

ARTIFICIAL INTELLIGENCE IN EDUCATION: THE FINE LINE BETWEEN A SYSTEM'S AND A LEARNER'S PERFORMANCE

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INTRODUCTION

AI-powered technologies are increasingly being developed for educational purposes (Pedro et al., 2019) with recent studies showing how they contribute to increased academic performance and overall better learning outcomes among students (Luckin et al., 2016). However, despite its effectiveness in terms of performance outcomes, very few applications get implemented in classrooms (Luckin et al., 2016).

RESEARCH PURPOSE

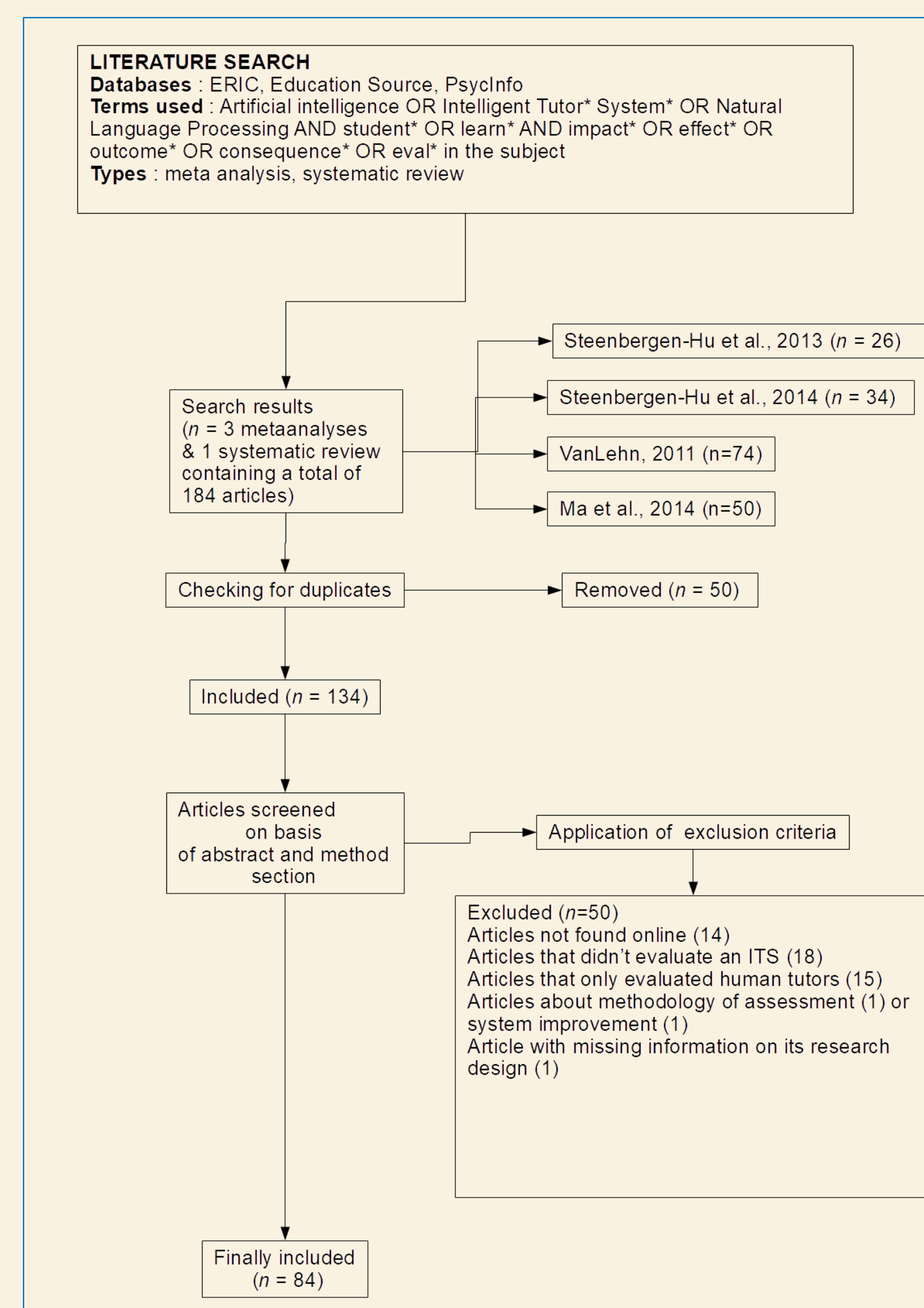
Findings from the field of Artificial Intelligence in Education (AIED) seem to target outcomes related more to the optimization of AI systems compared to the quality of learning (Benteux & Chichekian, 2020). The main purpose for this systematic review was to **examine the impact of AI-powered pedagogical tools on student learning**. Based on Grubisic, Stankov & Zitko (2006)'s model regarding the evaluation of Intelligent Tutoring System's (ITS) pedagogical impact, we hypothesized that the research designs applied in the selected articles used mostly pre and post tests, as well as control group experimental designs.

METHODOLOGY

We analyzed **84 articles** used in three meta-analyses (Ma et al., 2014; Steenbergen-Hu et al., 2013; Steenbergen-Hu et al., 2014) and one systematic review (VanLehn, 2011) evaluating the effectiveness of AIED systems on learning outcomes.

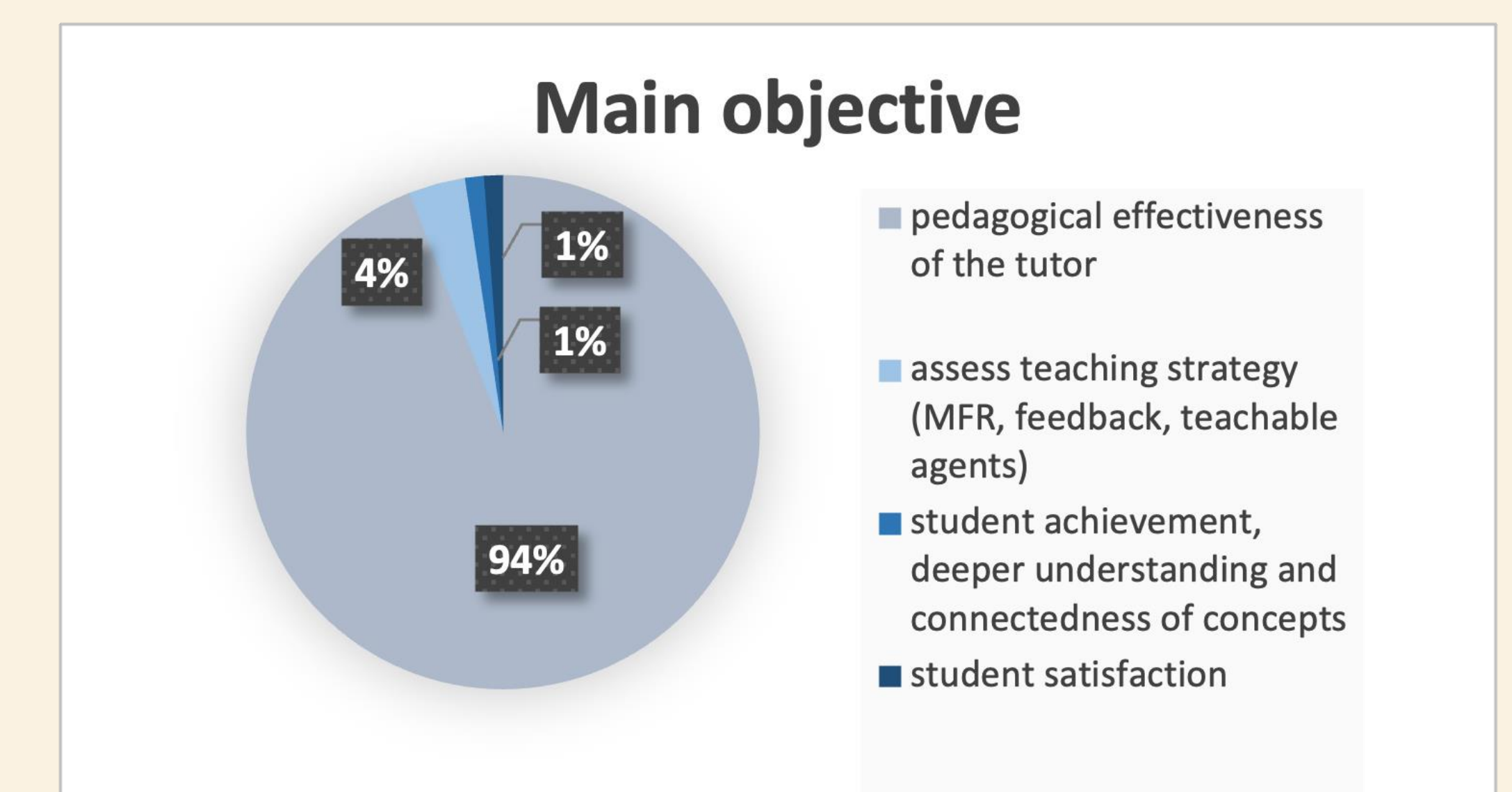
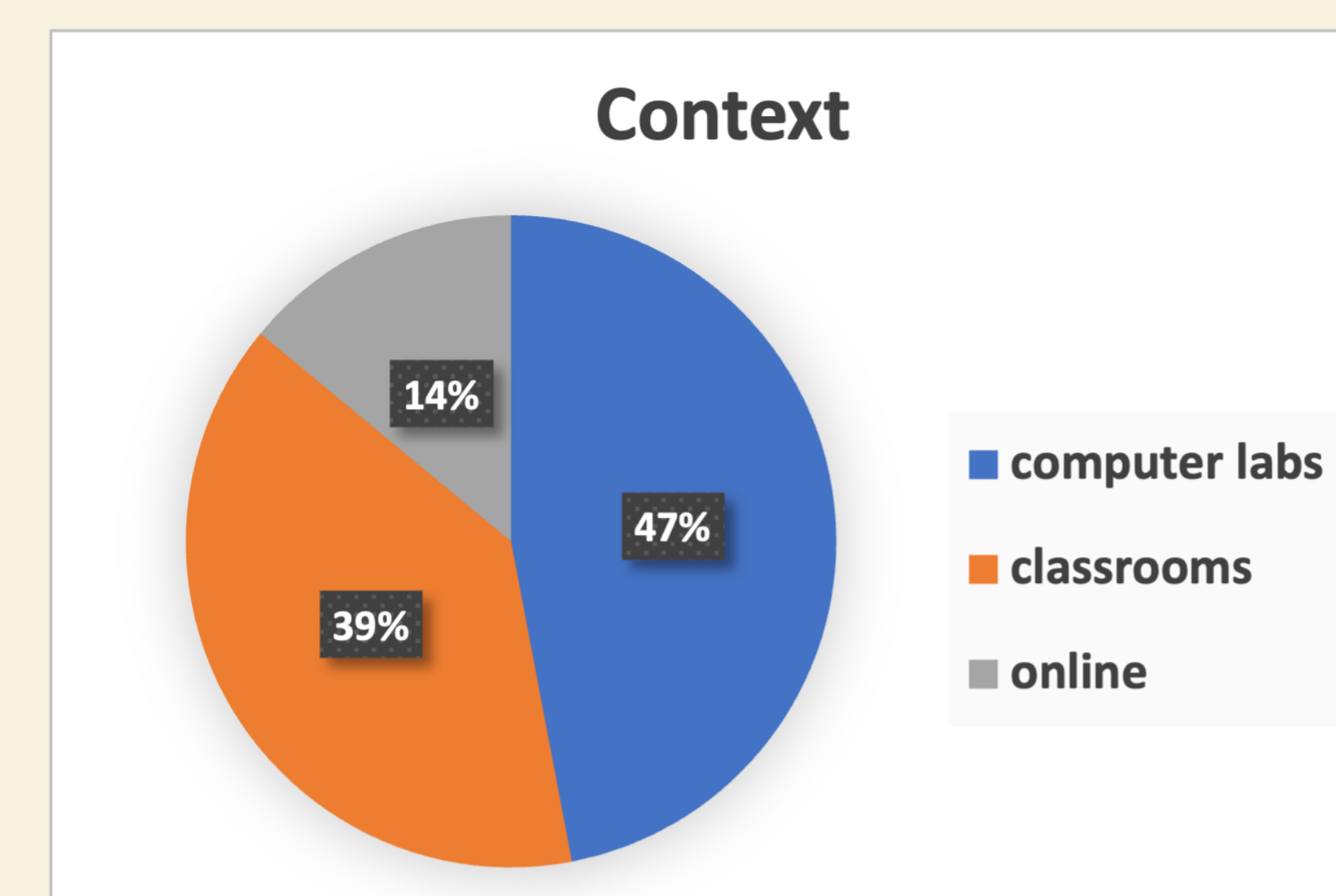
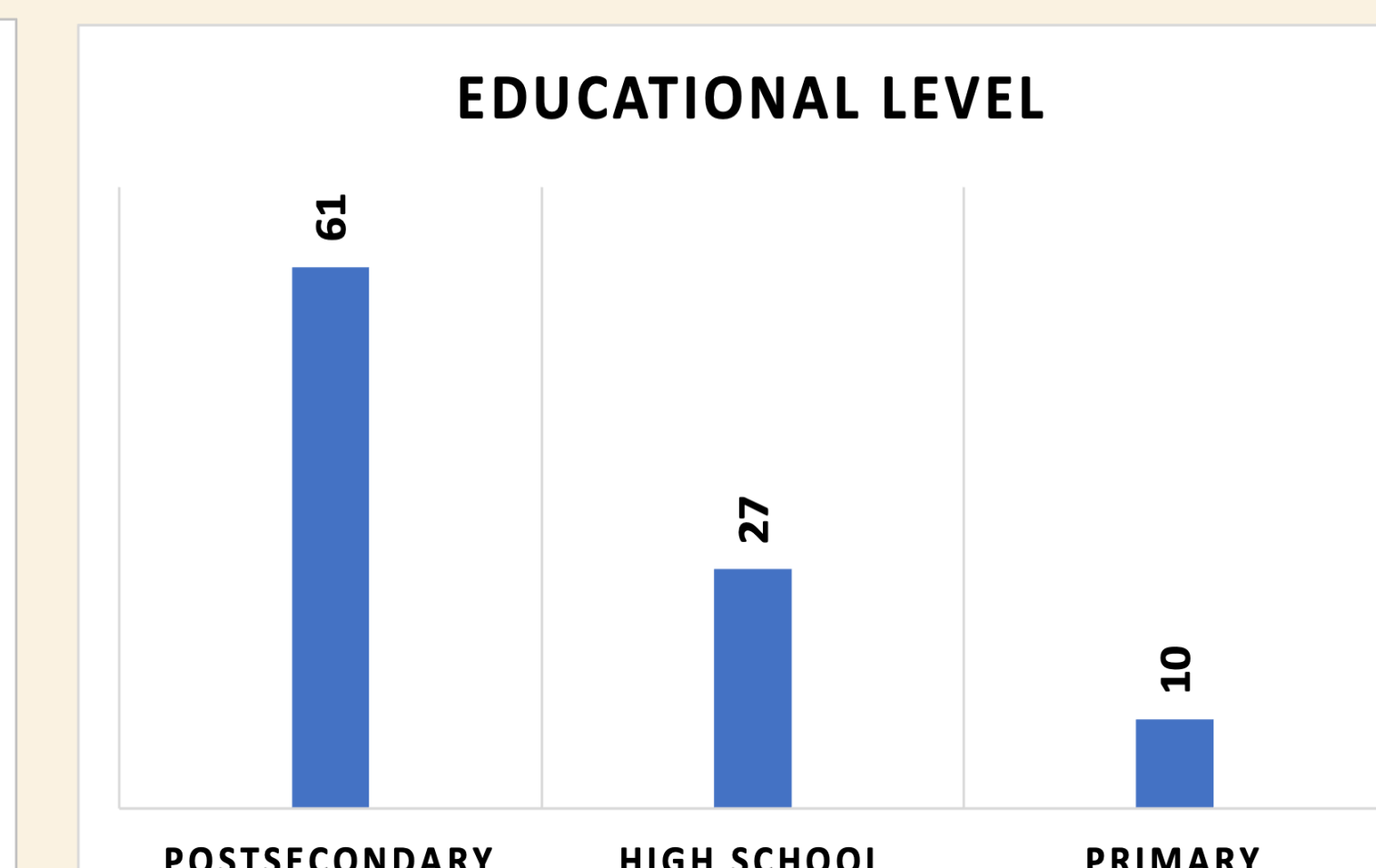
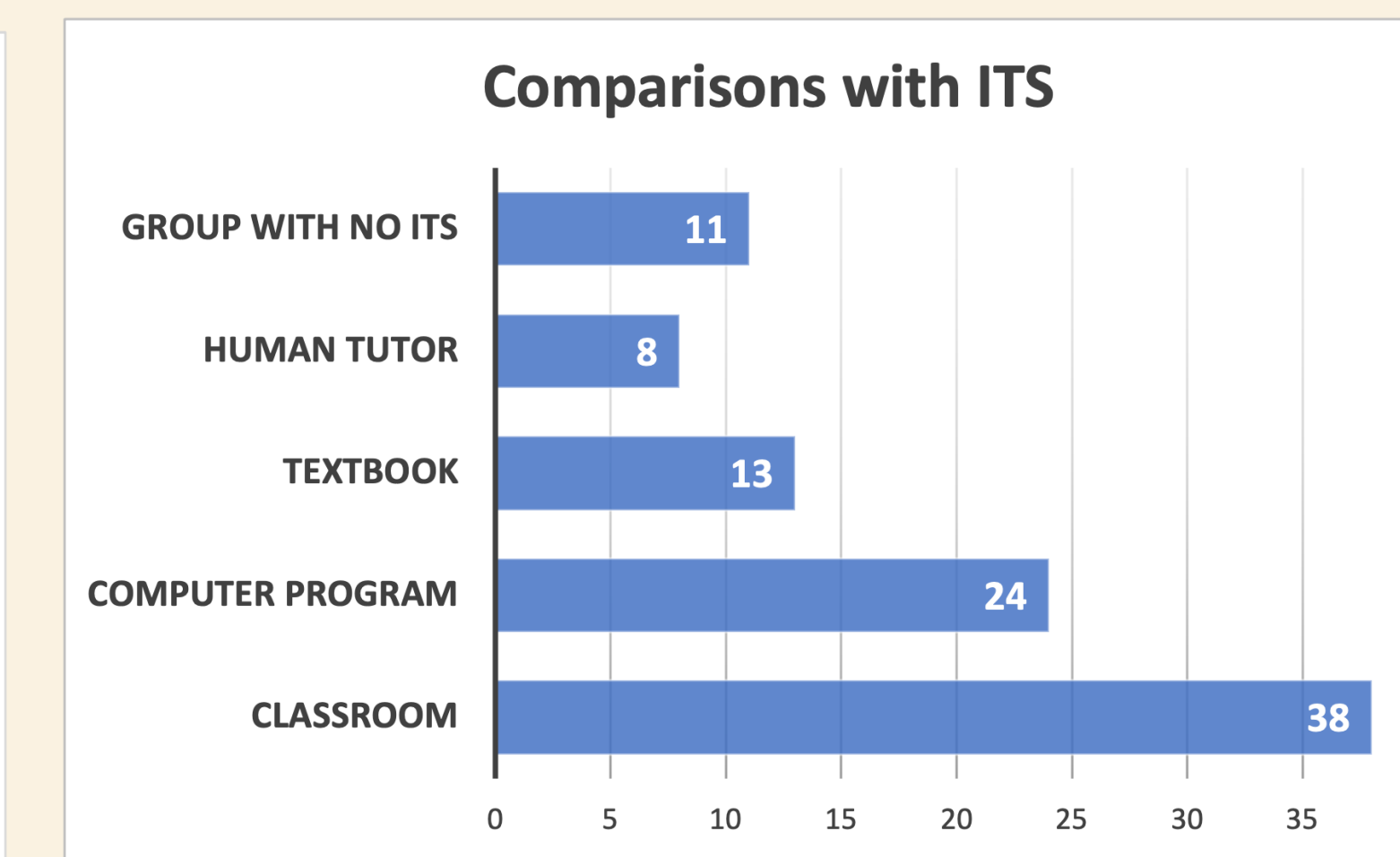
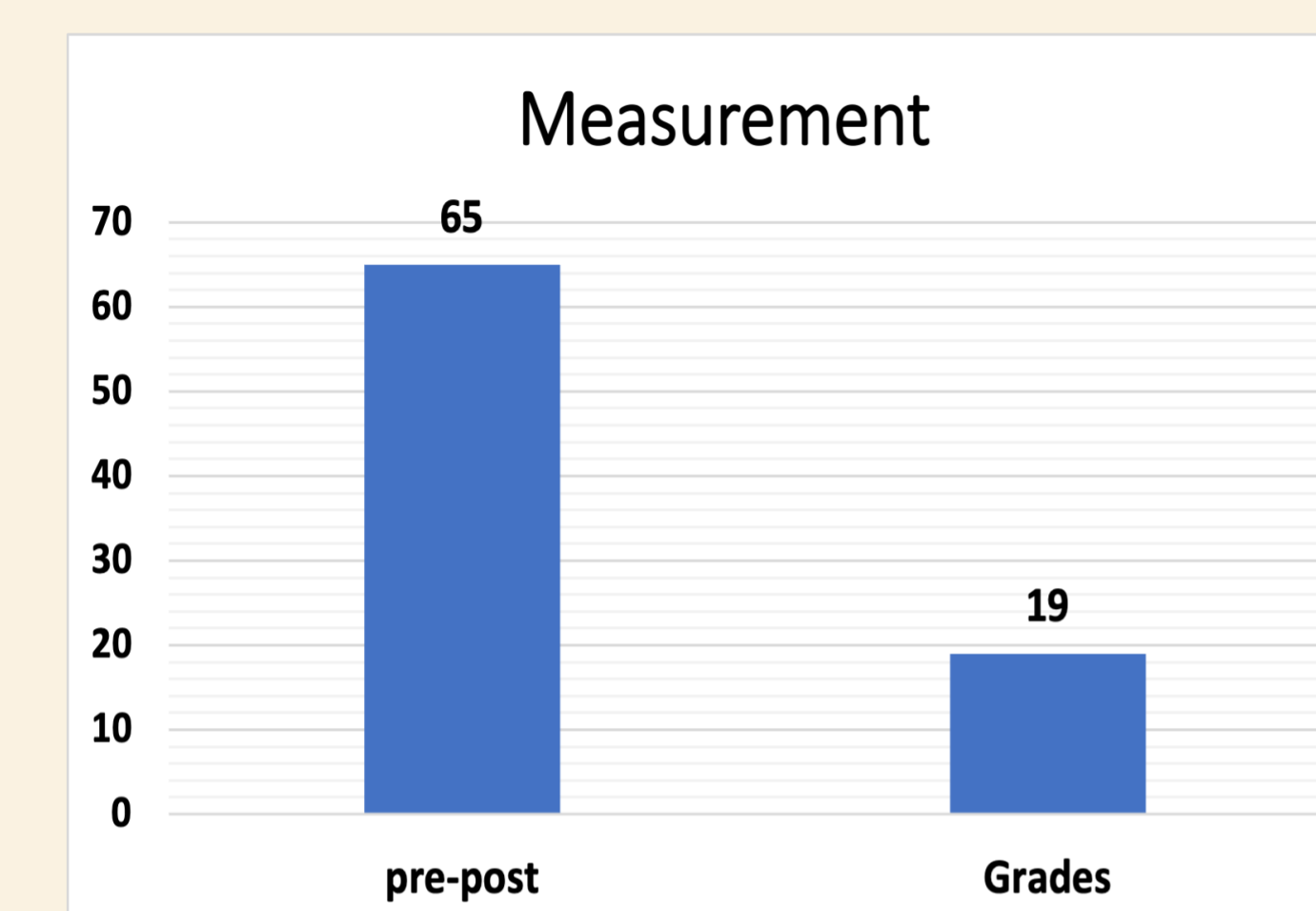
The elements coded and analyzed in each of these articles were :

- purpose of the study
- research design and method
- type of intelligent tutoring system
- sample size
- education level
- domain of study
- context of the study
- comparison groups
- measurement
- time elapsed between pre and post tests



FINDINGS / RESULTS / LESSONS LEARNED

- **55 different ITSs were identified in 84 articles.**
- ITSs were mostly used in the sciences, namely in mathematics (38,1%), computer science (20,2%), physics (15,5%), statistics (3,6%), and biology (3,6%).
- Most of the ITSs were experimented at the postsecondary level (60,7%), followed by high schools (27,4%), primary schools (9,5%), and in professional training (2,4%).
- **94 % of the articles assessed the ITS's pedagogical effectiveness through learning gains**
- ITSs were compared to traditional classrooms (38,1%) or to computer programs (23,8%).
- 46,4% were conducted in computer labs, 39,3% in classrooms, and 14,3% were online experiments.
- The most common research designs were experimental (46,4%) or quasi experimental (44%).
- The data collected were mainly the results of a pre-post test (72,6%)



CONCLUSIONS / LAST WORDS

Our analyses highlighted the scope of the methodology used in AIED research, as well as the evaluative framework used when assessing learning outcomes. The latter seemed more **aligned with a computer science perspective and focused on evaluating the effectiveness of ITSs on learning gains rather than the quality of learning** which is often the focus in educational research. For these AI-powered tools to function optimally and bring an added value to classroom-based learning, it is worthy to integrate interdisciplinary perspectives when developing complementary research designs in AIED (Tuomi, 2018).