



Original Article

Design and Pilot Evaluation of a Gamified Urban-Management Application to Enhance Environment-Related and Health-Related Citizen Participation in Tabriz, Iran

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Abstract

Introduction: A growing challenge in city life is how to synthesize sustainability, public health, and citizen engagement. Traditional urban management methods frequently fail to activate residents to participate in initiatives that enhance environmental quality and well-being. Digital tools and gamification approaches have become valuable resources for encouraging behavior change and fostering civic engagement. This study aimed to improve pro-social behavior, practical civic knowledge, and participation in local environment- and health-related activities by designing and testing a gamified mobile application.

Methods: “Tabriz-Senin,” a simple, quiz-first Android game, was created and tested to increase civic awareness and pro-social behavior in Tabriz-Iran. The application was positioned as a portable digital health instrument integrated into municipal services since many of the quiz topics focused on urban environmental and health-related activities, including waste sorting, safe transportation, and emergency preparedness. The Unity prototype included district-level leaderboards, badges, streak bonuses, and timed multiple-choice tests across three domains.

Results: In a controlled environment, twenty participants used their own phones. Telemetry revealed short, consistent use (median session ≈3.5 minutes; >85% completion; most items under 20–30 seconds). SEQ indicated high ease of use (median: 6.0), and all UEQ-S subscales were above neutral. Clearer badge progress and quicker corrective solutions were given priority in the feedback. The results confirmed viability, and a neighborhood-scale field test and improved feedback/reward transparency were the next steps.

Conclusion: This approach could support healthier urban environments and safer citizen behaviors, linking civic participation to population health and environmental stewardship.

Keywords: Urban, Gamification, Citizen, Health, Environment, Tabriz

Received: March 2, 2026, Revised: April 21, 2026, Accepted: May 24, 2026, ePublished: June 20, 2026

Introduction

Cities focus on service delivery, infrastructure spending, and energy use,¹ as well as the need and opportunity for citizen participation to enhance sustainability and urban governance.² Air quality, green space, safety, and cardiometabolic risk are among the environmental exposures and population health that are shaped by these same urban systems.¹⁻³ Therefore, there may be direct effects on the health and well-being of the urban environment when individuals are involved in waste management, traffic safety, and disaster preparedness. Short, customized information is delivered by digital engagement platforms, which are increasingly regarded as a component of the digital health ecosystem that connects daily habits to healthier cities.^{4,5} Simultaneously, cities across the globe grapple with limited financial resources

and increasing demand for services.^{2,6} Moreover, there is no universal approach to public engagement; instead, cities need to tailor their tools to match citizen motivations, local capabilities, and levels of trust.⁷ These insights demonstrate a design challenge, namely, to develop engagement strategies that are easy for citizens to access, rewarding, and transparent while also providing actionable feedback for city managers.^{8,9}

Gamification is one viable solution to this problem. The self-determination theory (SDT) and flow theory explain why gamified interactions might encourage recurring participation through emphasizing autonomy, competence, and relatedness and connecting continuous engagement to a balance between difficulty and skills, respectively.^{3,10,11} As a result, recent gamification practices have shifted away from straightforward “point-badges-



leaderboards” toward more meaningful experiences that are tailored to the individual user profiles.⁴ Moreover, the value of iteration between domain specialists and end users is emphasized by the user-centered, theory-informed design. This strategy works well for municipal services, which need to accommodate different literacy levels and daily routines.¹²

Accordingly, this study aims to improve pro-social behavior, practical civic knowledge, and participation in local activities related to the environment and health by designing and testing a gamified mobile application for Tabriz, Iran. Apart from promoting compliance with local ordinances and appropriate behavior (e.g., trash disposal, park and traffic etiquette, and emergency safety, which are closely related to urban environmental quality and injury prevention), the product seeks to increase knowledge about Tabriz (its history, services, contacts, and procedures) and encourage participation in reporting, co-creating solutions, and providing feedback on local issues. Additionally, the experience focuses on short, repeating sessions and lightweight, socially visible acknowledgment (e.g., district-level leaderboards) to connect with neighborhood identity and promote persistent, community-anchored involvement because civic motivation and availability vary across residents.

The contributions are threefold: (i) a gamification pipeline that is municipality-oriented and repeatable from concept to prototype, (ii) a tangible quiz-driven design that is district-aware and in line with Tabriz’s priorities, and (iii) pilot evidence on perceived value and usability to guide future extensions (e.g., traffic mini-sims or location-based civic challenges) and municipal deployment. The remaining sections of the paper describe the design and pilot procedures, provide the findings, and suggest implications for roll-out at the city level.

Methods

Design Translation and Prototyping

We engaged in structured co-design with city officials, council-adjacent experts, informatics and education practitioners, and outside game-design advisors in order to convert municipal priorities into a workable product. Thus, a thorough game design document (GDD) (“Tabriz-Senin”) was employed as the definitive design artifact in place of graphical wireframes:

(1) Objectives and target audience; (2) Three knowledge/engagement domains: Tabriz-Knowledge, Municipality-Knowledge, and Law-&-Rights; (3) The fundamental trivia mechanism (timed, multiple-choice); (4) Scoring and progression; (5) Badges/titles; (6) Cadence (daily/weekly challenges); (7) UI/UX principles; (8) An implementation roadmap.

In addition, a playable Android prototype (Unity; “Tabriz-Senin,” prototype v0.1) was developed, which incorporated the quiz-first loop and lightweight recognition technologies under the guidance of the GDD. Timed multiple-choice questions, fixed question sets per domain (10 items each), streak bonuses, district-level

leaderboards, and badge progression (e.g., Golden Key Holder, Tabriz-Guardian, and Citizen of the Month) were all included in the pilot build. With endpoints /quiz/next, /score/submit, and /leaderboard/(district), the content was sent via a lightweight REST back-end; analytics recorded session counts, correctness of each item, completion status, and time-on-task. The pilot did not gather personally identifiable information in accordance with our ethics guidelines; instead, the more formal registration flows (e.g., national or local IDs) for the GDD were postponed until after the pilot.

Furthermore, advanced features were specified by the GDD, including weekly civic challenges (e.g., waste-reduction or safe cycling weeks), mission bundles (e.g., “answer five environment questions”), group/neighborhood competitions, daily contests, and material incentives (e.g., discounts for municipal services). Only the “Challenge of the Week” idea and digital prizes (points, badges, and leaderboards) were revealed for the pilot; tangible incentives were left as inactive design possibilities for subsequent municipal integration.

Item Bank and Timing Parameters

With per-item timings that matched the GDD’s range (about 20–30 seconds), the prototype used a modular question bank arranged by domain and difficulty (easy, medium, and hard). Civic learning was closely linked to urban environmental health and safety since many items across domains addressed environmental and health-related subjects (e.g., home waste sorting, pollution-aware behaviors, safe street use, and emergency health responses). Further, scoring was affected by difficulty; more points were awarded for more difficult items. Before being added to the pilot set, items were reviewed by two reviewers for clarity and single-best-answer accuracy after being created or selected with feedback from domain stakeholders.

Participants and Recruitment

In Tabriz, convenience sampling was employed for three groups: two outside game-design practitioners, graduate students studying urban planning and information, and municipal employees (waste management and education). Twenty adults ($n=20$; ≥ 18 years old, frequent smartphone users, and fluent in the interface language) took part in this study. Nonetheless, unresolved visual/motor impairments that prevented unassisted mobile use were excluded from the investigation. Departmental mailing lists and municipal invites were used for recruitment. Participants used their own Android devices (minimum OS Android 9.0; screen size ≥ 5.5 inches); sessions were held in a controlled setting at a municipal training room in Tabriz during March 2024. Furthermore, participation was free of charge and entirely optional. Through an in-app information screen and checkbox, digital consent was acquired.

Measures

User experience and perceived ease/value were the main

results:

- Attractiveness, perspicuity, stimulation, and dependability were the four subscales of the eight-item UEQ-S, which ranged from -3 to +3.
- Quiz Flow Single-Ease Question (SEQ) (1–7; higher scores indicate an easier level).
- Perceived Utility (one item; 1–7).

Telemetry-based secondary outcomes were time-on-task, set-level completion (10-item blocks), and per-item accuracy. The intended cadence and points of friction were recorded using qualitative questions, such as *Where, if anyplace, did you hesitate?* and *What would you alter about the challenge cadence, if anything?*

Procedure

Participants created a test profile, installed the prototype from a secure link, and finished one 10-item quiz per domain (order fixed across domains) after giving their consent. Then, they spent up to five minutes exploring the leaderboard and badge views. Eventually, they finished the two open-ended prompts, Perceived Utility, SEQ, and UEQ-S. No content coaching was offered, and staff members were only accessible to assist with technological problems. Wi-Fi sessions lasted approximately 12–15 minutes.

Analysis

The analyses were descriptive because they were exploratory in nature. SEQ and UEQ-S subscale medians and interquartile ranges (IQRs), as well as Cronbach's α , were presented for every UEQ-S subscale. An overall and domain-specific summary of time-on-task, accuracy, and completion rate was provided as well. Additionally, open-ended comments were thematically analyzed by two authors, and differences were settled through discussion. For scale summaries, missing data were handled list-wise, and Microsoft Excel 365 was used for the analyses.

Ethics

Institutional minimal-risk requirements were satisfied by the pilot. No PII was gathered; only planned telemetry (job completion, accuracy, and timing) was documented. Moreover, participants were not penalized for withdrawing.

Results

Overall, twenty participants were recruited for the pilot, who used their own Android phones in a controlled environment to complete onboarding and at least one 10-item test in each of the tracks [Municipality-Knowledge, Law-&-Rights, and Tabriz-Knowledge (Tabrizology)]. The participants successfully navigated the three fundamental knowledge tracks from the “track picker” view (Figure 1), entered the phone number on the single-field screen (Figure 2), and then authenticated and arrived at the home hub (Figure 3). With speedy solo play as the default and optional competitive or collaborative modes accessible from the mode hub, the prototype

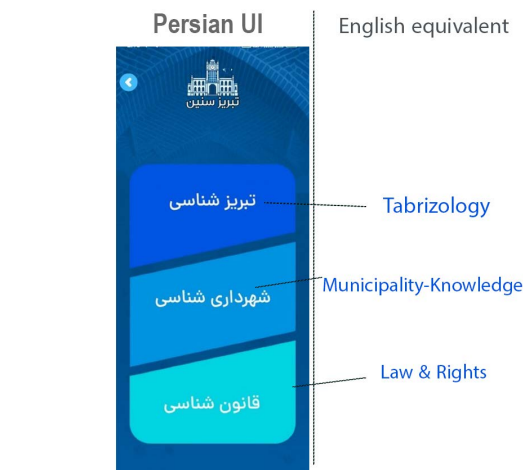


Figure 1. Track Picker View

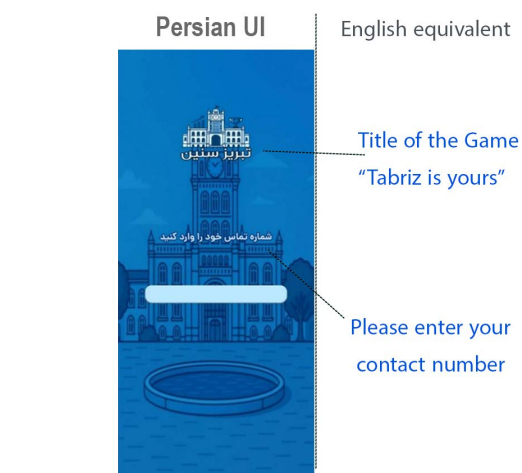


Figure 2. Phone Number Entry

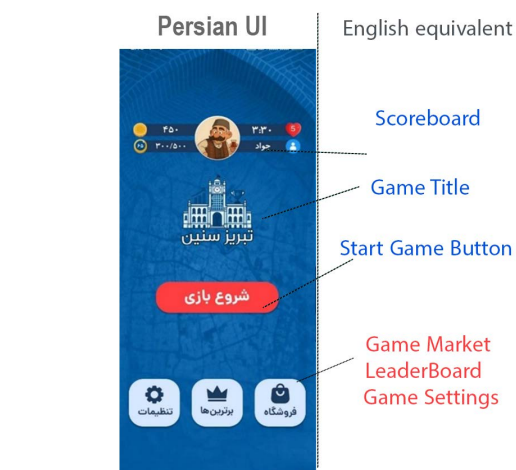


Figure 3. Home Hub View

accommodated the desired variety of question view (Figure 4).

In line with a micro-learning loop designed for brief daily engagement, the app maintained short, repetitive use across the cohort; the median session duration was roughly 3.5 minutes, and the aggregate completion rate for 10-item sets surpassed 85%. The home screen usually led participants to a timed multiple-choice question

where they could utilize simple tools, such as “retry,” “hint,” or “delete two choices.” When necessary, they were then given a brief written explanation coupled with quick correctness feedback. Correctness counts, time remaining, and soft prizes (coins/stars) were displayed in the session summaries, which, according to some participants, were beneficial for perceived progress.

Task performance trends matched time-boxed trivia expectations. In addition, all tracks had high completion rates, and there were no floor effects in item-level accuracy. With sporadic spikes on historical facts and law-and-rights items that used lengthier stems, the distribution of time-on-question in exploratory summaries from the analytics export indicated that most items fit easily inside the 20–30 second range (Table 1). Following the quiz flow, participants spent up to five minutes exploring the non-quiz surfaces (e.g., leaderboards and badges), representing that the recognition layer held participants’ attention even throughout this brief exposure period. The ability to successfully incorporate environmental and safety-related micro-tasks into everyday digital routines is suggested by the sustained completion of these brief tests. This is a necessary condition for digital health interventions that depend on modest, recurrent behavioral changes.

Positive user experience results were in line with a usable version 0.1. Participants rated the quiz flow as easy to complete on the SEQ (1–7; median: 6.0, IQR: 5.5–6.5).

Attractiveness, perspicuity, stimulation, and dependability were all rated favorably on the UEQ-S subscales (–3 to +3), each of which was significantly higher than neutral (attractiveness: median: 1.4, IQR: 1.1–

1.7; Perspicuity: median: 1.6, IQR: 1.3–1.8; Stimulation: median: 1.2, IQR: 0.9–1.5; Dependability: median: 1.3, IQR: 1.0–1.6). Further, each subscale’s internal consistency (Cronbach’s α : Attractiveness: 0.82, perspicuity: 0.85, stimulation: 0.78, dependability: 0.80) satisfied acceptable criteria. When combined, these findings imply that the visual language, interaction tempo, and initial flow are already enough for quick repeat sessions and can work as a basis for further content development.

Two themes emerged from the qualitative feedback, which are translated into specific improvements. First, social scaffolding was frequently cited as elements that link play to neighborhood identity and encourage return visits, particularly the district leaderboard and a weekly, time-boxed “Challenge of the Week.” Participants liked the concept of time-limited challenges that reward regular involvement and referred to the leaderboard as a “gentle push” to keep involved. Second, a goal for iteration was the clarity of micro-feedback: many participants requested clearer badge-progress indicators (“what unlocks what”) and quicker, more detailed explanations after erroneous replies. By narrowing the post-answer explanation card and adding progress markers and microcopy to the badge surfaces visible on the session summary, both problems can be resolved without changing the core loop.

During the pilot, the building operated as planned from a systems standpoint. Without gathering personally identifiable information, the analytics service logged session counts, quiz completion, per-item accuracy, and time-on-task once the Unity client successfully linked with the REST APIs (/quiz/next, /score/submit, /leaderboard/{district}). Furthermore, there were no documented adverse occurrences or technical dropouts. Overall, the pilot displayed early usability and perceived value, validated feasibility for brief, frequent sessions, and highlighted two specific UX enhancements (badge-progress visibility and post-answer feedback time) to be implemented prior to neighborhood-scale distribution.

Discussion

According to this pilot, a simple, trivia-first loop can provide brief, repeated engagement for pro-social behavior and municipal learning in Tabriz. It is further enhanced by district-level leaderboards and time-boxed weekly tasks. While requesting quicker corrective feedback and more transparent badge rationale, participants completed 10-item sets at high rates (>85%) in a median of about 3.5 minutes and mentioned social comparison (neighborhood

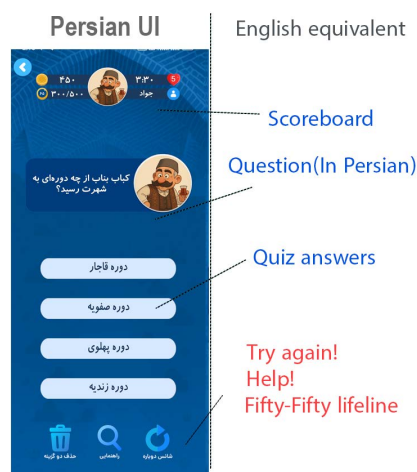


Figure 4. A Sample of Question View

Table 1. Task Performance and Engagement Metrics

Metric	Overall	Municipality-Knowledge	Law-&-Rights	Tabriz-Knowledge
Completion rate (10-item sets)	>85%	88%	84%	86%
Median session duration (minute)	~3.5	3.6	3.4	3.5
Median item accuracy (%)	81%	82%	79%	81%
Time-on-question fit (20–30 second window)	Within window for most items; occasional outliers on longer stems	Consistently within window; minor deviations on complex items	Mostly within window; slightly longer on legal definitions	Within window; rare outliers on historical questions

ranking) and predictable challenge cadence as motivators. These cues are consistent with those of recent research on the reasons and circumstances outside of entertainment contexts that gamification “works”.⁵

Numerous quiz questions addressed behaviors related to urban environment and health (e.g., waste sorting, safe mobility, and emergency preparedness), in addition to general civic education. These practices are situated at the intersection of public health and urban government, where citizen behavior affects injury risk, environmental quality, and shock resilience.^{1,2,8} Tabriz-Senin is positioned as a digital public health instrument that can support more conventional environmental and health initiatives in Tabriz by integrating them into a high-frequency, lightweight mobile experience.

Prioritizing brief sessions with precise, timely performance indicators corresponds to the competence and autonomy mechanisms of SDT, which are frequently linked to retention. According to the systematic assessments of online and health/wellbeing programs, gamification boosts engagement more than just cosmetic points, particularly when feedback makes progress clear.^{5,13} Moreover, design guidance shows that the clarity and usefulness of feedback mediates the association between mechanics and continued use, reflecting our participant’s call for faster corrections and transparent badge rules.¹⁴

District-level leaderboards and a “Challenge of the Week” were well received, which is consistent with the findings of randomized trials, demonstrating that social comparison beat individual-only formats and behaviorally designed gamification with social incentives (competition or support) increased engagement over several months.^{15,16} Beyond novelty effects, meta-analytic research also reveals the long-lasting advantages of gamified problems.¹⁷ Likewise, research on leaderboard design indicates that competition improves effectiveness if it is scaled to smaller communities, refreshed on defined cadences, and combined with clear advancement feedback.¹⁸

According to the literature on microlearning, brief, repetitive tasks reduce cognitive load and accommodate fragmented daily attention, which helps habit formation in mobile settings (e.g., behavior-change and health interventions).^{11,19} This finding is supported by our median ~3.5-minute sessions with high 10-item completion, implying that safety and environmental behaviors important to urban health can be performed in similarly short forms.¹⁹

Civics treatments that enhance civic self-efficacy and knowledge when assignments are brief, structured, and accompanied by clear feedback and apparent progress are similar to foregrounding quizzes that are linked to local laws and services.²⁰ This complements our “Civic Challenges” strategy, which links abstract rules to specific, time-bound microtasks (e.g., waste-reduction week).

According to several human-computer interaction/health evaluations, opaque incentive systems weaken intrinsic motivation and diminish perceived fairness; on

the other hand, explainable prizes (e.g., “why you got X” or “what unlocks next”) increase dependability and perspicuity, two UEQ-S aspects that were monitored earlier. A tappable “How badges work” explainer, visible progress meters, and instantaneous justifications for points and badges should all be included in our upcoming update.¹⁴

Short studies are a good fit for UEQ-S (attractiveness, perspicuity, stimulation, and dependability); new psychometrics research (UEQ+) supports short UX screening as long as internal consistency is examined, which is reported using Cronbach’s α .²¹ In addition, short-form measurement is supported by the original UEQ-S validation for quick iterations.²²

Implications

The top priorities for near-term changes include (1) more rapid on-screen corrective feedback (inline hints+connections to municipal resources for “learn more”), (2) completely transparent badge logic with progress indicators, and (3) ongoing neighborhood-scale competitions on weekly/monthly cadences. In addition to the A/B tests of feedback timeliness, incentive transparency, and district-vs. citywide-leaderboards for deployment, a 4-week to 8-week field trial is proposed to assess retention, knowledge gains, and pro-social behaviors (e.g., waste-sorting pledges, safer crossing behaviors, and improved emergency preparedness) as the proximal indicators of urban environmental and public health impacts.

Limitations of the Study

There was no active comparator. Moreover, the sample was small and convenience-based, and it used personal Android devices in a controlled environment. Accordingly, field testing is necessary for external validity and real-world retention.

Conclusion

Our findings are directionally consistent with those of earlier studies. In a digital health-related civic app, socially limited competition, SDT-aligned feedback, and predictable challenge cadences can sustain brief, recurrent civic-learning sessions centered on environmental and safety behaviors. Additionally, iterating on feedback speed and reward transparency are the most obvious levers for the next release. Finally, district-level social features appear particularly potential for municipal deployment in Tabriz to foster healthier, more sustainable urban living.

Authors’ Contribution

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Supervision: Taha Samad-Soltani.

Writing—Original Draft: Senobar Naderian.
Writing—Review & Editing: Taha Samad-Soltani.

Competing Interests

The authors declare no competing interests related to this publication.

Consent for Publication

Not applicable.

Consent for Publication

Not applicable, as this study does not include individual participant data or identifiable human data requiring consent for publication.

Data Availability Statement

Not applicable.

Ethical Approval

This study was approved by the Ethics Committee of Tabriz University of Medical Sciences before beginning the experiments (research ethics certification code: IR.TBZMED.VCR.REC.1403.301).

Funding

This project was financially supported by the Research Center of the Islamic City Council of Tabriz, and the associated research grant made it possible to implement the design, development, and pilot evaluation phases.

References

1. Rajagopalan S, Vergara-Martel A, Zhong J, Khraishah H, Kosiborod M, Neeland IJ, et al. The urban environment and cardiometabolic health. *Circulation* 2024;149(16):1298-314. doi:10.1161/circulationaha.123.067461
2. Mesa-Vieira C, Gonzalez-Jaramillo N, Díaz-Ríos C, Pano O, Meyer S, Menassa M, et al. Urban governance, multisectoral action, and civic engagement for population health, wellbeing, and equity in urban settings: a systematic review. *Int J Public Health* 2023;68:1605772. doi:10.3389/ijph.2023.1605772
3. Gondi S, Chokshi DA. Cities as platforms for population health: past, present, and future. *Milbank Q* 2023;101(S1):242-82. doi:10.1111/1468-0009.12612
4. Tzamourta KD. Human-centered design and development in digital health: approaches, challenges, and emerging trends. *Cureus* 2025;17(6):e85897. doi:10.7759/cureus.85897
5. Looyestyn J, Kernot J, Boshoff K, Ryan J, Edney S, Maher C. Does gamification increase engagement with online programs? A systematic review. *PLoS One* 2017;12(3):e0173403. doi:10.1371/journal.pone.0173403
6. De Foo C, Verma M, Tan SY, Hamer J, van der Mark N, Pholpark A, et al. Health financing policies during the COVID-19 pandemic and implications for universal health care: a case study of 15 countries. *Lancet Glob Health* 2023;11(12):e1964-77. doi:10.1016/s2214-109x(23)00448-5
7. Permanasari VY, Nadjib M, Sjaaf AC, Besral B, Anjani AA. The response of local governments in financing related to the COVID-19 pandemic: a literature review. *J Public Health Res* 2021;11(2):2620. doi:10.4081/jphr.2021.2620
8. Duea SR, Zimmerman EB, Vaughn LM, Dias S, Harris J. A guide to selecting participatory research methods based on project and partnership goals. *J Particip Res Methods* 2022;3(1):10.35844/001c.32605. doi:10.35844/001c.32605
9. Redvers N, Odugleh-Kolev A, Paula Cordero J, Zerwas F, Zitoun NM, Kamalabadi YM, et al. Relational community engagement within health interventions at varied outcome scales. *PLOS Glob Public Health* 2024;4(6):e0003193. doi:10.1371/journal.pgph.0003193
10. Martinez-Gil J, Pichler M, Lechat N, Lentini G, Cvar N, Trilar J, et al. An overview of civic engagement tools for rural communities. *Open Res Eur* 2024;4:195. doi:10.12688/openreseurope.18077.2
11. Moller AC, Kornfield R, Lu AS. Competition and digital game design: a self-determination theory perspective. *Interact Comput* 2026;38(3):433-46. doi:10.1093/iwc/iwae023
12. Xu L, Shi H, Shen M, Ni Y, Zhang X, Pang Y, et al. The effects of mhealth-based gamification interventions on participation in physical activity: systematic review. *JMIR Mhealth Uhealth* 2022;10(2):e27794. doi:10.2196/27794
13. Johnson D, Deterding S, Kuhn KA, Staneva A, Stoyanov S, Hides L. Gamification for health and wellbeing: a systematic review of the literature. *Internet Interv* 2016;6:89-106. doi:10.1016/j.invent.2016.10.002
14. Cheng VWS. Recommendations for implementing gamification for mental health and wellbeing. *Front Psychol* 2020;11:586379. doi:10.3389/fpsyg.2020.586379
15. Patel MS, Volpp KG, Rosin R, Bellamy SL, Small DS, Fletcher MA, et al. A randomized trial of social comparison feedback and financial incentives to increase physical activity. *Am J Health Promot* 2016;30(6):416-24. doi:10.1177/0890117116658195
16. Patel MS, Small DS, Harrison JD, Hilbert V, Fortunato MP, Oon AL, et al. Effect of behaviorally designed gamification with social incentives on lifestyle modification among adults with uncontrolled diabetes: a randomized clinical trial. *JAMA Netw Open* 2021;4(5):e2110255. doi:10.1001/jamanetworkopen.2021.10255
17. Mazeas A, Duclos M, Pereira B, Chalabaev A. Evaluating the effectiveness of gamification on physical activity: systematic review and meta-analysis of randomized controlled trials. *J Med Internet Res* 2022;24(1):e26779. doi:10.2196/26779
18. Park S, Kim S. Leaderboard design principles to enhance learning and motivation in a gamified educational environment: development study. *JMIR Serious Games* 2021;9(2):e14746. doi:10.2196/14746
19. De Gagne JC, Park HK, Hall K, Woodward A, Yamane S, Kim SS. Microlearning in health professions education: scoping review. *JMIR Med Educ* 2019;5(2):e13997. doi:10.2196/13997
20. Ballard PJ, Cohen AK, Littenberg-Tobias J. Action civics for promoting civic development: main effects of program participation and differences by project characteristics. *Am J Community Psychol* 2016;58(3-4):377-90. doi:10.1002/ajcp.12103
21. Santoso HB, Schrepp M, Hasani LM, Fitriansyah R, Setyanto A. The use of User Experience Questionnaire Plus (UEQ+) for cross-cultural UX research: evaluating Zoom and Learn Quran Tajwid as online learning tools. *Heliyon* 2022;8(11):e11748. doi:10.1016/j.heliyon.2022.e11748
22. Schrepp M, Hinderks A, Thomaschewski J. Design and evaluation of a short version of the User Experience Questionnaire (UEQ-S). *Int J Interact Multimed Artif Intell* 2017;4(6):103-8. doi:10.9781/ijimai.2017.09.001