INPLASY

Gamified interprofessional medical education: A systematic review and neuropsychological analysis

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INTRODUCTION

Review question / Objective 1) To identify the characteristics and quality of existing studies on gamified interprofessional education (IPE) in medical education 2) To identify significant improvements in learning outcomes brought by gamified medical IPE 3) To explore the mechanisms by which gamified medical IPE promotes the acquisition of medical knowledge and skills and interprofessional competencies.

Rationale This study reviews the use of gamification in interprofessional education (IPE) as a means to enhance medical education, and analyses existing game elements in IPE from a psychological and cognitive neuroscience perspective to provide further insight on the psychological basis of gamified IPE in medical education. A review of the type of game elements, learning objectives, learning objectives and quality assessment will help identify 1) the characteristics and quality of existing studies on gamified interprofessional education (IPE) in medical education; an analysis on the study outcomes across included studies will inform 2) significant improvements in learning outcomes brought by gamified medical IPE; a review of current neuroscience and psychological findings on identified game elements, with consideration of an interprofessional and medical context, will inform 3) the mechanisms by which gamified medical IPE promotes the acquisition of medical knowledge and skills and interprofessional competencies.

Condition being studied The three main conditions of gamified interprofessional medical education are gamification, interprofessional education and medical education. Interprofessional education refers to the interactive learning between professionals across different fields; gamification in education refers to the integration

of game elements in a learning environment or activity to enhance student engagement or learning outcomes; medical education refers to education related to the teaching of medical knowledge and skills relevant in clinical scenarios and in the workplace. Combined, gamified interprofessional medical education involves the learning of clinically applicable skills and concepts from other disciplines through activities imbued with game elements.

METHODS

Search strategy ("undergraduate" OR "postgraduate" OR "graduate") AND ("interprofessional" OR "interdisciplinary" OR "cross-disciplinary" OR "transdisciplinary" OR "multidisciplinary" OR "multiple professions" OR "multiple disciplines" OR "multiple programs" OR "different programs" OR "different programs" OR "different professions") AND ("game" OR "gamified" OR "gamification" OR "game-based" OR "play-based" OR "simulation" OR "puzzles" OR "escape room" OR "virtual reality" OR "augmented reality") AND ("medical" OR "medicine" OR "healthcare" OR "health") AND ("education" OR "lessons" OR "learning" OR "course" OR "teach" OR "lecture" OR "activity" OR "experience").

Participant or population Undergraduate or postgraduate students.

Intervention Participants exposed to gamified interprofessional medical education in interdisciplinary groups of 2 or more.

Comparator Comparators may include virtual delivery (live activities versus virtual activities), non-gamified interprofessional professional education (presence of gamification versus the absence of gamification), and time points (pre- and post-test comparisons, with or without follow-up).

Study designs to be included Single group cross-sectional studies, single group post-test studies, single group pre-test & post-test studies, nonrandomised 2-group studies, randomised controlled trials.

Eligibility criteria 1) studies should be primary research published in a peer-reviewed journal between 2019 and 2024; 2) the study should involve medical education; 3) interprofessional groups should be formed, consisting of two or more participants from more than one profession; 4) participants should be exposed to game elements in the learning process; 5) participants of the study should be undergraduate or postgraduate students at the time of intervention; 6) the paper should be written in or officially translated into English. Studies will be excluded if: 1) no test or descriptive statistics are reported; 2) the study is still ongoing ; 3) the study is not published in full.

Information sources Databases: Scopus, PsychInfo, PubMed, CINAHL, EMBASE, ERIC, Web of Science and Medline
Scopus (n = 1881), PubMed (n = 1018), Web of Science (n = 662), Embase (n = 607), CINAHL (n = 522), PsycINFO (n = 249), ERIC (n = 140), MEDLINE (n = 55)
9 additional studies were identified through citation searching.

Main outcome(s) 1) Significant learning outcomes (overall, and in interprofessional collaboration competencies and medical knowledge or skill acquisition respectively) and novelty of studies.
2) Types of game elements used
3) Quality of included studies (assessed by the Medical Education Research Study Quality Instrument (MERSQI) and a new Modified-MERSQI)
4) Existing psychological and cognitive neuroscience studies backing the effectiveness of identified game elements in interprofessional medical education.

Additional outcome(s) Ability of outcomes 2 and 3 in predicting the likelihood of significant outcomes (outcome 1). Synthesis of results from studies using the Readiness for Interprofessional Learning Scale (RIPLS) with single group pre-test & post-test designs.

Data management Citations were imported into Covidence for abstract screening and full text screening. Data extraction will be completed by two reviewers on Covidence with extraction tool 2, and a custom quality assessment template using the MERSQI and MMERSQI.
Covidence systematic review software, Veritas Health Innovation, Melbourne, Australia. Available at http://www.covidence.org.

Quality assessment / Risk of bias analysis Quality is assessed by the Medical Education Research Study Quality Instrument (MERSQI) and a new Modified-MERSQI.

Strategy of data synthesis Categorical data are dummy coded and logistic regressions will be performed on the presence of significant outcomes for interprofessional collaboration competencies

and medical knowledge or skill acquisition. MERSQI and MMERSQI percentage scores are paired by study and compared by paired t-tests. RIPLS scores will be synthesised across pre- and post-test studies (if applicable), and will be adjusted for the number of participants and group size. Paired t-tests and logistic regression will be completed in Python (Jupyter Notebook) or R (R Studio and Jamovi).

Subgroup analysis Subgroup analysis, grouped by game type, study design and assessment inventories and scales, will be analysed by their differences or similarities in study outcomes and study quality (except for study design subgroups).

Sensitivity analysis 1) Abstracts are not included
2) 5-year time range from 2019 to 2024
3) Level of education (and to an extent, age) is narrowed down to university undergraduate or postgraduate students
4) Outcomes analysed are significant outcomes with $p < .05$
5) Only peer-reviewed primary research are included
6) Subgroup analysis is grouped by study design and assessment inventory or scale**.**

Language restriction Studies must be written in or officially translated into English.

Country(ies) involved Hong Kong, China (The University of Hong Kong)

Other relevant information A draft manuscript is written up to the Methodology section.

Keywords Gamification; Interprofessional; Education; Medicine; Psychology; Cognitive Neuroscience.

Dissemination plans The abstract of the review will be presented at the 2024 North American Laidlaw Scholars Annual Student Conference at Columbia University in November 2024. A research report will be uploaded to the Laidlaw Scholars website. We plan to publish the final manuscript in an academic journal.

Contributions of each author
Author 1 - Yui Hin Ng - Author 1 drafted the manuscript, and screened all studies. Modelling and data extraction will be done by author 1. The author is a recipient of the Laidlaw Undergraduate Research and Leadership Scholarship and a consecutive Dean's Honour List student majoring in Psychology and Neuroscience at the University of Hong Kong.

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Author 2 - Fraide Jr. Agustin Ganotice - Consensus reviewer, will supervise or participate in all of Author 1's work. Author 2 is an expert in interprofessional education and the director of the Bau Institute of Medical and Health Sciences Education at the University of Hong Kong. He is an assistant professor and the supervisor of Author 1.
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