

PRISMA 2020 Checklist

Systematic Review

Manuscript title:

Gamification as an Information Technology Tool for Enhancing Cognitive Skills and Critical Thinking: A Systematic Review

TITLE

| Item | PRISMA checklist item | Location reported |
|------|--|-------------------|
| 1 | Identify the report as a systematic review | Title |

ABSTRACT

| Item | PRISMA checklist item | Location reported |
|------|---|-------------------|
| 2 | Structured summary of objectives, methods, results, and conclusions | Abstract |

INTRODUCTION

| Item | PRISMA checklist item | Location reported |
|------|---|---------------------------------|
| 3 | Rationale for the review in context of existing knowledge | Section 2 (Literature Review) |
| 4 | Explicit statement of objectives / research questions | Section 3 (Research Objectives) |

METHODS

Eligibility criteria

| Item | PRISMA checklist item | Location reported |
|------|----------------------------------|----------------------|
| 5 | Inclusion and exclusion criteria | Section 5.5; Table 2 |

Information sources

| Item | PRISMA checklist item | Location reported |
|------|-----------------------------------|-------------------|
| 6 | Databases and information sources | Section 5.2 |

Search strategy

| Item | PRISMA checklist item | Location reported |
|------|-----------------------|--------------------------------|
| 7 | Full search strategy | Section 5.3; GitHub repository |

Selection process

| Item | PRISMA checklist item | Location reported |
|------|---------------------------------------|---------------------|
| 8 | Study selection and screening process | Section 5.4; Fig. 2 |

Data collection process

| Item | PRISMA checklist item | Location reported |
|------|-------------------------|-------------------|
| 9 | Data extraction process | Section 5.6 |

Data items

| Item | PRISMA checklist item | Location reported |
|------|---|-------------------|
| 10a | Outcomes and variables extracted | Sections 2.3–2.6 |
| 10b | Other variables (context, technology, design) | Sections 5.6, 6 |

Risk of bias assessment

| Item | PRISMA checklist item | Location reported |
|------|--|-------------------|
| 11 | Assessment of methodological limitations | Section 2.5 |

Effect measures

| Item | PRISMA checklist item | Location reported |
|------|-----------------------|--|
| 12 | Effect measures | Not applicable (qualitative synthesis and bibliometric analysis) |

Synthesis methods

| Item | PRISMA checklist item | Location reported |
|------|--|----------------------|
| 13a | Synthesis approach | Sections 5.6, 6 |
| 13b | Data preparation methods | Section 5.6 |
| 13c | Methods for tabulation and visualization | Figures 3–7; Table 3 |
| 13d | Exploration of heterogeneity | Sections 6.1–6.4 |
| 13e | Sensitivity analysis | Not applicable |

Reporting bias assessment

| Item | PRISMA checklist item | Location reported |
|------|-------------------------------|------------------------|
| 14 | Reporting bias considerations | Section 2.5; Section 7 |

Certainty assessment

| Item | PRISMA checklist item | Location reported |
|------|------------------------------------|-------------------|
| 15 | Certainty and strength of evidence | Section 6.5 |

RESULTS

Study selection

| Item | PRISMA checklist item | Location reported |
|------|------------------------------|---------------------|
| 16a | Search and selection results | Section 5.4; Fig. 2 |
| 16b | Excluded studies and reasons | Section 5.4 |

Study characteristics

| Item | PRISMA checklist item | Location reported |
|------|-------------------------------------|-------------------------|
| 17 | Characteristics of included studies | Table 3; GitHub dataset |

Risk of bias in studies

| Item | PRISMA checklist item | Location reported |
|------|-----------------------------|-------------------|
| 18 | Risk of bias within studies | Section 2.5 |

Results of individual studies

| Item | PRISMA checklist item | Location reported |
|------|-----------------------------|-------------------|
| 19 | Results of included studies | Sections 2.3–2.6 |

Results of syntheses

| Item | PRISMA checklist item | Location reported |
|------|-----------------------|-------------------|
| 20a | Summary of findings | Section 6 |
| 20b | Statistical synthesis | Not applicable |
| 20c | Heterogeneity | Sections 6.1–6.4 |

| Item | PRISMA checklist item | Location reported |
|------|-----------------------|-------------------|
| 20d | Sensitivity analysis | Not applicable |

Reporting biases

| Item | PRISMA checklist item | Location reported |
|------|-----------------------|-------------------|
| 21 | Reporting bias | Section 7 |

Certainty of evidence

| Item | PRISMA checklist item | Location reported |
|------|-----------------------|-------------------|
| 22 | Certainty of evidence | Section 6.5 |

DISCUSSION

| Item | PRISMA checklist item | Location reported |
|------|--|-------------------|
| 23a | Interpretation of results | Section 6 |
| 23b | Limitations of evidence | Section 7 |
| 23c | Limitations of review process | Section 7 |
| 23d | Implications for practice and research | Sections 6.5, 7 |

OTHER INFORMATION

| Item | PRISMA checklist item | Location reported |
|------|-----------------------|--------------------------------|
| 24a | Registration | Not registered |
| 24b | Protocol | Not applicable |
| 24c | Amendments | Not applicable |
| 25 | Funding | Section 8 (Acknowledgements) |
| 26 | Competing interests | Not declared |
| 27 | Data availability | Section 5.7; GitHub repository |