SOFTWARE ARCHITECTURE TEACHING
A Systematic Review

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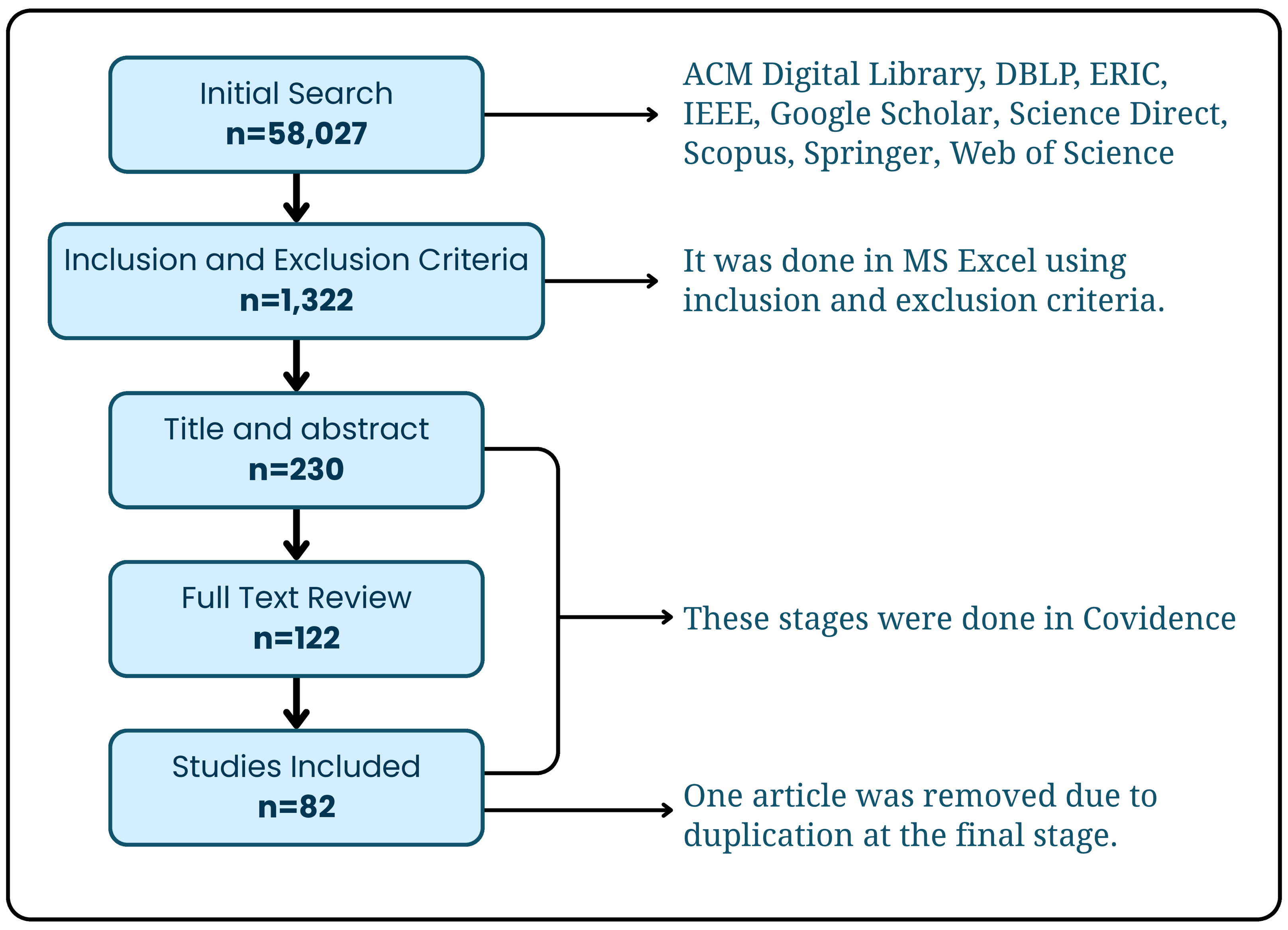
01 Abstract

This systematic review investigates the current landscape of Software Architecture (SA) education by analysing 82 peer-reviewed studies. It identifies ten major teaching themes and critically evaluates the interactive alignment of these themes with industry expectations, assessment approaches, learning outcomes based on Bloom's Taxonomy, and challenges. The review highlights the importance of student-centred themes and persistent issues with conceptual abstraction, as well as time and workload constraints for students and instructors. It offers evidence-based recommendations for curriculum improvement, pedagogical reform, and future research directions for various stakeholders in SA education.

02 Introduction

Software Architecture (SA) is essential in shaping system structure and performance, but teaching SA remains one of the most abstract and complex topics due to its high demand for conceptual thinking and design justification. This review is motivated by two key concerns: the mismatch between academic curricula and industry demands and a lack of consolidated insights into effective SA teaching strategies, particularly from the student perspective.

03 Methodology



The SLR follows the guidelines proposed by Kitchenham and Charters: Planning, Execution and Review [1].

04 Results and Analysis

RQ1: Teaching Strategy

10 themes were identified

RQ2: Hands-on Experience

Project-based and real-world tasks most prevalent

RQ3: Assessment Methods

Summative and formative methods dominate, but the experiential method is impactful with software architecture, while Kata is underused.

RQ4: Learning Outcomes

Most outcomes fall into mid-levels of Bloom's Taxonomy [2]. But Game-based learning and Problem-based Learning contribute to higher-order level of learning outcomes.

RQ5: Challenges

Abstractness, time constraints, instructor expertise and tool complexity are topmost challenges but can be reduced by teaching suitable theme.

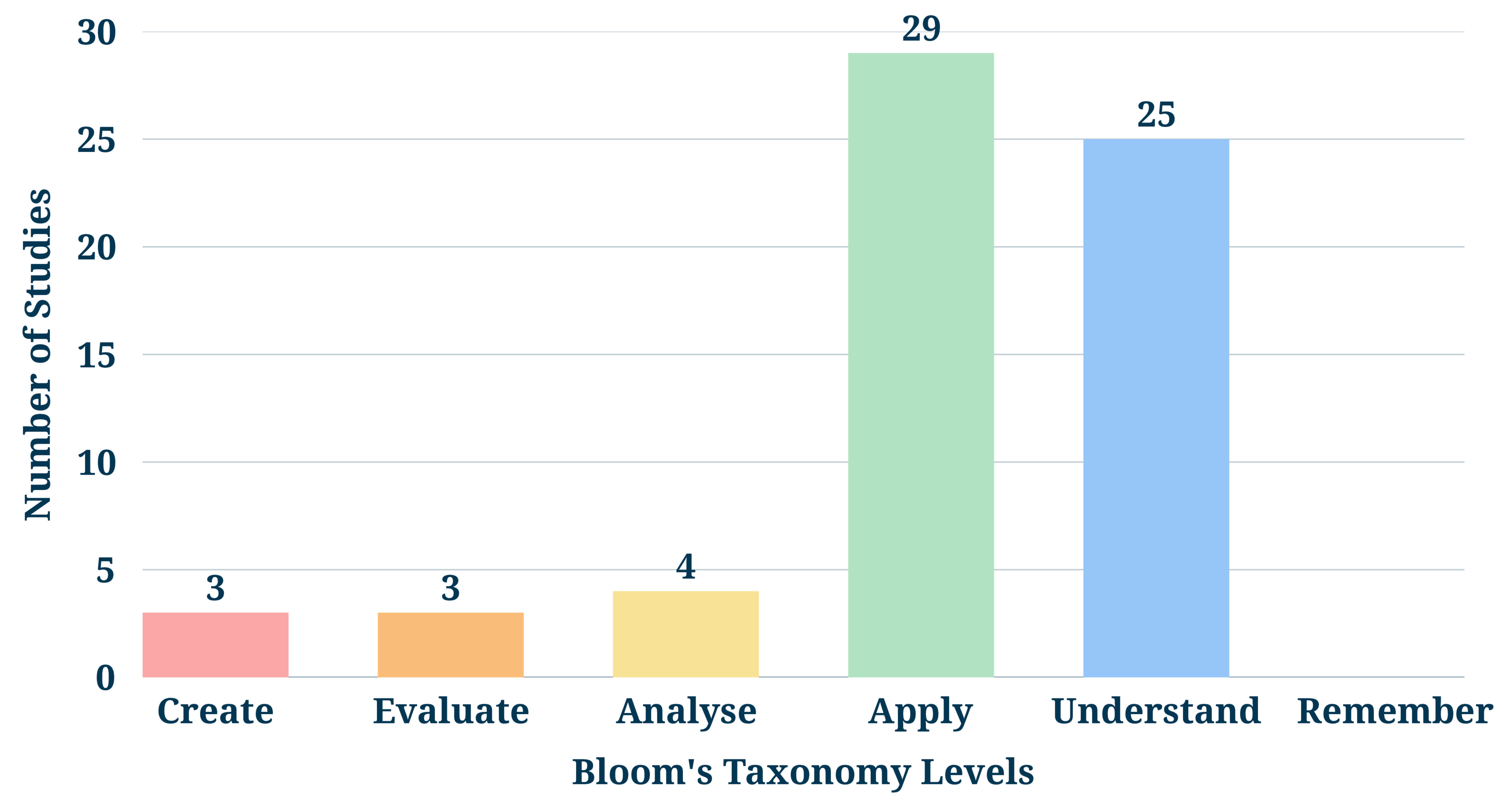


Figure 1: Number of studies aligned in each level of Bloom's Taxonomy [2]

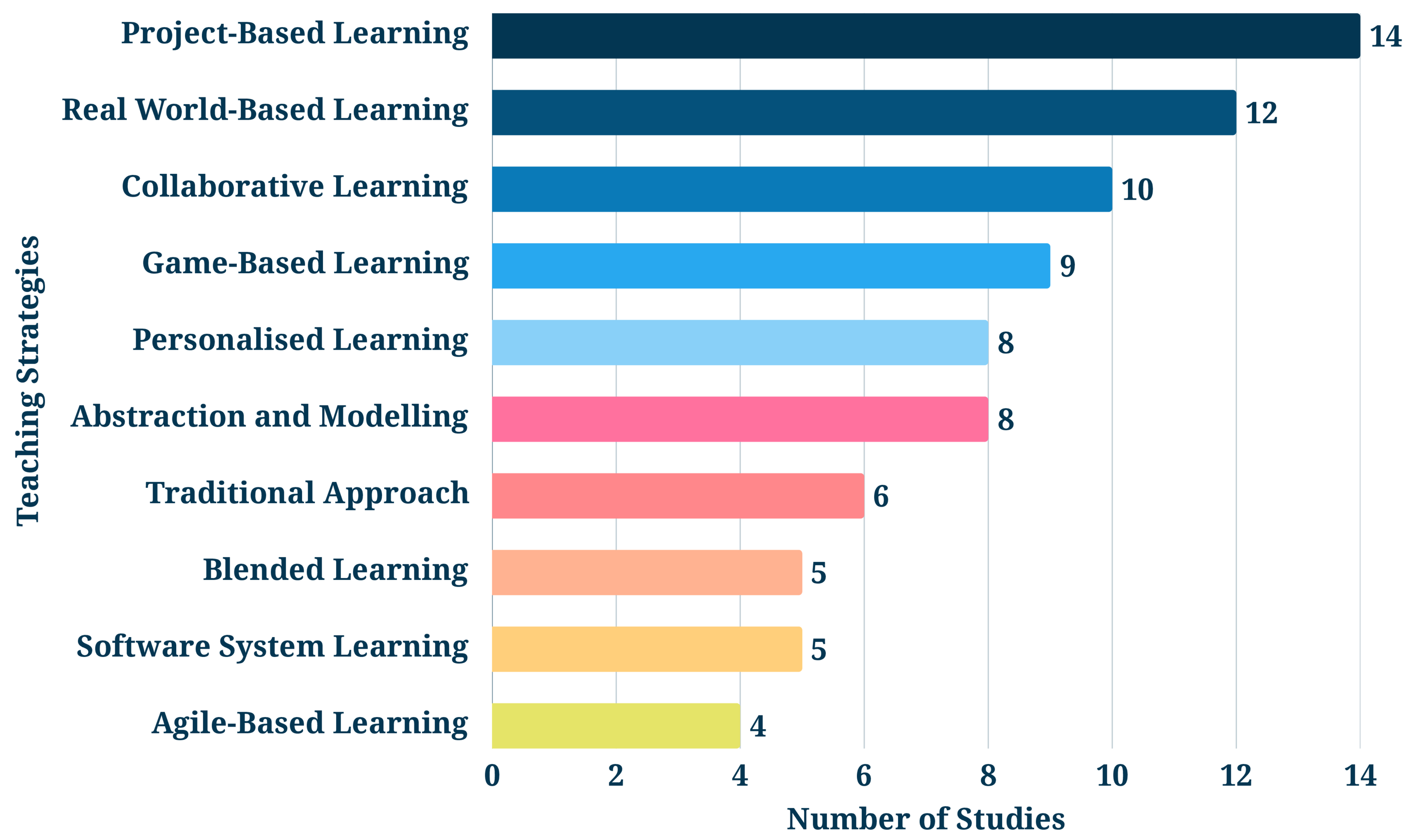


Figure 2: Number of studies categorised under ten teaching strategies.

05 Key Findings

- Active learning strategies are more effective than traditional methods
- Project-based and Game-based learning enhance industry alignment and high-order thinking.
- Bloom's Taxonomy shows a gap in higher order skill development.
- Assessment practices need innovation; integrating experiential methods is vital.
- Challenges are interlinked, requiring holistic, adaptive solutions.

06 Conclusion

This study aims to bridge the academic-industry gap in SA education by adopting blended strategies of PBL and experiential assessment methods. Future efforts should also focus on agile methodology and Architectural Kata to strengthen the effectiveness of SA education and student preparedness.

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References

[1] B. Kitchenham and S. Charters, "Guidelines for performing Systematic Literature Reviews in Software Engineering," vol. 2, 01/01 2007.

[2] N. E. Adams, "Bloom's taxonomy of cognitive learning objectives," (in eng), J Med Libr Assoc, vol. 103, no. 3, pp. 152-3, Jul 2015, doi: 10.3163/1536-5050.103.3.010.