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SKETCHING ABSTRACTION OF HUMAN FIGURES FOR DESIGN EDUCATION

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ABSTRACT
Industrial Design programmes over the past two decades have modified their curriculum content to address shifting technology, society economies, and expanding opportunities that design can address. Industrial Design has seen great value in the approach of Design Thinking which is reflected in education through course project methodologies where solutions may take a variety of forms beyond that of traditional products by working with a human centred approach. A key aspect to these methodologies is storytelling through the sketch depiction of human figures. Although Industrial Designers have developed techniques and methods to sketch products and often even environments, sketching the human figure bears further investigation. Sketch depictions of humans range from simple doodle figures as a means of brainstorming, to detailed renderings of end users for concept presenting. With figure sketch depiction offering many opportunities in today's Design Thinking climate of storytelling, this paper asks the question "At what level of realism in human figure sketching is optimal for design storytelling?" In the paper we examine the range of sketching humans from extremely simplified to highly realistic and detailed, and what range of abstract to realistic provides designers in today's climate the promotion of idea development and presenting.

Keywords: Abstraction levels, sketching, figure drawing, visualisation, storytelling

1 INTRODUCTION
Today's robust use of storytelling using the human figure for narrative differs from product development of Industrial Design's past. Traditionally, we see the human figure sketched to show scale, ergonomics, and some use narrative when developing products. More often the product alone is sketched without the depiction of human form. The lack of human presence in the depiction of designs was common in the past by architects and designers. The oddness of sketch depictions showing a building devoid of people in the past is mentioned by Colomina and Wigly noting the strangeness of these design drawings to being almost completely devoid of human figures. [1]. In the present day, we see the depiction of human figures as being of central importance in Industrial Design. The value of today's Design Thinking as being 'human centred' and sketching humans in 'storytelling' are central to concepting. Human centred approach started many years ago with the likes of Victor Papanek, then made popular within the field by Donald Norman and more recently by Tim Brown 'Design Thinking' based around a problem statement not just reworking of an existing manufactured product [2].
Design Thinking (DT) puts people first, ahead of the product, it suggests "establishing a personal connection with the people—or users—for whom a solution is being developed" [3]
The importance of storytelling has been established and seen as a needed theme across all design courses. [4]

1.1 Design thinking and visual thinking
"The meaning or essence of the subject is more effectively conveyed by an image than a written or spoken description. Visual aids are powerful tools for conveying information and ideas and for enhancing storytelling".[5] Both Shaw and Paepecke-Hjeltnes underscore the visual representation for remembering and therefore understand the sketched the figure is an important aspect of creating an impression.[6] Simple thumbnail figures can appear in early brainstorming as part of the Design Thinking approach. The need for this in the university is stated by Corremans and Mulder-Nijkamp,

who posit that "students' sketch competences should extend beyond merely object related sketches and drawings". [7]
However, most design education institutions have based their educational content regarding visualisation, in particular design sketching, on more traditional approaches that regard the product only. Authoritative books on design sketching such as "sketching" (Eissen & Steur)[8] and "How to draw" (Robertson), showcase this product focus very clearly. Thus, the question arises how to teach the sketching of the human figure for present-day design students.

1.2 Sketch realism

Simple, abstract versions of the figure have been deployed in methods of Visual Thinking in the works of e.g., Willemien Brand to be effective in elevating an understanding and getting ideas flowing.[5] The past decades have seen many individuals and companies producing works of this nature, while others have adopted a somewhat more intricate depiction of the figure. For example, the work of JAM visual thinking or INK strategy show a different level of abstraction.
One aspect of sketching the human figure, which could significantly influence educational strategies on the topic, is the level of realism that is aspired to. The representation of the human figure can vary from abstract to highly realistic. Perhaps somewhat counterintuitively, it is not certain that a less realistic depiction equals a less effective design sketch. UX designer Komarov, for instance, considers how much realism doesn't actually add to the content, but the importance lies in "communicating your ideas as quickly and as clearly as possible, not drawing pretty pictures" [9]We understand that realism may not be better. In fact, it might be worse. Too much realism might actually have a negative effect on the narrative quality of the sketch, especially regarding the figure. The comic book artist Scott McCloud offers the following diagram of a person's face from abstract to detailed realism (figure1). McCloud argues that "By stripping down an image to its essential "meaning" an artist can amplify that meaning in a way that realistic art can't." [10]

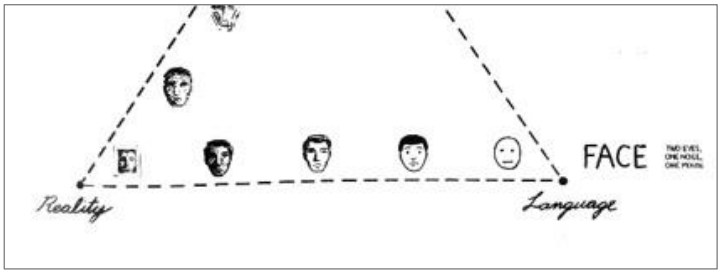
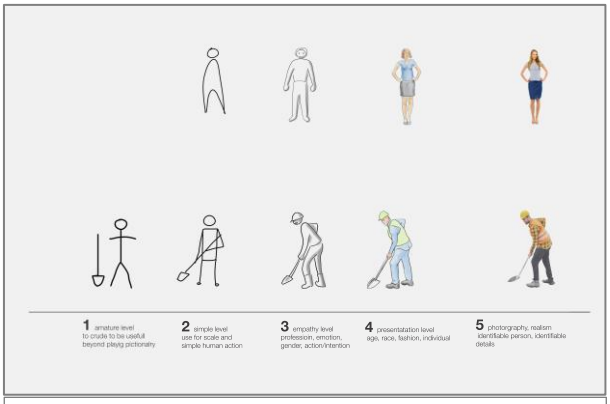
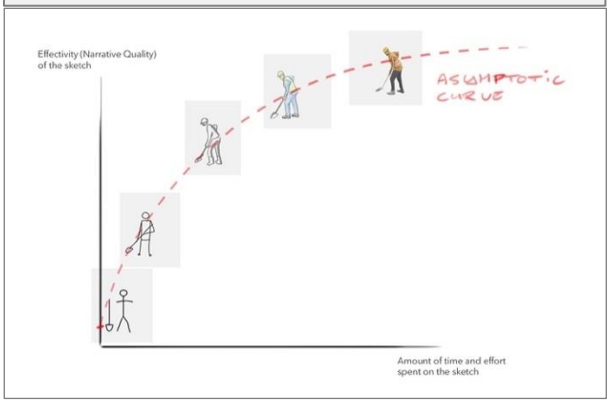


Figure 1. Levels of facial abstraction (cropped from McCloud's original)

Based on the abovementioned, we propose a chart which maps the realism level of the figure from simple/abstract to highly detailed/realistic.
Applying this idea to sketching for design purposes, one could consider the 'characterisation' of the user as a "best practice" [4]. If best practice in sketching is regarded as sketching both effectively as well as efficiently, we could plot the effectiveness of the sketch versus the amount of time and effort needed to create it. With correct methodology, one could induce a large part of the effect with minimal expenditure of time and effort (figure 2). In sketching and drawing, the best practice would thus result in a curve of asymptotic character shown in figure 3, where the realism levels have been mapped onto this hypothetical curve.
Thus, this paper puts forth the question "What level of realism in human figure sketching is optimal for design storytelling?" Considering the curve from figure 3, where figures are depicted from highly abstract to high realism, suggesting that too much realism scale would not be considered 'best practice'. With too little effort a simple abstract stick figure sketch does not purport enough narrative, while too much effort would yield only very little additional narrative quality for a large investment of time and effort. Therefore, the authors hypothesize that some middle level of realism should be optimal. This level allows the optimal balance of sketching quickly without adhering to a high level of realism.





Figures 2 & 3. A range of realism, and plotting narrative vs. time

2 METHOD

To test the hypothesis, thirty Industrial Design Engineering students at TUDelft participated in a workshop study. The participants, with a varying range of seniority and sketching skill level were given two tasks. The first task was to produce sketches with the aim to convey a particular narrative. The second task was to assess their peers' sketches on the narrative quality. Each participant was assigned a number, which was noted down by the assessor during the assessment task. This way it was clear which assessment pertained to which sketch sheet.

2.1 Task I: Persona sketching

Arriving students were asked to take a seat at an individual desk with sketch paper with a sticky note on the desk corner having a number on it. The authors introduced the nature of the research with examples of sketched of human figures as depicted in design, including the chart of figure abstraction level by the authors. No mention of our hypothesis was suggested. The participants were then asked to establish a persona describing three narrative characteristics: 1) profession, 2) activity/context and 3) state of mind/emotion. Without the use of text, the participants were then assigned the task of visually depicting this persona through sketching, the participants could sketch in their own comfort level, yielding a range of different levels of complexity, realism and detail in the results. Participants filled at least one sheet with multiple sketches, iterating on the depictions of the same persona they had decided upon. They were asked to note down, covertly in order to remain hidden from peers looking at the sketch sheet, the three characteristics of their established persona.

2.2 Task II: Peer assessment

With the first task completed, the participants were now tasked with assessing their peers' sketches of personas. On a scale from 1 to 5, they were asked to rate how evident they found the three persona characteristics to be present on the sketch sheets. Figure 4 shows the assessment form handed to the student to complete this task, fille in by one of the participants. This assessment sheet was filled in for three peers by every participant, so that every sketch sheet would be rated three times by three different peers. Each reviewer asked to rate the effectiveness of profession, activity/context, and state of mind/emotions.

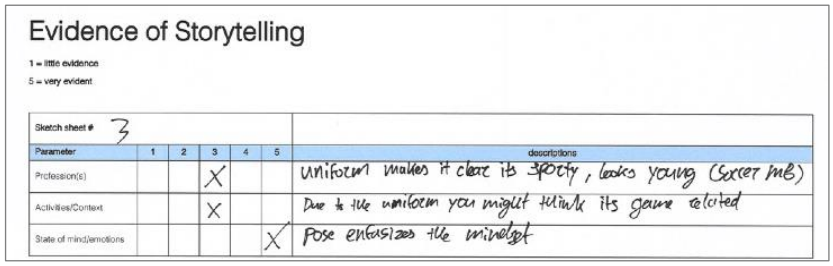


Figure 4. Example of a sketch assessment form from the study. Top left, the sketch sheet number of the participant being assessed is noted down

3 RESULTS

Each student's sketch (with assigned number1-30) with the three peer reviewers scores were compiled. See figure 5. Due to practical limitations, only the overall average scores were considered in the results, which are shown in the dark green column. Based on this overall average score, the top three rated sketch sheets were compared to the bottom three. The chart in figure 5 shows the sketch sheet numbers, their assessment ratings and averages for characteristics as well as overall averages. Three of the thirty sketch assessments were not used in the analysis due to missing or incomplete reviews.

sketch sheet #	characteristic	assessment 1	assessment 2	assesment 3	CHARACTERISTIC AVERAGE	OVERALL AVERAGE
1	P	4,5	5	5	4,83	4,06
	A	5	4	5	4,67	
	S	5	1	2	2,67	
2	P	4	5	4	4,33	4,33
	A	4	5	5	4,67	
	S	3	5	4	4,00	
3	P	3	3	5	3,67	3,67
	A	3	2	5	3,33	
	S	5	2	5	4,00	
4	P	5	4	4	4,33	4,00
	A	5	2	4	3,67	
	S	5	5	2	4,00	
5	P	1	2	4,5	2,50	3,28
	A	3	4	5	4,00	
	S	2	4	4	3,33	
6	P	5	5	5	5,00	4,22
	A	5	5	5	5,00	
	S	3	2	3	2,67	
7	P	5	5	5	5,00	4,33
	A	5	5	5	5,00	
	S	3	3	3	3,00	
8	P	3,5	4	5	4,17	4,50
	A	4	5	5	4,67	
	S	4	5	5	4,67	
9	P	5	5	5	5,00	4,50
	A	5	3,5	5	4,50	
	S	3	5	4	4,00	
10	P	2	2	3	2,33	2,83
	A	4	3	4	3,67	
	S	3	2	2,5	2,50	
11	P	5	5	5	5,00	4,33
	A	5	5	5	5,00	
	S	3	3	3	3,00	
12	P	5	5	4	4,67	3,89
	A	4	5	3	4,00	
	S	3	4	2	3,00	
13	P	1	3	4	2,67	3,44
	A	1	4	4	3,00	
	S	4	5	5	4,67	
14	P	3	5	2	3,33	2,83
	A	2	4	1,5	2,50	
	S	4	3	1	2,67	
15	P	2	5	5	4,00	4,33
	A	5	5	4	4,67	
	S	4	5	4	4,33	
16	P	2	3	4	3,00	2,78
	A	4	1	4	3,00	
	S	2	1	4	2,33	
17	P	5	5	5	5,00	3,89
	A	3	4	5	4,00	
	S	2	3	3	2,67	
18	P	3	2	1	2,00	3,78
	A	5	4	5	4,67	
	S	5	4	5	4,67	
19	P	1	1	2	1,33	3,22
	A	5	5	5	5,00	
	S	3	4	3	3,33	
20	P	5	5	5	5,00	4,78
	A	5	5	5	5,00	
	S	5	4	4	4,33	
22	P	4	4	4	4,00	2,89
	A	2	3	2	2,33	
	S	3	1	3	2,33	
23	P	5	4,5	5	4,83	4,61
	A	5	5	5	5,00	
	S	4	3	5	4,00	
24	P	1	2	5	2,67	3,67
	A	5	5	5	5,00	
	S	4	3	3	3,33	
25	P	2	1	2	1,67	2,22
	A	3	1	4	2,67	
	S	2	2	3	2,33	
27	P	4	2	3	3,00	3,89
	A	5	4	5	4,67	
	S	4	4	4	4,00	
29	P	5	5	5	5,00	3,67
	A	3	1	3	2,33	
	S	4	3	4	3,67	
30	P	5	3	5	4,33	4,56
	A	5	5	5	5,00	
	S	5	5	3	4,33	

Figure 5. Assessment of the sketches for profession (P), activity (A) and state of mind (S) with three assessments for each sketch sheet. The light green shows the average assessment score for each characteristic and the dark green shows the overall average score

3.1 Analysis

Ranked from highest to lowest overall average rating, sketch sheet numbers 20, 23 and 30 rank as the three highest rated. Sketch sheet numbers 25, 16 and 14 rank as the three lowest. Figure 6 shows collage of the three highest and three lowest rated sketches, with the top row showing the highest and the bottom row the lowest. Comparing the top and bottom three assessed sketches, the authors looked for similarities between the top three which were not apparent in the bottom three, and vice versa.

Firstly, the top 3 sketches all show a mid-range level of realism and detail, comparable to level 3 to 4 of the chart in figure 2 discussed previously. In comparison, the bottom 3 sketches show the figure at an abstracted level, two students using hardly more than stick-figure depictions, very similar to level 1 to 2 of the figure 2 chart.

Second, the figures in the top three sketches all interact with a clear, identifiable tool or contextual prop. Props and contextual factors are visible in the bottom three sketches as well, yet their depiction is abstract or ambiguous, either of a more abstracted nature or not specific at all. For instance, the cube on a table in sketch #25.

Third, the top 3 sketches show more facial features, whereas 2 of the bottom 3 hardly show any.

Furthermore, the top three sketches seem to make an effort to depict the figure as a 3-dimensional entity rather than a 2-dimensional and almost abstracted entity. The sense of perspective, overlap and posture

or gesture is generally more apparent and more “life-like” compared to the figures in the bottom 3 sketches.

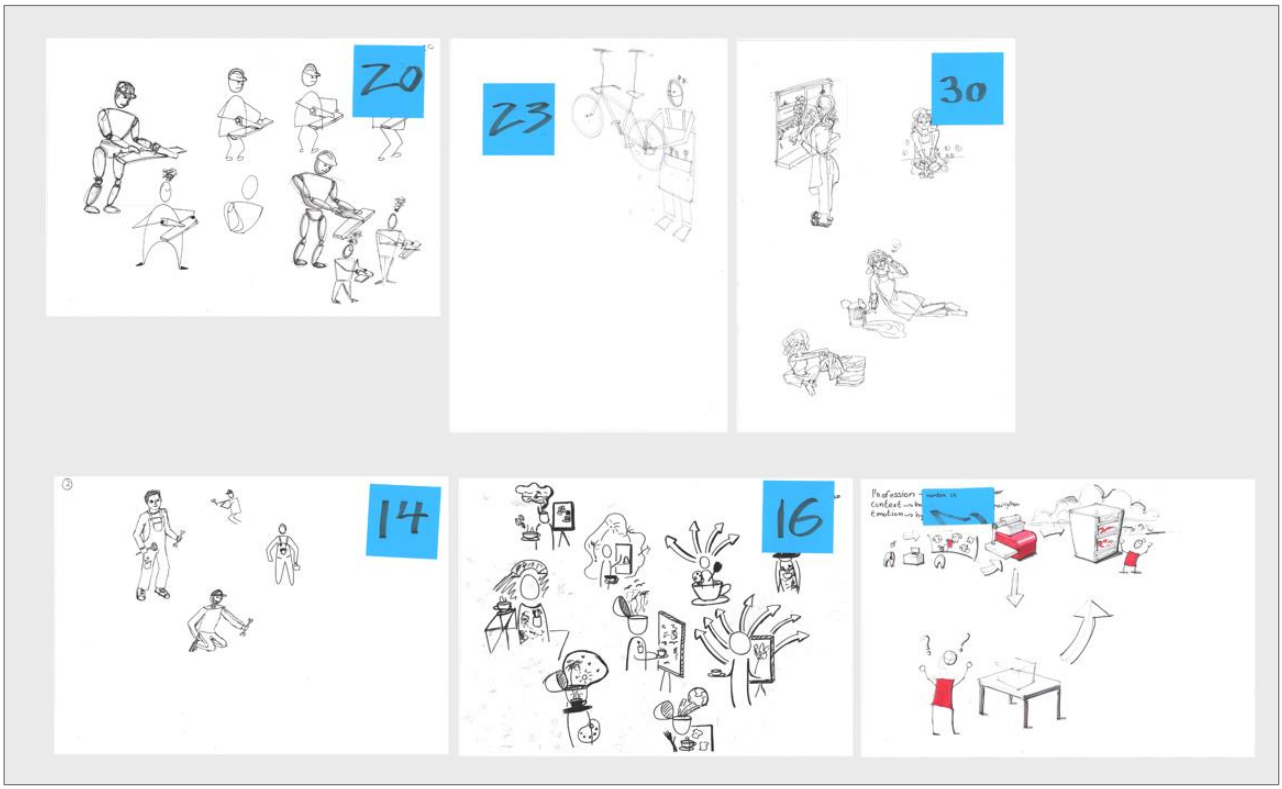


Figure 6. Collage of the 3 highest rated sketches (top) and the 3 lowest rated sketches (bottom)

4 CONCLUSIONS

In conclusion, our hypothesis appears to be supported by the results of this study. It is indeed likely that there exists a lower bound with regard to simplicity or abstraction of the figure, if the goal is to convey characteristics of a persona. Elements that seem relevant to incorporate to at least some extent are:

- Facial features, which most likely serve to boost the narrative quality regarding emotion.
- Tools, props and/or contextual elements, which act as visual cues regarding the profession, allowing for the opportunity to adopt in the figure a certain position or movement which aids in conveying the particular activity.
- Detail in the attire of the persona
- The depiction of a specific pose or movement in the figure
- The depiction of the figure as a 3-dimensional entity, regarding environment and perspectival cues.
- A stick-figure like depiction, especially one without any recognisable facial features, runs the risk of falling short with regard to narrative quality.

5 DISCUSSIONS

The study knows some limitations. Firstly, not all the data was analysed. Only the overall average score was investigated. It would be interesting to investigate characteristic scores specifically and see whether those sketches show distinct commonalities as well. Of the 27 sketches, only 6 were analysed as they represented the most successful and least successful narrative sketches. The limitation makes this only a qualitative investigation of the results.

With regard to the task, it appeared that some participants had misunderstood the task. some unforeseen variances in the results, particularly in the number of sketches. With regards to simplification, what should not be overlooked in education, is the notion that simplifying a sketch does not necessarily mean that the sketch is easier to do. As a design sketching practice, it could often be seen that simplification can actually be harder but is nonetheless important as simplification enhances the narrative. [11] So,

with that in mind, nothing conclusive can yet be said about the difficulty level of sketching the figure in design education.

REFERENCES

[1] Colima B. and Wigley M. (2016) Are we Human? Notes on an Archaeology of Design. Lars Muller, Zurich.

[2] Brown T. and Wyatt J. (2010). Design thinking for social innovation. *Development Outreach*, *12*(1), 29-43.

[3] Bason C. and Austin R. D. (2019). The right way to lead design thinking. *Harvard Business Review*, *97*(2), 82-91.

[4] Parkinson D. and Bohemia E. (2012). Designer storytelling. In *DS 74: Proceedings of the 14th International Conference on Engineering & Product Design Education (E&PDE12) Design Education for Future Wellbeing, Antwerp, Belgium, 06-07.9. 2012*.

[5] Brand W. (2017). *Visual thinking: Empowering people & organisations through visual collaboration*. Amsterdam, The Netherlands: BIS publishers.pg 49

[6] Paepcke-Hjeltness V., Mina M. and Cyamani A. (2017, October). Sketch noting: A new approach to developing visual communication ability, improving critical thinking and creative confidence for engineering and design students. In *2017 IEEE frontiers in education conference (FIE)* (pp. 1-5). IEEE.

[7] Corremans J. and Mulder-Nijkamp M. (2019). Towards an extended design sketch & visualisation taxonomy in industrial design education. In *Visual Proceedings of the 21st International Conference on Engineering and Product Design Education (E&PDE 2019), University of Strathclyde, Glasgow. 12th-13th September 2019/Bohemia, E.[edit.]; Kovacevic, A.[edit.]; Buck, L.[edit.]; et al.[edit.]* (pp. 1-11).

[8] Eissen K. and Steur R. (2007). *Sketching: Drawing techniques for product designers.* Amsterdam, The Netherlands: BIS publishers.

[9] Komarov N. Sketch more. Sketch less https://uxdesign.cc/sketch-more-sketch-less-f3258ab4731a. 2017

[10] McCloud S. (1993). *Understanding comics: The invisible art.* HarperCollins, New York.pg. 51

[11] Hoftijzer J. W., Sypesteyn M. and Kormelink S. (2020) A New Language for Sketching the Intangible; Building on a Mutual Fundament. DS 114 Visual Proceedings of 22nd International Conference on Engineering and Product Design Education. Editors: Buck L., Bohemia E. and Grierson H.