instrument but as a discipline in its own right. Hence, when exposed to sketching as a quick, messy process, they may enter into a state of cognitive dissonance, further preventing them from embracing it. These findings raise questions about how educators can encourage students to incorporate sketchnoting into their learning strategies and how to emphasise the benefits of using it in their design process. The findings also suggest that educators must address student misconceptions about the effectiveness and value of drawing for design and its relationship with the iterative development that is inextricable from design practice.

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