

Background

- **Gamification** or **serious games**: a pedagogical strategy for improving both learner participation, and knowledge acquisition and retention.
- Effective gamification requires incorporation of **user experience (UX)** elements in design.
- Application of gamification in **pharmacy education and practice** is relatively underexplored in the literature.

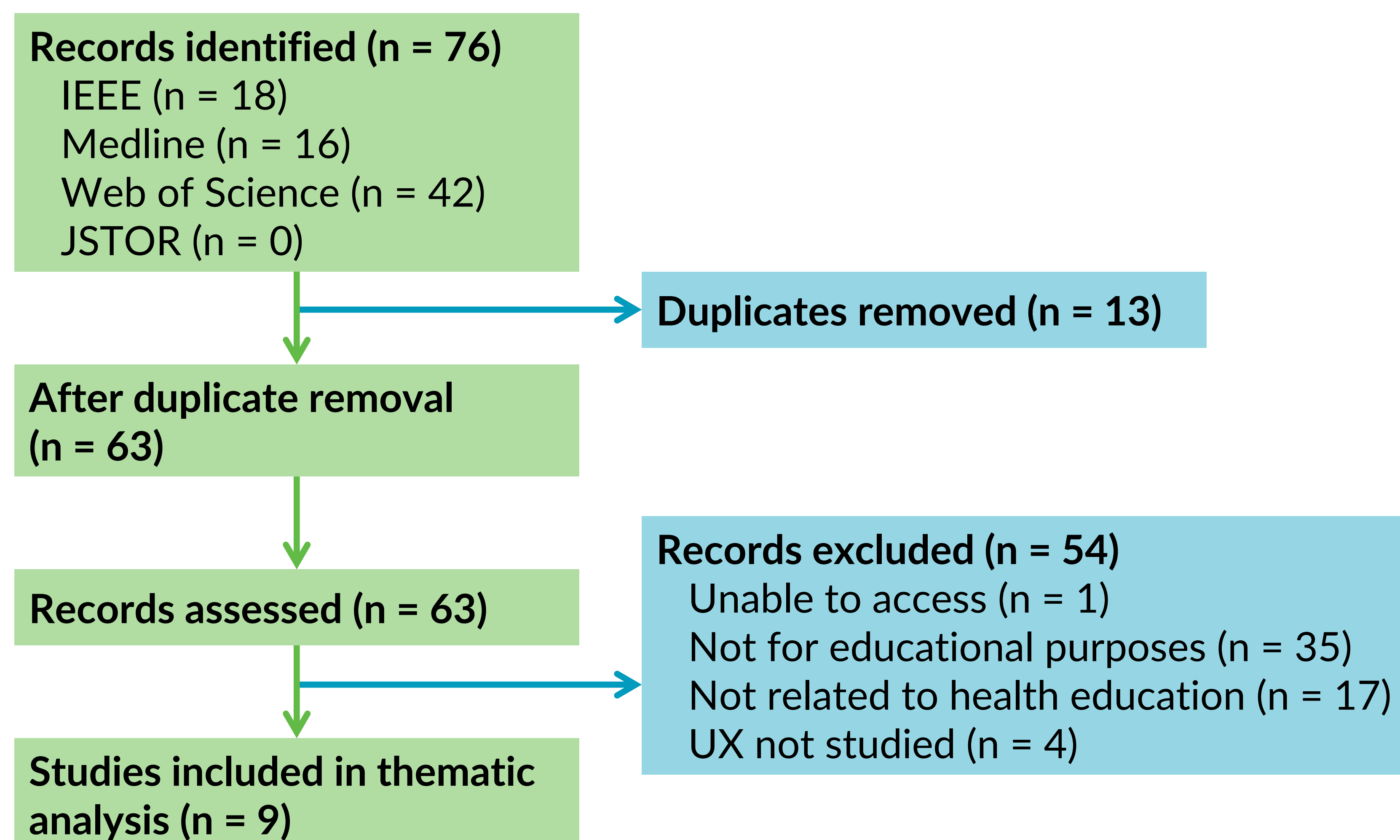
Objective

1. To identify key **UX elements** critical for effective gamification in health profession education.
2. To identify **topics most needing knowledge reinforcement**, in a third-year elective course on patient & medication safety in the Doctor of Pharmacy (PharmD) program.
3. To **develop, implement, and evaluate** an **educational gamification pilot project** in the above course.

Methodology

1. A literature review was conducted on **MEDLINE, JSTOR, Web of Science**, and **IEEE Xplore**, with results subject to thematic analysis (**Figure 1 & Figure 2**).
2. A **needs assessment survey** was completed by the two previous cohorts of the course (i.e., Winter 2021 & Winter 2022) (**Table 1**).
3. Safety Games were pilot tested in the **Winter 2023** offering of the course (**Figure 3**).

Figure 1 Flow diagram of literature review.



- 76 articles were identified (**Figure 1**). Six key UX elements were identified from nine articles included in the thematic analysis (**Figure 2**).
- Three course topics and three competency domains were identified by past students to require the most knowledge reinforcement, and thus, most likely to benefit from gamification (**Table 1**).

Figure 2 User experience (UX) themes identified in thematic analysis.

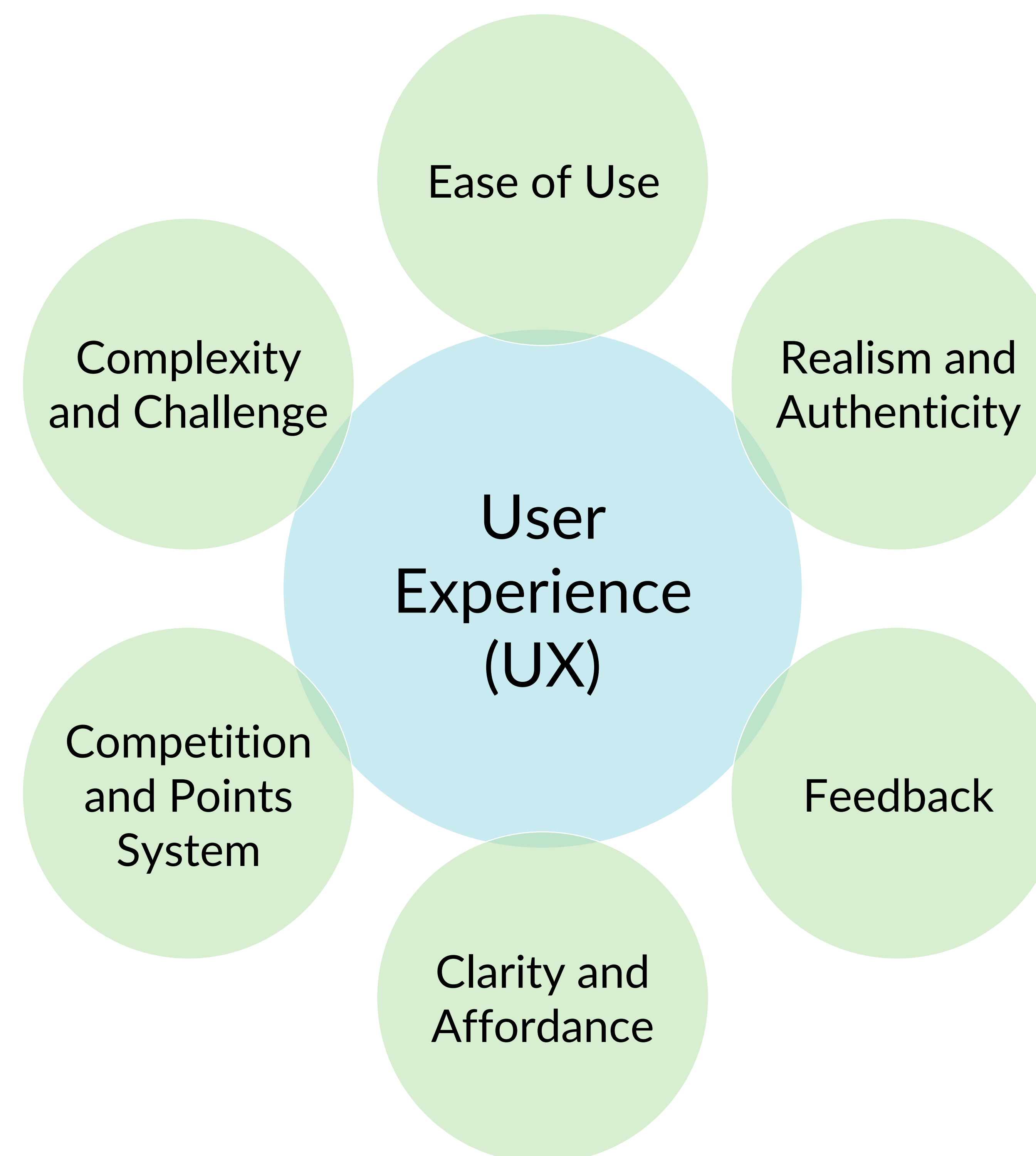
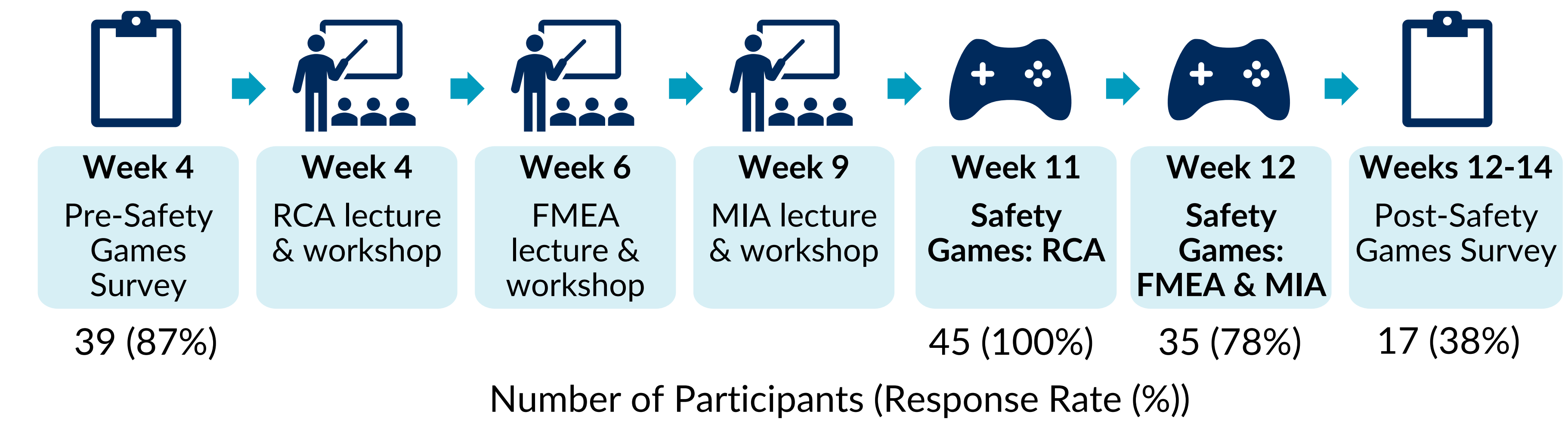


Table 1 Course topics and Canadian Patient Safety Institute (CPSI) (now known as Healthcare Excellence Canada) Safety Competency Framework domains identified to be the most needing knowledge reinforcement by past students.

Course Topics	CPSI Safety Competency Domains
• Root Cause Analysis (RCA)	Domain 4: Safety, Risk, and Quality Improvement
• Failure Mode and Effects Analysis (FMEA)	Domain 5: Optimize Human and System Factors
• Multi-Incident Analysis (MIA)	Domain 6: Recognize, Respond to and Disclose Patient Safety Incidents

Results

Figure 3: Timeline of course content and Safety Games implementation and evaluation ($n = 45$ students). RCA = Root Cause Analysis; FMEA = Failure Mode & Effects Analysis; MIA = Multi-Incident Analysis.



- Participants' mean score on knowledge assessment increased by **23.4%** post- vs. pre-implementation (**Figure 4**).
- Majority of participants agreed that Safety Games were **enjoyable (94%)**, **improved their knowledge and understanding (94%)**, and they would **recommend the games to their peers (100%)**.
- Safety Games helped participants **recall** knowledge learned, **refresh** understanding, fill in knowledge **gaps**, and **reinforce intention** to manage safety practices in the future.

Figure 4: Improvement of participants' performance on knowledge assessment surveys pre- and post-implementation.

Survey	Pre-Safety Games	Post-Safety Games
Response Rate	39/45 (87%)	17/45 (38%)
Average Score	3.8/9 (43%)	7.9/12 (66%)

Score increased by **23.4%** (mean difference)
 $p = 0.0027$ | 95% CI = [20.6%–26.3%]

Conclusion

- We identified several UX elements that should be considered in the design of games in health professional education.
- We demonstrated a successful proof of concept of educational gamification in pharmacy education.
- Future areas to explore include extending educational gamification to pharmacy practice and/or other health professions.

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