Supplementary Material S1

Detailed Pedagogical Protocol, Instructional Design, and Gamified Workshop Assets

Associated Article: A gamified active-learning workshop versus traditional instruction: digital competence test scores in first-year university students. An exploratory quasi-experimental study.

Journal: Multimodal Technologies and Interaction (MTI / MDPI)

1. General Overview and Pedagogical Progression Architecture

The gamified active-learning workshop was designed as a five-session progressive learning sequence delivered over one calendar month (80 minutes per in-person session, following the baseline diagnostic Session 0). The instructional logic transitioned from foundational operational skills (institutional platform access, cloud file management, security) to applied academic productivity (office suite processing, synchronous collaboration), concluding with high-level critical, ethical, and reflective skills (information literacy, AI ethics, and digital wellbeing).

Table S1. Comprehensive Workshop Schedule and Methodological Structure

Session	Central Topic	Predominant Methodological Approach	Primary Digital Tools & Assets
Session 1	Institutional Platform Domain & Digital Security	Gamified Escape Room (access, identity verification, cloud organization)	Portal UA, Canvas LMS, MS Teams, Outlook, OneDrive, MS Authenticator
Session 2	Academic Productivity & Office Suite	Progressive Challenge-Based Tasks (document, spreadsheet & pitch design)	MS Word, MS Excel, MS PowerPoint, OneDrive, Canvas LMS
Session 3	Synchronous Collaboration & Netiquette	Permanent Squad Missions with Assigned Technical Roles & Co-Creation	MS Teams (Channels/Chat), Collaborative MS Word (Cloud), OneDrive
Session 4	Information & Data Literacy	Interactive Presentation & Adaptive Branching Competition	Google Scholar, SciELO, Web Search Operators, OneDrive, Gimkit Platform
Session 5	AI Ethics, Critical Use & Digital Wellbeing	Guided Prompt Engineering & Integrative Gamified Assessment	MS Copilot, AI Tools, Gimkit Platform, OneDrive Portfolio

2. Detailed Session-by-Session Instructional Protocol

Session 1: Institutional Platform Domain and Digital Security

Learning Objective: Master the institutional digital ecosystem (Universidad Autónoma de Chile) to foster secure academic self-management.

Phase Breakdown:

- Introduction (15 min): Overview of the centralized @cloud.uautonoma.cl account. Conceptual walkthrough of Canvas (LMS), Teams (synchronous communication), Outlook (formal mail), OneDrive (cloud storage), and Two-Factor Authentication (2FA).
- Development / Mission (50 min): Escape Room Architecture. Permanent student squads (4–5 members) solve chained challenges to unlock room codes: (1) Access LMS via official portals; (2) Update Canvas profile and locate assignment submission portals; (3) Configure Microsoft Authenticator 2FA; (4) Access MS Teams chat; (5) Create the root folder "Digital Portfolio" in OneDrive with subfolders for Sessions 1–5; (6) Draft and send a formal email to the Game Master (Instructor).
- Closure (15 min): Verification of squad exit codes. Formal email verification containing proper salutation, squad identification, and session evidence attachment.

Gamification Component: Physical-digital Escape Room narrative involving room lock codes, verification stamps, and real-time score updates.

Generated Student Artifacts: Authenticated profile status, 2FA setup confirmation, OneDrive root directory structure, formal email submission.

Session 2: Office Suite for Academic Production

Learning Objective: Create digital academic content using word processing, spreadsheet analysis, and slide presentation software.

Phase Breakdown:

- Introduction (15 min): Direct instruction on software application selection: MS Word for structured academic reports/citations, MS Excel for data organization and graphing, MS PowerPoint for concise visual synthesis.
- Development / Mission (50 min): Three sequential productivity challenges: (1) Word Challenge: Formatting an unstyled text on gamification using heading styles, page breaks, and generating an automated Table of Contents; (2) Excel Challenge: Building a data table (10 rows × 3 columns), computing percentages, and generating an annotated bar/line chart; (3) PowerPoint Pitch: Designing a 3-slide presentation (Title, Core Synthesis, Conclusion) adhering to visual contrast principles.
- Closure (15 min): Cloud synchronization verification in OneDrive and assignment submission via Canvas LMS.

Gamification Component: Time-capped progressive production challenges with squad milestone badges.

Generated Student Artifacts: Structured Word document with automated TOC, Excel file with rendered data charts, 3-slide PPT pitch.

Session 3: Synchronous Collaboration and Netiquette

Learning Objective: Manage online team communication and collaborative workflows adhering to professional netiquette standards.

Phase Breakdown:

- Introduction (15 min): Workshop on digital professional identity, formal vs. informal communication channels, profile image appropriateness, and tone modulation when addressing authority figures vs. peers.
- Development / Mission (50 min): Collaborative squad mission: (1) Create a private team channel in MS Teams adding the Game Master; (2) Send contrasting formal and informal chat messages to test netiquette rules; (3) Initialize a shared collaborative MS Word document in OneDrive; (4) Co-author a quick user guide on institutional tools with assigned technical roles per squad member.
- Closure (15 min): Debriefing plenary on online collaboration friction, version control, permission management, and conflict resolution.

Gamification Component: Interdependent squad role assignment (Lead Editor, Technical Verification Officer, Netiquette Reviewer) required to complete the shared artifact.

Generated Student Artifacts: MS Teams private team setup, netiquette chat logs, co-authored cloud Word document, shared access link.

Session 4: Information and Data Literacy

Learning Objective: Search, filter, evaluate, and ethically cite academic information for critical knowledge construction.

Phase Breakdown:

- Introduction (15 min): Participatory discussion contrasting casual web browsing ("Googling") with systematic academic research. Walkthrough of evaluation criteria: authority, affiliation, currency, accuracy, and relevance. Review of copyright, plagiarism prevention, and citation standards.
- Development / Mission (50 min): Guided academic search exercises on Google Scholar and SciELO using Boolean operators and exact phrase matching (""). Squads locate, evaluate, and save 3 peer-reviewed sources into their OneDrive portfolio.
- Closure (15 min): Formative assessment competition via Gimkit covering advanced search syntax, source credibility, and copyright rules.

Gamification Component: Adaptive Gimkit branching session featuring live power-ups, XP accumulation, and immediate feedback loops.

Generated Student Artifacts: Curated academic reference collection in OneDrive, Gimkit real-time accuracy and participation log.

Session 5: Artificial Intelligence, Ethics, and Digital Wellbeing

Learning Objective: Integrate artificial intelligence tools into academic workflows under ethical principles while maintaining digital health and balance.

Phase Breakdown:

- Introduction (15 min): Conceptualization of AI as a "Co-Pilot, not the Pilot". Introduction to MS Copilot for ideation and outline structuring, emphasizing human verification, factual checking, and mandatory disclosure. Discussion on ergonomics, screen time management, and digital disconnection.
- Development / Mission (50 min): Practical prompt engineering exercise: Students craft structured academic prompts, analyze AI-generated outputs, identify hallucinations/errors, rewrite a refined paragraph in their own voice, and complete an ethical usage declaration.
- Closure (15 min): Final verification of the complete OneDrive Digital Portfolio and execution of the integrative final Gimkit challenge.

Gamification Component: Final boss-stage integrative Gimkit challenge combining all 5 session domains, followed by squad portfolio badge certification.

Generated Student Artifacts: Structured prompt log, human-edited academic paragraph, signed AI ethical disclosure, complete OneDrive Portfolio link.

3. Gamification Framework and Assessment Traceability

A. Escape Room Mechanics (Sessions 1–3)

The Escape Room environment utilized interactive presentation interfaces integrated with physical tracking sheets. Squads earned physical/digital validation stamps from the Game Master upon successfully executing technical tasks (e.g., verifying 2FA configuration or setting folder permissions). Reaching room exit codes required 100% participation of all squad members, enforcing positive interdependence.

B. Gimkit Adaptive Assessment (Sessions 4–5)

Gimkit served as an adaptive, gamified assessment platform. Questions were categorized according to the DigComp 2.2 framework. The platform provided instantaneous corrective feedback, allowing students to re-attempt missed concepts in real time while maintaining engagement through game-based incentive mechanics (XP, virtual strategy power-ups).

C. OneDrive Digital Portfolio (Artifact Traceability)

To ensure that gamified activities resulted in concrete competency development, every session generated a verifiable digital artifact. The root directory was structured as follows:

```
/OneDrive - Universidad Autónoma de Chile/
└── Digital_Portfolio_[Student_ID]/
    ├── Session_1_Platforms_Security/ (2FA_Confirmation, Formal_Email_Draft)
    ├── Session_2_Office_Productivity/ (Formatted_Report.docx, Chart_Data.xlsx, Pitch.pptx)
    ├── Session_3_Collaboration/ (Collaborative_Guide.docx, Teams_Log)
    ├── Session_4_Information_Literacy/ (Curated_Sources.pdf, Search_Syntax)
    └── Session_5_AI_Ethics_Wellbeing/ (Prompt_Log, Ethical_Declaration.txt)
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