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DIGITAL GAMES USE IN ENTREPRENEURHIP EDUCATION AT THE UNDERGRADUATE LEVEL: A SYSTEMATIC REVIEW

USO DE JUEGOS DIGITALES EN LA EDUCACION EMPRESARIAL A NIVEL DE PREGADO: UNA REVISION SISTEMATICA

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ABSTRACT

Past reviews on digital games use in entrepreneurship education failed to provide detailed information on how researchers employed gameplay in learning models. Additionally, prior reviews have inadequately examined the methodological rigor and the distributional characteristics of articles within such an area. This systematic review provides information about the geographic spread and breadth of digital games use in entrepreneurship education literature. More importantly, the current analysis provides in depth assessment of the methodological attributes of published articles in the discipline. Based on the comprehensive evaluation, future research directions are suggested to strengthen this area of study.

KEYWORDS

digital games, entrepreneurship education, game-based learning design, simulation games, higher education

RESUMEN

Las revisiones anteriores sobre el uso de juegos digitales en la educación empresarial no proporcionaron información detallada sobre cómo los investigadores emplearon el juego en los modelos de aprendizaje. Además, las

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revisiones anteriores han examinado de manera inadecuada el rigor metodológico y las características de distribución de los artículos dentro de dicha área. Esta revisión sistemática proporciona información sobre la distribución geográfica y la amplitud del uso de juegos digitales en la literatura sobre educación empresarial. Más importante aún, el análisis actual proporciona una evaluación profunda de los atributos metodológicos de los artículos publicados en la disciplina. Con base en la evaluación integral, se sugieren direcciones de investigación futuras para fortalecer esta área de estudio.

PALABRAS CLAVE

juegos digitales, educación empresarial, diseño de aprendizaje basado en juegos, juegos de simulación, educación superior

INTRODUCTION

Digital games increase students' interest, engagement, and motivation along the entrepreneurial learning excursion (Samuel & Rahman, 2018; Takemoto & Oe, 2021; Chen et al., 2022). More importantly, many researchers and practitioners argue that the use of digital games improves learners' entrepreneurial intentions, as well as activity (Chen et al., 2021; Pech et al., 2021; Ozgen, 2022). The use of computerized digital games in entrepreneurship education (EE) has exponentially grown in the past decade (Fox et al., 2018; Ivanytska et al., 2021; Secundo et al., 2021). There is little research summarizing digital games use and entrepreneurship education. This present review covers the aforementioned gap in the literature.

The abrupt closures of university and college campuses in March of 2020 because of Coronavirus, entrepreneurship Professors shifted their classes to online, virtual, and remote learning environments (Choudhary, 2021; Huang, 2021; Kauppinen &; Rezghi et al., 2022). One particular technology, digital games, gained popularity in the EE for its high experiential, critical thinking, cognitive demanding, and real-world scenarios' simulation capabilities (Fellnhofer, 2018; Lamine et al., 2021; Chen et al., 2022). Despite the growing interest and publishing in the area of digital games implementation in EE settings (Mollick, 2020; Takemoto & Oe, 2021; Ozgen, 2022), there have been no reviews or syntheses outlining the main trends in this area of scholarly research.

Past investigations on the implementation of digital games in EE at the undergraduate level have inadequately examined the variety of ways researchers have utilized digital games in EE contexts (Granić et al., 2017; Bagheri, 2019; Covaş et al., 2019) Information on the extent to which digital games have been used as dependent or independent variables in EE investigations is unknown (Krajger, et al., 2018; Panchenko, et al., 2020; Situmorang, et al., 2021). Antecedents and outcomes of using digital games in EE research have not been adequately explored in the extant empirical literature (Fleacă, 2017; Hidayat, 2018; Almeida & Buzady, 2019). The moderators or mediators in the association between digital games use and EE outcomes, while plentiful and variegated, have been insufficiently explored (Newbery, et al., 2016; Almeida, 2017; Rosli, et al., 2019; Onder, 2019a; Onder, 2019b).

Past reviews on digital games in entrepreneurship failed to identify associations between games' use and learning outcomes (Fu et al., 2016; Popescul, et al., 2016; Moraffi, et al., 2017). Reviews on digital games in business education at large have not examined the various research designs, methods, and sources of articles (Bogers & Sproedt, 2012; Carenys & Moya, 2016; Oe, et al., 2020). Many features differentiate the present review from its prior ones. First, information on journals and authors affiliations and methodological rigor is offered (Lee & Giorcelli, 2015; Ellahi, et al., 2017; Grivokostopoulou, et al., 2019). Second, themes in the research design and significance pattern of findings are presented since past reviews neglected the noticeable amount of non-significant findings reported in the literature (Kebritchi, et al., 2010; Wardaszko, et al., 2016; Akhmetshin, et al., 2019; Chen, et al., 2021).

The purpose of this review is to synthesize how researchers used digital games in EE settings at the undergraduate level. The objective of this paper is to report the methods, samples, and data analysis techniques used in the literature on digital games and EE. In addition, the review outlines the main theory antecedents and outcomes used in the digital games and EE literature. First, the characteristics of published articles are considered including the year, venue, author's affiliation, citations, and ranking of the publication. Then, the review explores the patterns researchers used digital games in their studies whether as independent or dependent variables. Next, the synthesis examines the various antecedents, moderators, mediators, and outcomes of digital games use in EE contexts. The investigation also covers the methodologies, theories, and models used in studying digital games use in EE research at the undergraduate level. This review is mainly concerned with undergraduate level courses covering all classes on the freshmen, sophomore, junior, and senior levels. This decision does not restrict the findings from being used in other applications like non-undergraduate EE settings.

Business school faculty and professional instructors of EE benefit from the findings of this review in several respects. Game features associated with increased students' engagement in the learning process would be identified helping teachers better select from the plethora of available options. Further, the identification of popular games that increase students' entrepreneurial attitudes and intentions would be recommended for higher education and professional learning staff to be used in their courses. In addition, knowledge of the specific skills each tested game in the literature possesses permit higher education staff to align their teaching with specific games that are deemed appropriate for their own setting.

Knowledge concerning the effectiveness of digital games' use in EE aids policymakers and higher education stakeholders in reformulating the curriculum and instruction of entrepreneurship courses at the undergraduate level. Identifying specific links between games' utilization and EE outcomes like intentions or behaviors allow decision-makers to utilize empirical findings to support their choices when altering learning systems at the higher education level. More specifically, learning how gameplay affects different EE outcomes enable instructors to deploy different levels of gameplay at various stages of entrepreneurial learning.

Information presented in this synthesis allows game designers to better refine their development strategies. Learning how different game features like flow, challenge, or rules influence various EE outcomes like intentions, self-efficacy, or

action enables designers to accentuate needed features while deemphasizing others in future games' updates. In a similar vein, when instructors note deficiencies in a specific area like entrepreneurial passion or intentions, they may aggrandize their use of particular games or features in those games to ameliorate students' outcomes in the areas of need.

This review highlights the main theoretical and methodological shortcomings of digital games' use in EE literature. The quality of research designs, sampling strategies, data collection, and analysis techniques are rigorously assessed. Knowledge from learning the common conceptual gaps aid future researchers with a guiding foundation to better investigate the relationship between digital games' use and EE outcomes. Simultaneously, learning the most common theories adopted by authors in the literature allows future researchers to identify missing theoretical links to be accounted for in their constructed games or models.

The rest of the manuscript is organized in the following manner. A methodology section outlining the search terms, names of databases, eligibility criteria, inclusion rules, and exclusion stipulations is detailed for readers to gain an understanding of how the researcher compiled the body of articles to be analyzed. Next, the analysis of all articles starts with outlining the characteristics of articles including the year of the publications, the number of citations per publication/year, and the journal ranking on the ABCD continuum in business management fields. Following the description of the articles' publication attributes, the researcher offers a systematic review of the methodologies employed in the scholarly corpus considered in this research. Subsequently, the antecedents, decisions, and outcomes of digital games in the literature are investigated within all articles. Furthermore, an analysis of digital games' features, users' motivations/intentions, and mediators/moderators used in studies are thoroughly evaluated. In the final section, a list of practical future research directions is supplied to stakeholders to better advance digital games' use effectiveness in EE settings at the higher education level.

METHODOLOGY

First, the targeted databases featuring relevant literature on digital game use and entrepreneurship education were specified. Business Source Complete, ABI/INFORM, and Google Scholar were searched separately for related articles for inclusion in this review. All databases were accessed between Oct 1st and Nov 1st, 2022. The search in each database was conducted in more than a single session over a period of a few days.

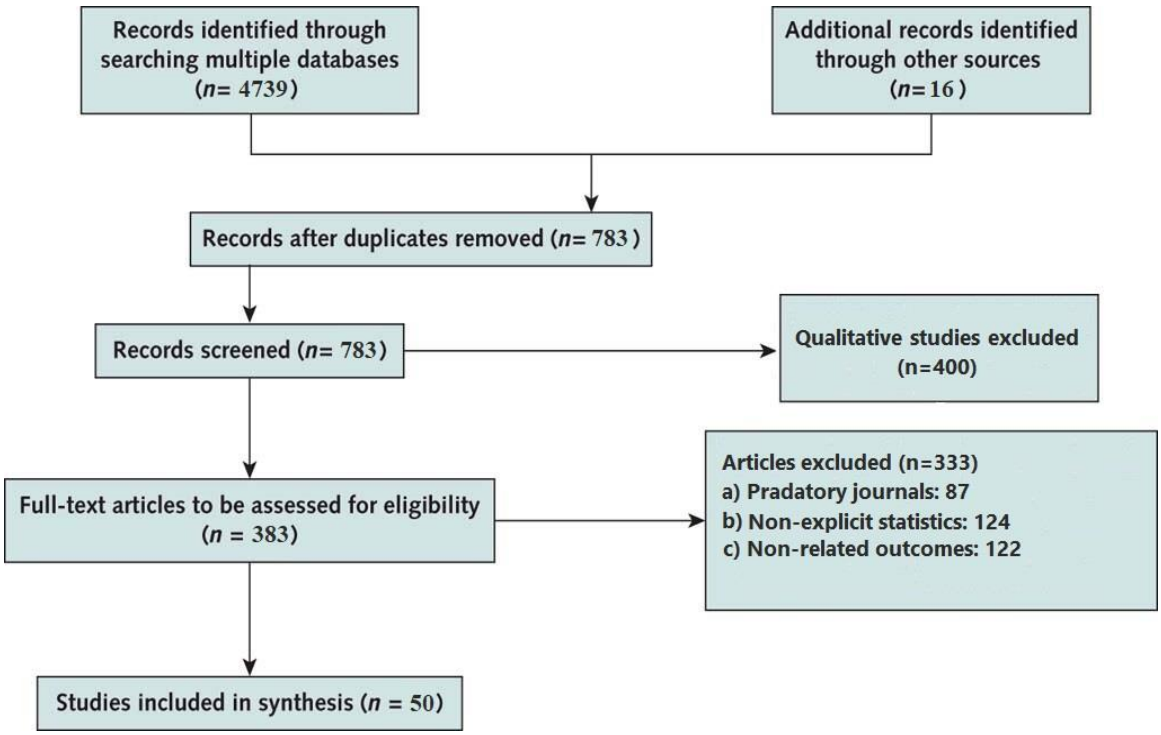
The search keywords and subject terms were: (computer game OR digital game OR virtual game OR electronic game OR video game OR digital simulation game OR computer-based OR serious game OR game-based) AND (entrepreneur education OR entrepreneur learning OR entrepreneur teaching). Each search featured the use of all aforementioned terms to capture any article that utilized any combination of terms found within the two sets.

The inclusion criteria for this review featured peer-reviewed articles published in English-language journals. Note that all included papers in the review are from peer-reviewed journals that published stringent criteria for accepting quality manuscripts. Book chapters, conference papers, posters, or reports were excluded because there is no way to examine the degree to which such

publications went through rigorous publication procedures. Since digital games are new to higher education, articles published prior to 2010 were excluded. The reliance on digital games in teaching entrepreneurship is a recent phenomenon. The rise of e-learning, virtual education programs, and massive Open Online Courses after 2010 assisted in popularizing digital games as educational tools (Fellnhofer, 2015; Ellahi, et al., 2017; Peterková, et al., 2022). Further, the closure of college and university campuses because of COVID-19 in 2020 around the world helped increase the reliance on digital games making it a novel approach for teaching entrepreneurship in higher education. Note that all articles in digital games use and EE since 2010 were included in this analysis. Further, the data collection period took one month to collect the information to complete this research.

An initial pool of 4739 studies were identified in all database searches. To narrow this large number to a manageable figure, all studies published prior to 2010 were removed resulting in 3026 studies. Then, all conference papers, book chapters, and theses/dissertations/working papers were removed downsizing available studies to 1483. Duplicates were then excluded resulting in 783 articles. Conceptual and non-empirical reports, reviews, and synthesis were removed resulting in 517 studies. Then qualitative studies were taken away decreasing the number to 383. From the remaining pool of articles, papers in a) non-predatory journals, b) with available full-text accessible files, and c) explicitly has statistics or effect sizes on the role of digital games use in entrepreneurship outcomes were retained resulting in 50 codable articles.

Figure 1. Studies selected.



All peer-reviewed available journals in the searched databases were included in this research. One noteworthy observation is that mainstream entrepreneurship flagship journals have not published many papers on digital

games use in entrepreneurship education. Most published articles are found in non-ranked journals on the ABCD conventional ratings of top publications in business schools. Therefore, excluding non-ranked journals will result in eliminating an entire body of literature, and thus unjustifiable. Further, many articles were published in non-business or entrepreneurship journals. Such papers were featured in education technology publications venues or humanities/social science journals (Almeida, 2017; Bamufleh, et al., 2020; Dowling-Hetherington, et al., 2020; Pech, et al., 2021; Huang, et al., 2022; Onder, 2022).

Within each article, the research design, sampling strategy, number of participants, and statistical analysis techniques used were gathered. Further, the journals' name, its country of affiliation, and impact factor were collected to learn more about the quality of publications on the topic. Further, the nature of digital games use as a variable was assessed by extracting whether it was an independent, dependent, moderator, or mediator and theory within the empirical analyses featured in the review. Finally, the main findings of each article to uncover the main trends and non-findings in the literature were also mined to provide readers with succinct accounts of the literature on digital games use in entrepreneurship education. Note that recommended presentation practices of systematic reviews' findings suggest the showcasing of all included manuscripts in the analysis (Page at al., 2022).

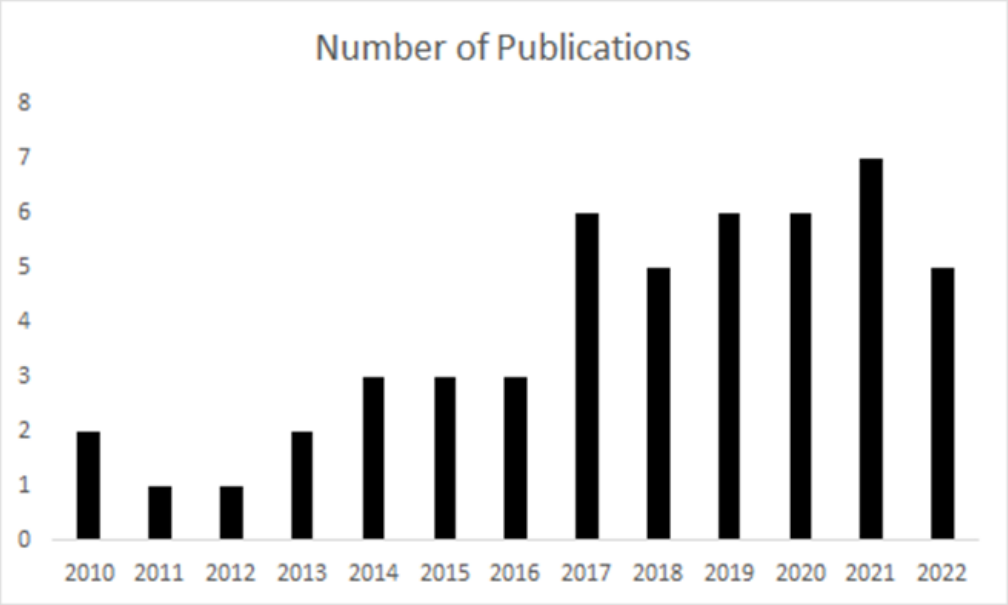
It would be unjustifiable to disregard research papers solely on the basis of falling into a ranking system. Further, many editors at top journals may not be interested in a variety of topics leading to the exclusion of the research area from mainstream journals. Many of the included journals have metrics like impact factors. Nevertheless, research has never been defined by a single number like a specific ranking, designation, or a number summarizing the quality of a paper. Each paper on digital games use and EE at the undergraduate level published between 2010 and the time of writing this research had an equal chance of being selected in the sample of paper included in this research. If one author published more than a single paper, all the papers on this research's topic were included. Note that all papers included were featured in the databases search. This approach is consistent with the way systematic reviews have been conducted in business administration fields.

RESULTS

Publications trend

Figure 2 demonstrates the number of publications using quantitative methods on digital games use in entrepreneurship education between 2010 and 2022. Noticeably, there is a rising interest as time passes in digital games and entrepreneurship publications. The second half of the past decade witnessed more publications compared to the first half. The past two years have also seen a significant interest in the phenomenon. Two potential explanations arise to clarify such a trend. First, the past seven years witnessed the development of more online and virtual courses needing remote educational platforms. The gaming industry has taken note of such a need and developed several products to be used at the higher education sector. Second, the global pandemic of Covid-19 has led to the reliance on remote teaching resources like business simulations in entrepreneurship courses.

Figure 2. Number of publications by year.



Distribution of Digital Games and Entrepreneurship Research

There are 42 journals that published empirical papers on digital games and entrepreneurship education between 2010 and 2022. Out of the total number of journals, 18 possess an impact factor while 24 journals did not publish information about their publication impact factor. The average impact factor for the 18 journals is 1.28. The highest impact factor is associated with Computers & Education. Sustainability has the highest number of appearing articles equal to 4. Computers & Education and Journal of Entrepreneurship Education each published 3 papers. The vast majority of journals are associated with a single paper. One potential explanation to this phenomenon is the interdisciplinary nature of the field. Reading journals' titles gives the impression that many audiences are interested in the utilization of digital games in entrepreneurship education around the world.

Table 1 displays the names of journals, their impact factors, and the number of papers appearing in them to convey a distribution al trend of research on digital games and entrepreneurship education.

Table 1. The distribution of papers on journals and their impact factors

Journal Names	Journal Impact Factor	Article
Sustainability	3.88	4
JIBED	Unavailable	1
Cypriot Journal of Educational Sciences	Unavailable	2
Journal of Educational Computing Research	3.08	1
Journal of Small Business & Entrepreneurship	2.82	1
Journal of Enterprising Culture	1.78	1
University of Hudersfield Journal	Unavailable	1
Journal of Education and Learning	1.93	1
Simulation & Gaming	1.77	1
Computers & Education	11.18	3

Journal on Efficiency and Responsibility in Education and Science	0.25	1
Computers in Human behavior	6.82	1
Journal of Entrepreneurship Education	0.41	3
Educational Technology & Society	2.633	2
Australasian Journal of Educational Technology	1.171	1
International Journal of Training and Development	Unavailable	1
Perspectives on Computer Gaming in Higher Education	Unavailable	1
Jurnal Manajemen	Unavailable	1
Journal for International Business and Entrepreneurship Development	Unavailable	1
Journal of Educational Technology & Society	2.633	1
Journal of research on technology in education	3.281	1
Digital systems for open access to formal and informal learning	Unavailable	1
Decision Sciences Journal of Innovative Education	Unavailable	1
Entrepreneurship Education	Unavailable	1
World Review of Entrepreneurship, Management and Sustainable Development	Unavailable	1
Active Learning in Higher Education	1.45	1
Central European Conference on Information and Intelligent Systems	Unavailable	1
International conference on interactive collaborative learning	Unavailable	1
WSEAS Transactions on Environment and Development	Unavailable	1
Journal of Small Business Management	3.461	1
Developments in Business Simulation and Experiential Learning: Proceedings of the Annual ABSEL conference	Unavailable	1
Issues in Information Systems	Unavailable	1
Budapest International Research and Critics in Linguistics and Education (BirLE) Journal	Unavailable	1
Journal of teaching in international business	Unavailable	1
US-China Education Review	Unavailable	1
Transformations in Business & Economics	1.963	1
Academy of Entrepreneurship Journal	2.114	1
Digital Education Review	Unavailable	1
Industry and Higher Education	Unavailable	1
Economics, Finance and Management Review	Unavailable	1
Ovidius University Annals, Economic Sciences Series	Unavailable	1

Note. Average of 18 journals with impact factors 1.283. There 24 journals without impact factor.

Figure 2 displays the number of publications on digital games use and EE since 2010. Table 1 demonstrates the distribution of papers on journals and their impact factors. On the surface level, it appears that no relationship exists between the content of the two information sets. On a deeper level, however, one may note the higher number papers published by more journals including few with impact factors. This indicates more interests in the topic among journal editors in business disciplines.

Table 2 showcases all articles along their citations. Overall, the total number of citations for all articles is 3136. Such a figure conveys an importance of this research agenda across several fronts and within many disciplines. By the same token, few articles are influential in the field by having a large number of citations. For instance, Kebritchi, Hirumi and Bai (2010) analysis on the effects of Mathematics computer games on students' achievement in business related statistics/mathematics course has the highest number of citations (917). The next most cited paper was written by Sanchez (2013) on the use of a specific

entrepreneurship digital gaming program and its relation to entrepreneurship intentions with 762 citations. Next, the

Guillén-Nietoand Aleson-Carbonell (2011) study on the effects of games on learning outcomes has 412 citations. All other papers in this investigation have less than 100 citations. One of the explanations to this observation is the recent date of many papers' publications.

Table 2 also demonstrates the names of the authors to published papers on digital games and entrepreneurship education. On the one hand, most authors published one article on their topic of interest. Zulfiqar (2019, 2021) seems to be the most prolific writer on the subject attempting to analyze simulations effects on students' attitudes and intentions concerning entrepreneurship with 2 distinct publications. Similarly, Fellnhofer appears to be one of the most interested researchers on the topic with two different papers. One of the noticeable observations is that most articles are the fruits of the collaborative efforts of more than a single author. About 20% of the entire body of included articles, single authors are the sole investigators of the projects.

In other words, most research articles were written by two or more authors. One of the potential explanations for this trend is that business Professors across colleges and universities partner with each other in designing digital simulations for teaching their or courses. Alternatively, faculty teams adopt ready to use games or simulations to be incorporated into their curriculum.

Table 2. Article name and number of citations

Article Title	Authors' Names	Year	Citations
Best Practice of Using Digital Business Simulation Games in Business Education	Peterková, J., Repaská and Prachařová (2022)	2022	0
Changing entrepreneurial intention and behaviour: a digital game-based learning environment dedicated to entrepreneurship education	Fellnhofer	2015	27
Experience with entrepreneurship learning using serious games	Almeida	2017	18
An analysis of influence of business simulation games on business school students' attitude and intention toward entrepreneurial activities	Zulfiqar, Sarwar, Aziz, Ejaz Chandia and Khan	2019	99
Understanding and predicting students' entrepreneurial intention through business simulation games: a perspective of covid-19	Zulfiqar, Al-reshidi, Al Moteri, Feroz, Yahya and Al-Rahmi	2021	23
Effects of entrepreneurship simulation game seminars on entrepreneurs' and students' learning	Huebscher and Lendner	2010	62
Developing cognitive and non-cognitive entrepreneurial competences through business simulation games	Costin, O'Brien and Hynes	2019	9
Impact of business simulation games in enterprise education	Williams	2011	33
Students' Acceptance of Simulation Games in Management Courses: Evidence from Saudi Arabia	Bamufleh, Hussain, Sheikh and Khodary	2020	6
The impact of international business strategy simulation games on student engagement	Rogmans and Abaza	2019	26
Applying a business simulation game in a flipped classroom to enhance engagement,	Huang, Silitonga and Wu	2022	17

learning achievement, and higher-order thinking skills			
Students Preferences in Teaching Methods of Entrepreneurship Education	Pech, Rehor and Slabová	2021	7
Students' perception of the impact of competences on learning: An analysis with business simulations	Hernández-Lara, Serradell-López and Fitó-Bertran	2019	23
Game-based entrepreneurship education: Identifying enterprising personality, motivation and intentions amongst engineering students	Mayer, Kortmann, Wenzler, Wetters and Spaans,	2014	37
A study of supplementing conventional business education with digital games	Ellahi, Zaka and Sultan	2017	24
Alignment of teacher and student perceptions on the continued use of business simulation games	Tao, Cheng, Sun	2012	48
Understanding online business simulation games: the role of flow experience, perceived enjoyment and personal innovativeness	Matute-Vallejo, Melero-Polo	2019	42
Business students' experiences of technology tools and applications in higher education	Dowling-Hetherington, Glowatz, McDonald, Dempsey	2020	10
Learning Business Through Simulation Games. Survey Among Students Who Played Developed Games	Õun, Mägi, Noppel	2016	1
Business Simulation, Student Competency, And Learning Outcomes	Dharmastuti, Darmoyo, Gunawan, Duka	2021	1
Changing entrepreneurial intention and behaviour: a digital game-based learning environment dedicated to entrepreneurship education	Fellnhofer	2015	27
A study of supplementing conventional business education with digital games	Ellahi, Zaka, Sultan	2017	26
Digital Games in Education The Design of Games-Based Learning Environments	Gros	2014	87
Digital game-based learning in the context of school entrepreneurship education: Proposing a framework for evaluating the effectiveness of digital games	Panoutsopoulos, Sampson	2014	6
Gamification of Entrepreneurship Education	Isabelle	2020	45
Experience with Entrepreneurship Learning Using Serious Games	Almeida	2017	20
Online and blended entrepreneurship education: a systematic review of applied educational technologies	Chen, Ifenthaler, Yau	2021	22
Game-based entrepreneurship education: impact on attitudes, behaviours and intentions.	Fellnhofer	2018	30
Motivation to adopt game-based learning (gbl) for employee training and development: A case study.	Sugahara	2018	8
Central issues in the use of computer-based materials for high volume entrepreneurship education.	Cooper	2010	11

Preliminary Evaluation of a 3D Serious Game in the Context of Entrepreneurship Education	Granić, Nakić, Ćukušić	2017	2
Creating and testing a game-based entrepreneurship education approach	Krajger, Lattacher, Schwarz	2018	7
Innovative teaching techniques for entrepreneurship education in the era of digitalization	Mavlutova, Lesinskis, Liogys, Hermanis	2020	15
Innovative technologies in entrepreneurship education: The case of European and Asian countries.	Akhmetshin, Mueller, Chikunov, Fedchenko, Pronskaya	2019	21
The Impact of an Entrepreneurship Education Program on Entrepreneurial Competencies and Intention	Sánchez	2013	762
The Impact of Serious Games in Economic and Business Education: A Case of ERP Business Simulation.	Beranič, Heričko	2022	9
Influencing attitudes towards entrepreneurship with digital game-based educational experience in secondary education.	Wardaszko, Wittenzellner, Holzmann, Winniczuk	2016	2
The effects of modern mathematics computer games on mathematics achievement and class motivation.	Kebritchi, Hirumi, Bai	2010	917
Examining the impact of a gamified entrepreneurship education framework in higher education	Grivokostopoulou, Kovas, Perikos	2019	47
Serious games and learning effectiveness: The case of It's a Deal!.	Guillén-Nieto, Aleson-Carbonell	2011	412
An exploratory study on the relationship between digital games and transfer of learning	Lee, Giorcelli	2015	10
Is gamification a magic tool?: Illusion, remedy, and future opportunities in enhancing learning outcomes during and beyond the COVID-19	Oe, Takemoto, Ridwan	2020	14
Playful collaboration (or not): using a game to grasp the social dynamics of open innovation in innovation and business education	Bogers, Sproedt	2012	35
Learning on gaming: a new digital game based learning approach to improve education outcomes.	Maraffi, Sacerdoti, Paris	2017	20
Education by Choice, Not by Chance: Adjustment of Business Education to the Requirements of Contemporary Organisations.	Popescul, Pavaloaia, Tugui, Georgescu, Radu, Berechet	2016	34
Gamification in entrepreneurship and accounting education.	Rosli, Khairudin, Saat	2019	9
Assessment of entrepreneurship competencies through the use of FLIGBY.	Almeida, Buzady	2013	18
Entrepreneurship Education Through Mobile Augmented Reality for Introducing SMEs in Higher Education	Situmorang, Kustandi, Maudiarti, Widyaningrum, Ariani	2021	2
Application of innovative smart technologies of virtual reality in business education as the basis of qualified professional preparation of future managers.	Panchenko, Haleta, Chernenko	2020	2

Sustainability of Entrepreneurial Education in the Republic of Moldova	Covaș, Solcan, Stihi	2019	3

Note. The total number of citations is 3136.

Figure 3 presents the distribution of journals per country hosting all journals considered in this research. Note that the United States has the highest number of journals publishing on digital games and entrepreneurship education. The United Kingdom follows the lead of the US in hosting journals publishing empirical papers on the topic. Western European countries like Switzerland, The Netherlands, and Australia all have one journal that published papers on different aspects of the association between digital games and entrepreneurship education. By the same token, Singapore, Hong Kong, and Malaysia in addition to Australia have each at least one journal that published papers on games and entrepreneurship in educational settings. Note that all countries highlighted in Figure 3 have relatively advanced higher education systems supportive of the establishment and maintenance of excellent academic journals in entrepreneurship-related topics.

Figure 3. Distribution of digital games in entrepreneurship education research

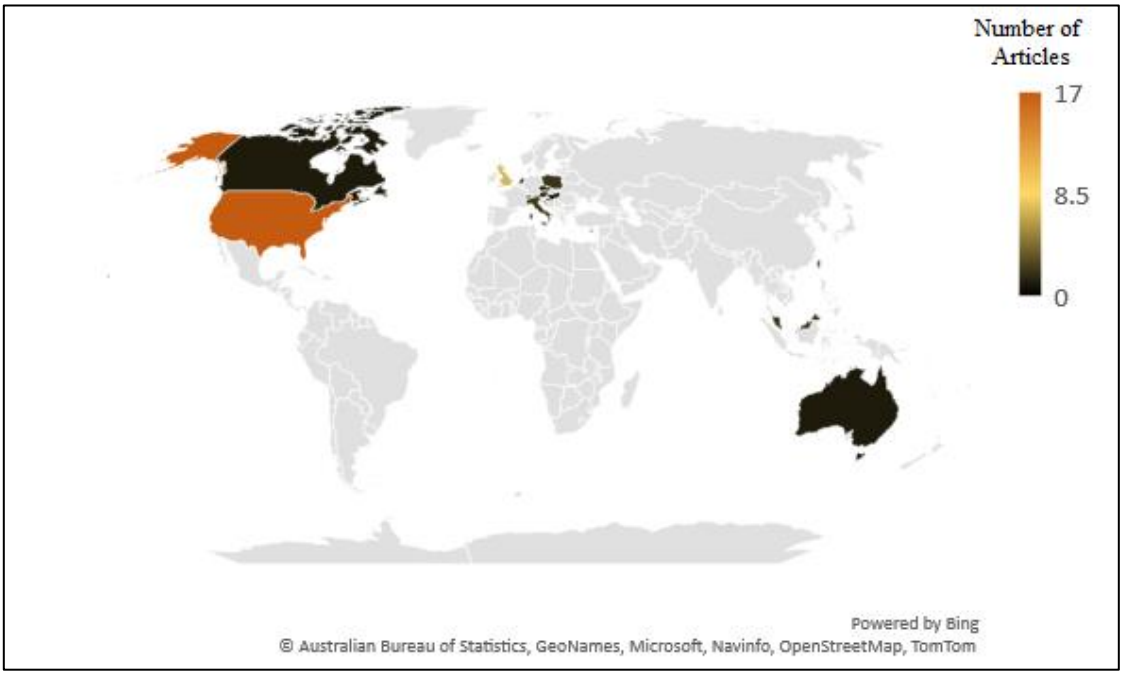


Figure 4 represents the distribution of first authors' countries for the fifty articles on digital games use and entrepreneurship education included in this research. Note that Spain has the highest number of articles compared to the rest of the world. The US, UK, Pakistan, and Switzerland all have more than a single article on digital games and entrepreneurship education. East Asian countries including Taiwan, Hong Kong, and Malaysia also featured more activity compared to large countries like China or Canada with more than a single paper on the same topic. Small Western European nations like Austria and The Netherlands each have 1 author interested in the subject. Similarly, Eastern European nations like Czech Republic and Romania each has a single author. The authors' distribution map is dispersed including many continents like North America, Europe, Asia, and

Australia. Notably, The Middle East and North Africa, African countries, and Latin American nations did not have a single author on digital games and entrepreneurship education. One of the potential explanations of the observation is the limited use of innovative technology in higher education in these regions. More importantly, most games are in English and learners in such countries have lower English proficiency competencies compared to Western Europe and advanced Eastern Asian countries.

Figure 4. Distribution of authors in entrepreneurship education research

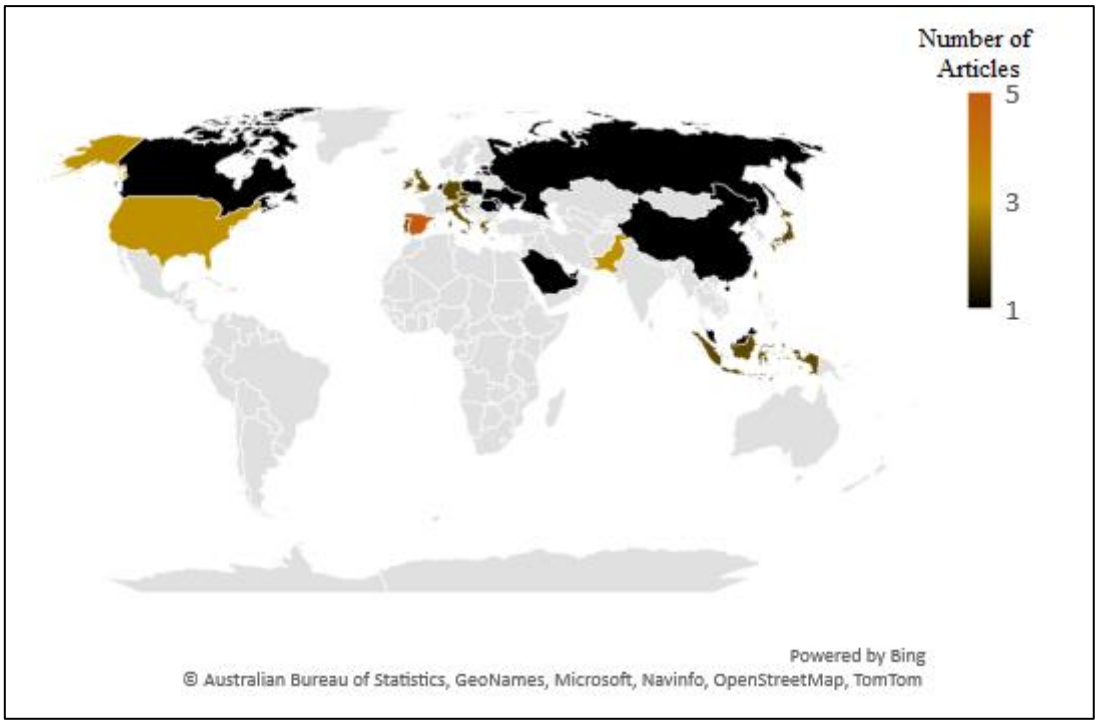
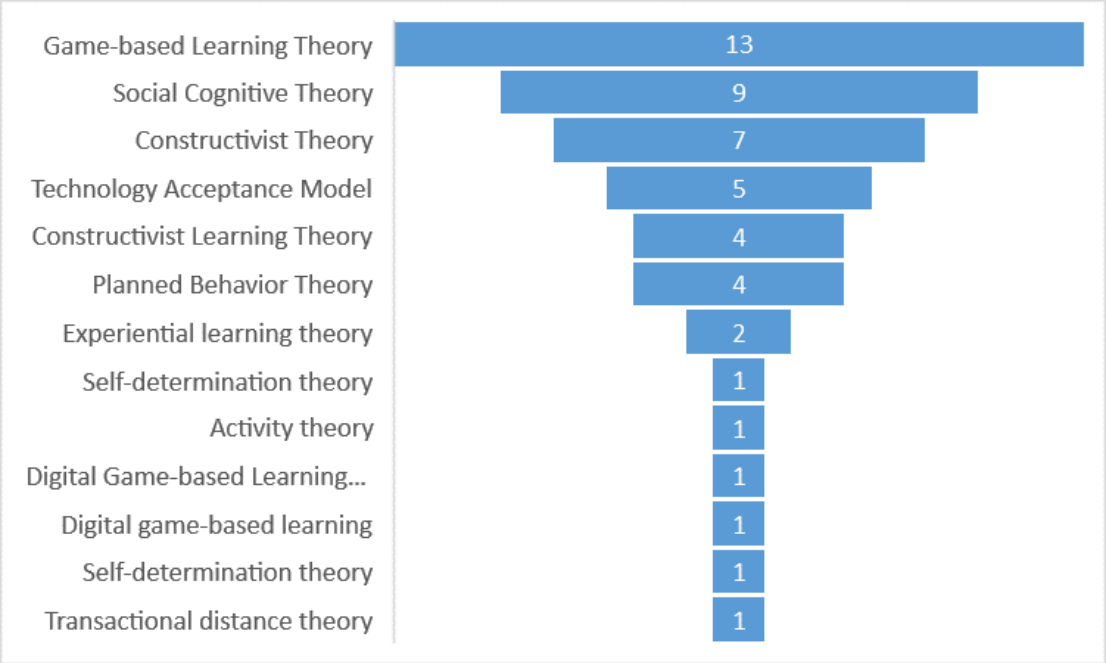


Figure 5 showcases the common theories cited or used by authors in the digital games and entrepreneurship education research articles in this analysis. The most prevalent theory is game-based learning or gamification theory. While many authors stated or implied the use of games related theories, most have not provided graphical representations of the variables and relationships in the actual published content. Second, behavioral models like social cognitive or planned behavior theories are common in the literature. Third, educational learning frameworks primarily represented by constructivism and its wide manifestations constituted another popular theoretical underpinning to the research. Next, education technology models like the technology acceptance model and its associated derivatives have been represented by few authors in the research on digital games and entrepreneurship education. While authors may have labeled their theories using various nomenclature, behavioral, educational and technology models all have been referenced to back the formulation of hypotheses tested throughout the research articles included in this analysis.

Figure 5. Distribution of Theoretical Frameworks in Digital Games and Entrepreneurship Education

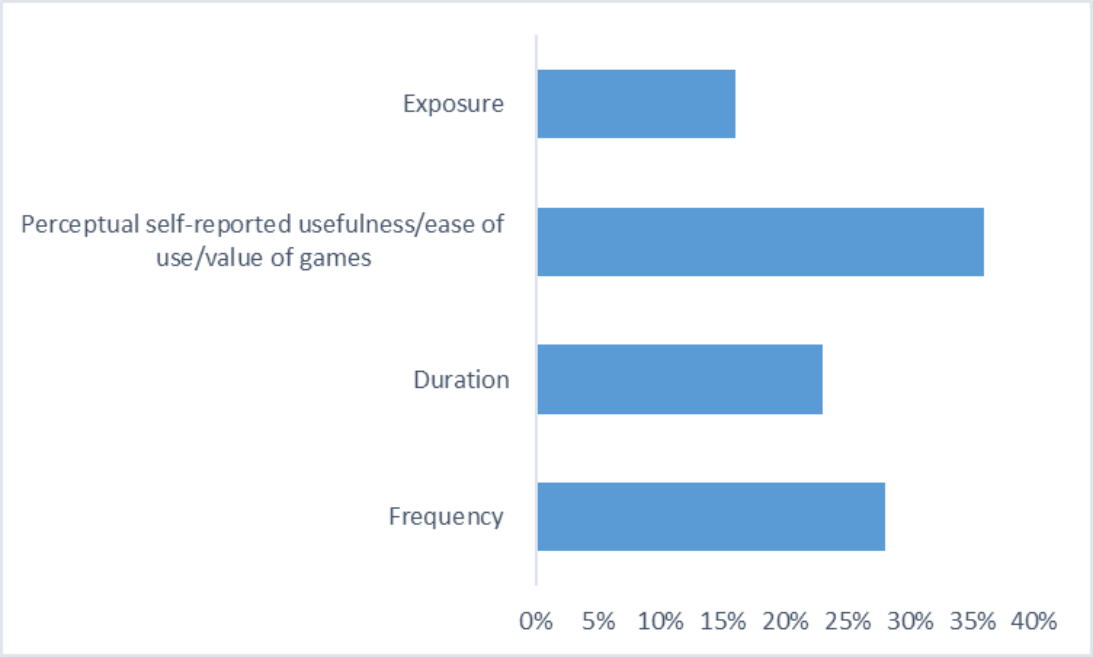


Digital Games and Entrepreneurship Research Themes

Theme One: Using Digital Games as an Independent Variable

One of the major themes emerging in this research is the different uses of digital games as independent variables in explaining entrepreneurial education outcomes. The most common use of digital games is to measure learners' perceived value of gameplay associated with learning outcomes. Researchers utilize ease of use, usefulness, and self-efficacy with respect to digital games measures to quantify gameplay effects on entrepreneurial outcomes. Additionally, researchers have utilized the frequency of gameplay as a metric assessing its effect on learning. Relatedly, authors have used the duration of total gameplay in models predicting digital games effects on entrepreneurial education measures. Few quasi-experimental designs have utilized simple exposure to gameplay and its use in learning to investigate digital games effectiveness in enhancing learning outcomes.

Figure 6. The different uses of digital games as independent variables in explaining entrepreneurial education outcomes

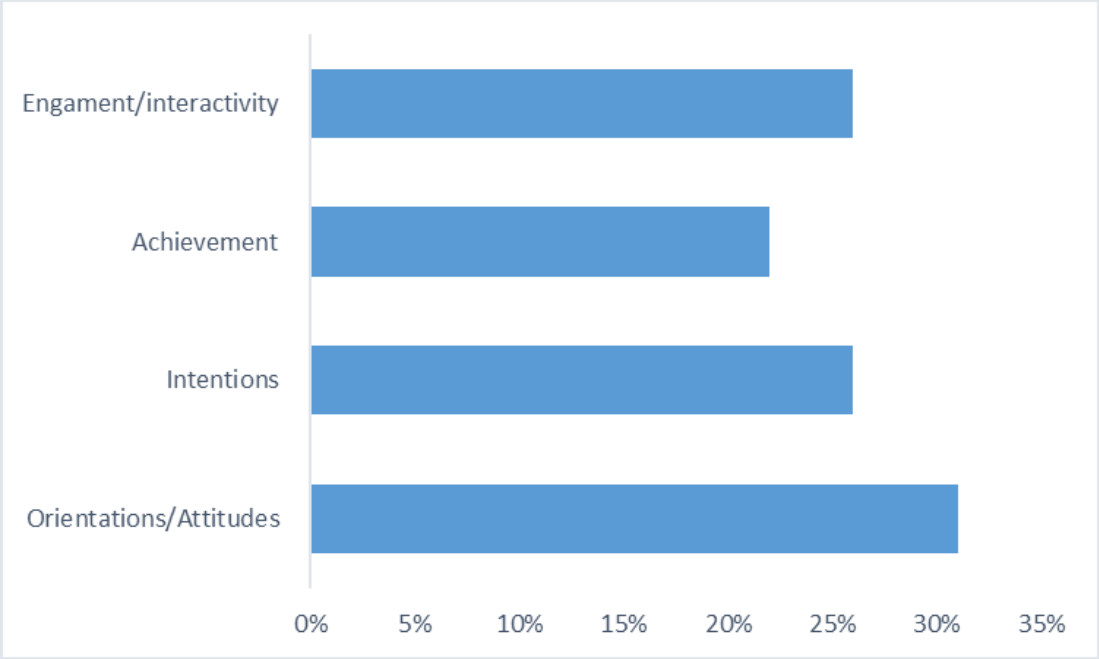


The inspection of articles on digital games uses in entrepreneurship education found that the overwhelming majority of studies utilize digital games as an independent variable. None of the reviewed studies have specified digital games or their play as the main dependent variable in their research. One reason explaining this phenomenon is the interest of researchers in finding out the effect of digital gameplay on learning outcomes in the entrepreneurship educational realm.

Theme Two: The Emphasis on Orientations and Intentions

Another theme in the digital games and entrepreneurship education research is the various measurements of learning outcomes. The most common category of variables related to the effects of digital gameplay concerns entrepreneurial orientations or attitudes. Researchers were mostly interested in learning whether gameplay enhances entrepreneurial tendencies among students. Next, researchers have explored whether gameplay carried effects on students' interactivity or engagement in their entrepreneurship courses. Three main types of interactivities are common in the literature: peer to peer, student to instructor, and learner to content. In a similar vein, researchers have examined how gameplay affected achievement in entrepreneurship courses. Much of achievement measures were either the use of grades or self-reported students' provided records.

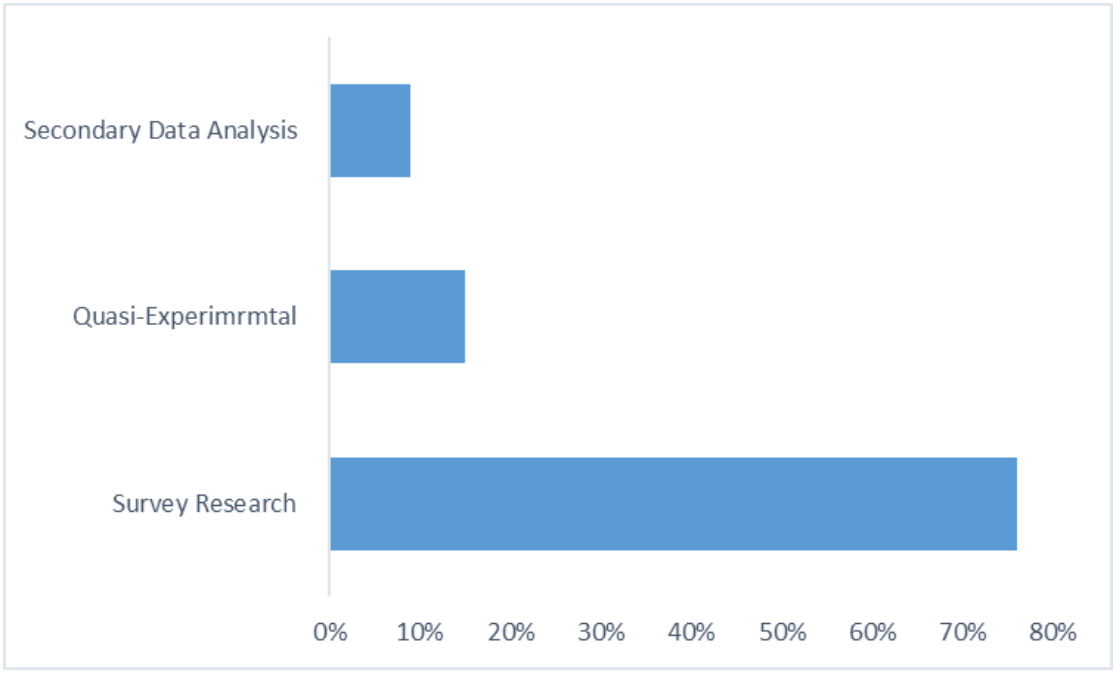
Figure 7. The various measurements of learning outcomes



Theme Three: Research Design Type

The third theme in digital games use and entrepreneurship education research is the overwhelming reliance on survey methods and self-reported data based on questionnaires. About three quarters of all included articles in this analysis featured the use of survey research designs. Researchers typically recruit convenience samples of students to participate in their investigations. Participants are asked to complete questionnaires oftentimes in-class by one or more faculty to obtain the data for completing the research. Next, few researchers relied on the use of quasi-experimental designs to carry out their research. Two non-equivalent or non-randomized selected groups are recruited in a non-random sampling method to satisfy the research ends. Pre-post non-equivalent designs are the most common quasi-experimental research strategies in this literature. Additionally, fewer researchers, less than 3, utilized one form of secondary data analysis to perform their research. These researchers utilized their or peers' data to carry out their research projects.

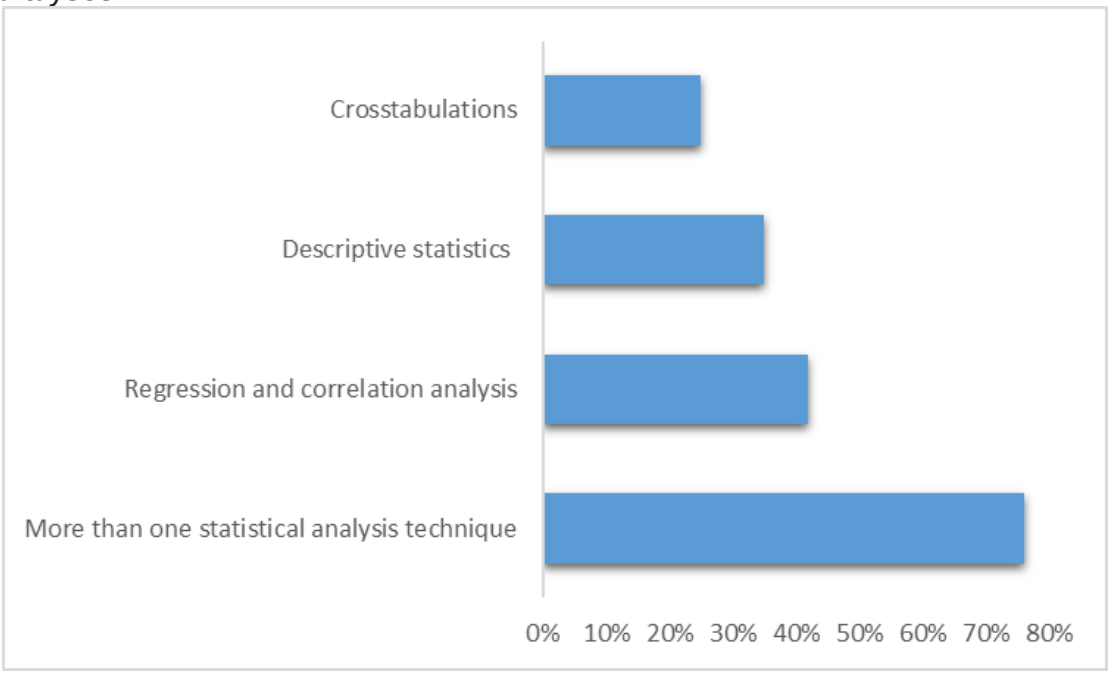
Figure 8. The overwhelming reliance on survey methods and self-reported data based on questionnaires.



Theme Four: Data Analysis

The fourth theme in this review is the emphasis on descriptive statistical models and crosstabulation analyses in the literature on digital games use and entrepreneurship research. A bit more than forty percent of all articles shared specific regression and correlational output with readers. About one third of all studies reported descriptive statistics like means and standard deviations to describe patterns in the variable's distributions. A quarter of research articles in the same domain reported crosstabulations between gameplay related variables and entrepreneurship education outcomes. Approximately one fifth of all included articles reported hypotheses tests results to indicate a type of significance. More than three quarters of all articles used one or more statistical analysis technique to investigate relationships between digital games use and entrepreneurship education outcomes.

Figure 9. The emphasis on descriptive statistical models and crosstabulation analyses



DISCUSSION

One of the most notable limitations in the literature is the heavy use of convenience small homogenous samples. Professors or researchers recruit their students to perform their analyses. Most students are from the same college or environment providing little variation with respect to demographic or experiential characteristics. Such choices of research design raise many reliability and validity concerns across all stages of the analysis. Therefore, future researchers are recommended to construct better samples and vigorously attempt to collect information from more representative samples. Additionally, researchers need to exercise more caution with regards to testing the validity of their instruments and data. Generalizability is difficult to obtain if samples are not carefully designed.

Relatedly, much of the present research utilizes cross-sectional correlational methods. Despite the significant advantages such techniques afford researchers, they fail in establishing causal relationships. Future researchers are encouraged to utilize more rigorous experimental designs to help in establishing robust connections between gameplay and entrepreneurial outcomes. Longitudinal and panel datasets measuring gameplay and gains in entrepreneurial intentions also need to be augmented to build better information in the field.

One of the striking findings in this research is that most authors are concerned with Western or East Asian samples of students. Especially, the main focus of major studies was on the students from the American and British universities even some of these studies were published from sources located in different countries. African, Caribbean, Latin American and Middle Eastern students are not represented sufficiently in this research agenda. Future researchers are recommended to examine the links of gameplay and entrepreneurial outcomes in such neglected areas. Knowing such information helps in establishing comparisons between educational systems to understand what works best for all

students. One of the starting points in this area is the construction of reliable datasets that measure gameplay use in business schools across marginalized geographic clusters. Future researchers may perform a bibliometric study on digital games use and EE outcomes to explore more patters in this research area.

To a large extent, authors in the digital games use and EE literature have not shared the names of games used in their papers. Similarly, researchers have failed to provide detailed characteristics of the games used in EE applications presenting a difficulty for replication. In addition, most papers did not detail the impact of games used on EE outcomes. Researchers offered few statements about the positive effects of games use on EE outcomes like achievements or motivation. To sum up, the research conclusion on digital games and EE outcomes, students become more interested in entrepreneurship and engaged in the journey leading to the foundation of new ventures.

CONCLUSIONS

The overarching interest of authors investigating the effects of digital games on entrepreneurship education is whether or not both constructs are related. While knowledge of simple correlations between digital games uses and entrepreneurial outcomes is useful, it fails to provide detailed information about the relationship. For instance, if we learn than digital games play is significantly positively correlated with entrepreneurial intentions, we still do not know what aspect of gameplay is truly associated with the observed increase in the outcome. Therefore, future researchers need to disaggregate the ways they examine digital gameplay, as well as entrepreneurial outcomes. Considering the dissection of gameplay into several dimensions or sub-constructs is a useful analytical tool to advance this research area.

The following statements provide a summary of the main findings in this analysis. This investigation found that most research on digital games and entrepreneurship education is performed using survey research methods. Additionally, much of the samples analyzed are students-based with convenience selection methods. A large proportion of studies failed to specify the names of games and did not spell out the details of how games were used in courses. Face to face settings in Western universities and colleges featured the most common setting for research articles in the analysis.

The objective of this conclusion is to show readers the dearth of research incorporating the use of moderators or mediators to measure digital games use in entrepreneurship education. Much of the research reviewed on digital games use and entrepreneurship education did not feature the use of mediators or moderators. Researchers are primarily interested in the direct effect of digital gameplay on entrepreneurship education outcomes. The use of digital games as a dependent variable is absent from most studies in this review. One explanation is that researchers are interested in determining the effect of digital games on learning outcomes. Researchers view digital gameplay as either a teaching method or a learning technique.

The objective of this conclusion is to demonstrate how researchers neglected the place, space, duration, and setting of digital games use in entrepreneurship education. Prior reviews on the use of education technologies in EE failed to specify the actual contexts or applications of digital games in higher education settings (Gros, 2014; Isabelle, 2020; Thanasi-Boçe, 2020). Knowledge on the

prevalence and ways of digital games use in face-to-face, online, remote, virtual, or blended learning environments is limited (Cooper, 2007; Guillén-Nieto & Aleson-Carbonell, 2012; Sugahara, 2018; Onder, 2021a; Onder 2022b). Similarly, the intentions and motivations behind using digital games in EE courses or seminars are to a large extent unexplored (Seethamraju, 2011; Mavlutova et al., 2020). Research on the outcomes of digital games in EE settings are underreported in the educational technology and management education literatures (Fox, et al., 2018). Additionally, published articles in the increasingly interdisciplinary digital games' utilization in EE deemphasize the wide variety of skills, abilities, competencies, and learning outcomes targeted by game designers, developers, and users (Sánchez, 2013; Panoutsopoulos & Sampson, 2014; Ávila-Pesántez, et al., 2017). Previous conceptual and empirical research on the use of digital games in EE ignored the differential roles of various game elements like flow, curiosity, rules, challenge levels, and complexity on EE outcomes (Linderoth & Sjöblom, 2019; Beranič & Heričko, 2022).

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