

# Smart Learning

## Environments and ergonomics:

### An approach to the state of the question

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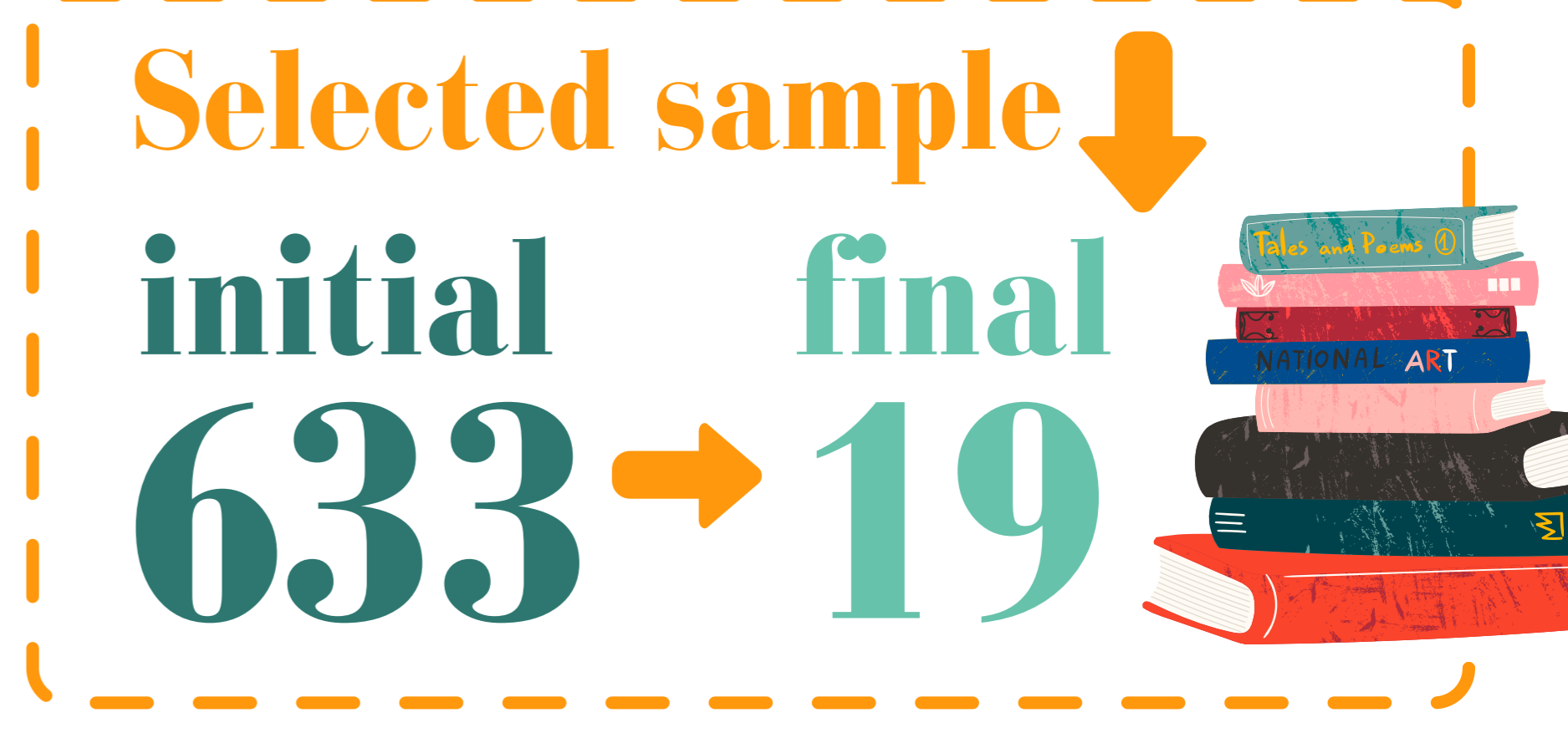
## 1. Introduction

- Smart Learning Environments (SLEs)** → Curricular integration of ICTs by means of tech rich.
- Concept that stems from smart education. (digitalization of education + face-to-face education)
- Ergonomics** → Discipline aimed at adapting a physical or virtual space to the individual characteristics of its user population.



## 2. Methodology

- Objective** → Analyzing the relevance of ergonomics in the studies and experiences related to SLEs.
- Method** → Systematic literature review.
- Research stages**
  - **Selection criteria** PRISMA statement + SALSA framework
  - **Period** 2013-2019
- **Filters** WoS and Scopus databases · Descriptors in English and Spanish · Removal of duplications · Narrowing down the area, language, and time.
- **Search strategies (title, summary, and keywords)**
  - **Area** Social Sciences
  - «smart learning environments OR smart classrooms AND ergonomics»
  - «smart learning environments OR smart classrooms AND inclusive education OR special needs education»
- **Documents** Articles, book chapters, and conference papers.
- **Qualitative analysis** Graphic representation designed with atlas.ti



## 3. Results

### Emerging nature of this research line ↓

8 documents do not present educational implementation and few works in Infant, Primary and Secondary Education, but more numerous in Higher Education.

### 3 categories

Related to contexts of teaching, learning and ergonomics.

### Codes

Text information units.

### Citations

The bibliographic references justifying it are linked to each code.

### C1 Physical context

- **Code “Smart Assistive Technologies”** More evident . Works 1, 3, 6 and 16.
- **Code “Adaptative digital resources”** (hardware y software) Works 2, 3 and 5
- **Code “Large screens or walls where interactive content can be projected”** Works 1, 5, 15 and 19.
- **Code “Utilization of sensors to favor task automation in the classroom”** Works 8, 13, 15 y 19.
- **Code “Augmented Reality (AR) and Virtual Reality (VR)”** Less often cited . Works 11 and 12.

### C2 Virtual context

- **Code “Real-time communication between educational agents through social networks”** Works 2, 4, 5 and 19.
- **Code “Interface or virtual world to favor learning”** Works 1, 7, 15 and 16.

### C3 Physical and virtual context

- **Code “Internet of things”** Works 4, 8, 9, 10 and 13.
- **Code “Recording and transmission of sessions on the Internet”** Work 15 (the least cited in the semantic network).
- **Code “Learning paths according to needs”** Works 17 and 18.

## 4. Conclusions

### SLEs → Lack of works

(from the perspective of ergonomics as an inclusive element)

↓  
Improve the teaching and learning process with adaptative technology and innovative features.



↓  
**Code** → “Augmented reality and virtual reality”  
**LESS FREQUENTLY CITED** but offers numerous possibilities for students with functional diversity.

↓  
“Large screens where interactive content can be projected”  
**ESSENTIAL** to facilitate access to information manipulation.

↓  
**Category “virtual context”** → **COMMUNICATION**

It is an **outstanding element** to optimize the learning environment and benefit students as well as teachers.

↓  
**Learning Management System**

Possibility to **reduce the distance** between **VIRTUAL** and **FACE-TO-FACE** environments.