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### ► To cite this version:

Jonathan Mirault, Christophe Moineau, Chrystelle Cerisier, Emeline Roy, Eric Tortochot. Designing by sketching and writing: case study of French design preservice teachers preparing a competitive recruitment exam. *Recherche en éducation*. Colloque international en hommage à Jacques Ginestié, UR4671 ADEF; INSPE Aix-Marseille; FED4238 SFERE-Provence; Pôle pilote AMPIRIC, Oct 2023, Marseille, France. hal-04233865

**HAL Id: hal-04233865**

**<https://amu.hal.science/hal-04233865v1>**

Submitted on 9 Oct 2023

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# Designing by sketching and writing: case study of French design preservice teachers preparing a competitive recruitment exam

Jonathan MIRAULT, Christophe MOINEAU, Chrystelle CERISIER,  
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# Plan

- 1. Context**
- 2. Theoretical framework**
- 3. Research question and hypotheses**
- 4. Methodology**
- 5. Findings**
- 6. Discussion**

## 1a. Context: an applied disciplinary test for design preservice teachers

- French preservice teachers in applied arts **designing** instructional script during a five-hour competitive recruitment exam called “applied disciplinary test”
- A creative activity with drawings and texts to define an educational design problem that both teachers and designers use to manage
- An experimental design in Jacques Ginestié platform, with videorecording during the exam session ...



Figure 1: Screens' capture of an instructional design situation: seven preservice teachers preparing a competitive recruitment exam

## 2. Theoretical framework: drawing and writing while designing

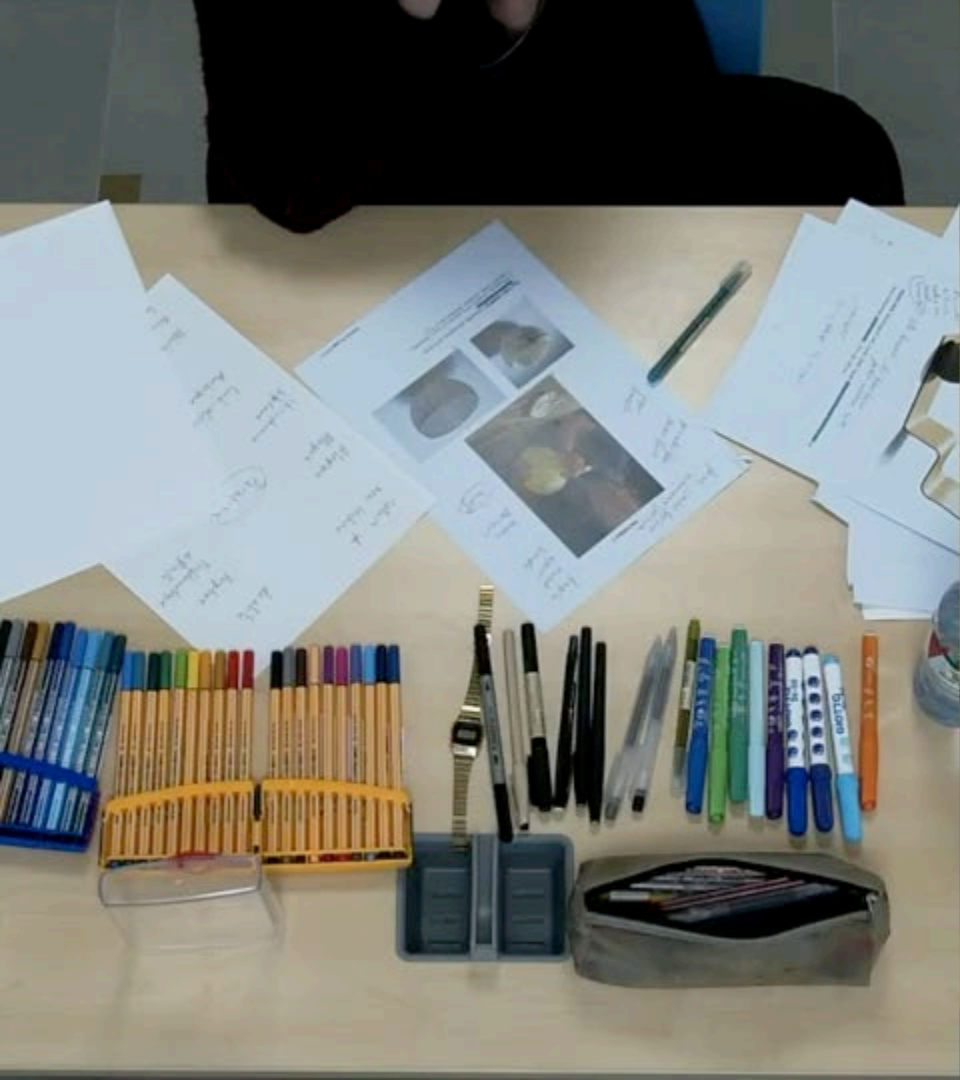
- According to Atman et al. (1999), Chen et al. (2022, p. 60) pointed out that “junior engineering students typically spent a large proportion of their time **defining the problem**, but the quality of their final designs was insufficient”
- Processes of instructional design using all of these artifacts and relying on skills design teachers and designers share (or not...): **analyzing, conceptualizing, synthesizing, sketching, creative thinking, reporting and communicating; planning / re-planning; teaching / learning; assessing / iterating**
- **Operative texts and operative images** and their regulatory function: scientific and pragmatic conceptualization in action: planning, dialoguing, uttering, explaining, they transforming, they redefining (Tortochot et al., 2022, p. 4)

### 3. Research question and hypotheses

- Does an observation of the movements of sheets, of tracing instruments and of hands inform us about certain aspects of the design activity?
- If so, about what do they inform us?
- How do preservice teachers manage tools and sheets during the solving problem phase?
- Moreover, is this research a predictive answer to what is forecoming (efficacy of the design, for example)?

## 4a. Methodology: exploratory research made with “concepts mapping” mixt method in two phases

- Recollection of data from five hours video recording
- Qualitative and quantitative analyses of data





## 4a. Methodology: exploratory research made with “concepts mapping” mixt method in two phases

- Choice of 2 participants amongst 7 (-2 because of the failure of a videorecording and of a participant who abandoned during the exercise)
- Use of the teacher’s assessment of the exam with required criteria on design skills for the first step: analysing with accurate concept definitions, confronting the prescription with several personal references and highlighting of personal themes
- Legibility of gestures, writing and drawings spread on sheets across the work surface

## 4a. Methodology: 1<sup>st</sup> phase / sheets' crowding measurement



Raw file



Transformed file

Figure 1. First frame of one recording before (left panel) and after (right panel) application of a perspective transformation algorithm.



Masked frame



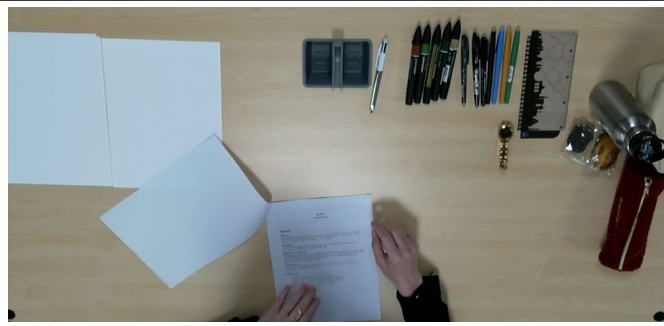
White pixels detection

Figure 2. Masking the sheets present in the beginning of the session (left panel) and detection of the residual white pixels (right panel)

## 4b. Methodology: 2<sup>d</sup> phase / coding of drawing and writing tasks

Time code	Action	Task	Hardware / supplies	Description / interpretation
Time marker during the action	Kind of activity (reading, writing, reading, etc.)	The gestures they do with or without some kind of tools, sheets, etc.	The tools, supports, sheets, they use purposely during the task	What the researcher sees and can name after he/she sees

**C4**  
 From the beginning of writing (0'00)...



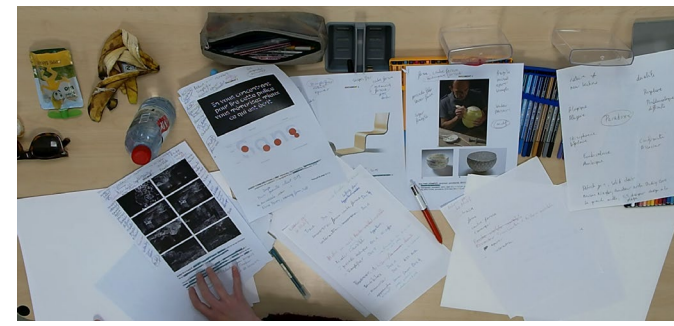
... to the end of analysing (0'54")



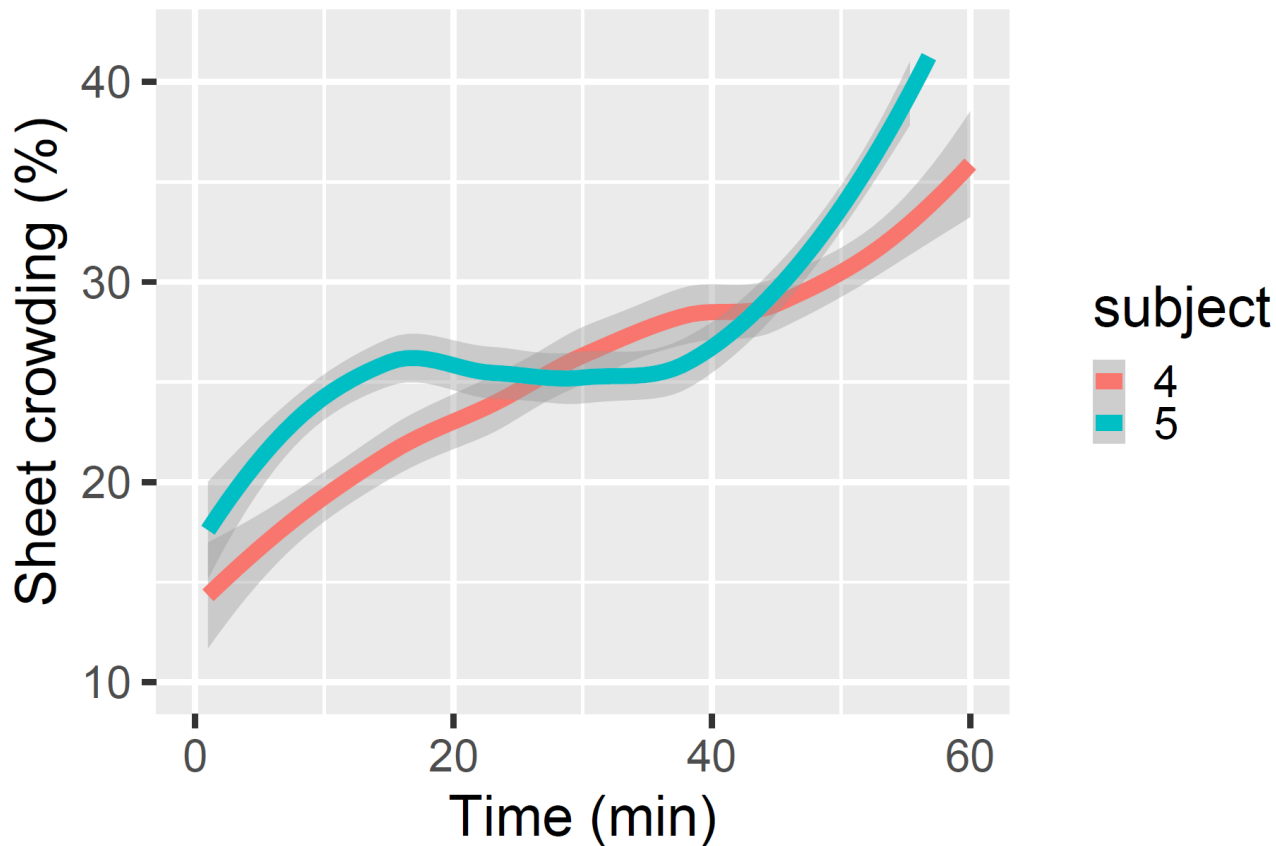
**C5**  
 From the beginning of writing (0'00)...



... to the end of analysing (1'34")



## 5a. Findings: sheets' crowding (graphs of C4 and C5 activity)



## 5a. Findings: sheets' crowding

- Regarding the crowding we measured, we observed various patterns across participants: however, we clearly saw that different phases were present, alternating from:
  - low crowding (when the sheets are packed)
  - to high crowding (when they were spread out over the table)
- We linked low crowding phase to subject reading and draft construction and high crowding to re-organisation and answers redaction

## 5b. Findings: drawing and writing tasks

- Regarding the tasks we observed, the design activity of preservice teachers in educational engineering during an exam, looks like solving problems in 'traditional' design activities:
  - the 'designers' arranged tools and sheets on the table in their own way (tidy or messy storage)
  - as in many design activity cases, the first hour is used to manage ideas, concepts, references (mind maps, tables, several sort of drafts, small sketches, etc.)
  - **several tasks are intertwined to set out the core idea emerging from the problem solving**

## 6. Discussion: process of educational designing

- Using mixt methods contributes to correlate some findings
  - the more they arrange their material on the table, the more they produce operative texts in an ordered conceptual arrangement
    - no significant storage of equipment on the work surface during the exercise can be correlated to a heuristic mind map, overall annotations,
    - significant storage can lead to a storage of orthogonal and organized table

## 6. Discussion: process of educational designing

- Using mixt methods contributes to correlate some findings
  - when they write, it can be:
    - an all over writing: on the blank sheets of paper, on the prescription papers in parallel or in overlap, or both
    - a specific writing on blank sheets of paper, away from prescription papers, avoiding some kind of confusion





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# Thank you for your attention !

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