

Global Trends in Flow Theory Research within Gameful Environments: A Scoping Review, Bibliometric Analysis and Agenda for Future Studies

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Abstract

A key challenge of any gameful environment (e.g., gamified systems, simulators, and board games) is to lead users to an engaging experience. Over the years, one of the most coveted and studied engagement experiences is the flow experience (from Flow Theory). However, it is difficult to identify the global trends in Flow Theory research within gameful environments. Stepping towards closing this gap, in this paper, we present a scoping review and bibliometric analysis on studies involving Flow Theory and gameful environment. The main results indicate that i) exists an increase in the number of studies published in the last years, ii) most of the studies are concentrated in the field of education, iii) the authors focus on conducting quantitative studies, iv) 601 authors from 40 different countries have published studies in recent years and v) only two countries are leading the publications in this field. Our results especially contribute to the fields of Human-computer Interaction, Game Studies, and Positive Psychology, presenting an overview of studies involving Flow Theory in gameful environments.

Keywords: Flow Theory, gameful environments, gamification, games, scoping review.

1. Introduction

In the context of gameful environments (e.g., gamified systems, simulators, and board games), one of the primary goals is to provide users with an engaging experience (Baptista and Oliveira, 2019; Santos et al., 2023; Santos et al., 2021). One of the most desired engaging experiences in this kind of environment is the flow experience (Oliveira et al., 2023; Oliveira et al., 2021; Sreejesh

et al., 2021), characterized by a state of “optimal immersion and focused enjoyment” (Csikszentmihalyi, 2020; Csikszentmihalyi and Csikszentmihalyi, 2014b; Nakamura and Csikszentmihalyi, 2009). The flow experience is aimed at researchers and designers because this experience is highly related to the positive/desired users’ behavior in gameful environments (Oliveira et al., 2018; Oliveira et al., 2021; Perttula et al., 2017). Thus, for example, those who experience flow in an educational system tend to have a positive learning experience (Erhel and Jamet, 2019; Oliveira et al., 2022; Özhan and Kocadere, 2020), or those who experience flow in a game tend to play longer or report a positive attitude towards the featured brand (Catalán et al., 2019; Dorokhine and Bratt, 2022; Hong et al., 2021).

In recent years, there has been a growth in the number of studies on the intersection between Flow Theory (represented in practice as flow experience) and gameful environments (Oliveira et al., 2018; Oliveira et al., 2021; Perttula et al., 2017). However, despite the growing interest in this field, and the publication of some secondary studies (Oliveira et al., 2018; Oliveira et al., 2021; Perttula et al., 2017), there remains a lack of clarity regarding the state of the art in this field (Hookham and Nesbitt, 2019; Moizer et al., 2019). Especially, the challenge lies in synthesizing and understanding the breadth of research that has been conducted, encompassing different contexts, fields, and contributors, making it difficult for the community to identify the global trend (e.g., how and who has conducted research) in the area. Thus, identifying the key themes, trends, and gaps in the literature is essential for advancing research in this area and informing the development of more effective and engaging gameful experiences.

To address this challenge, in this paper, we present a scoping review (to identify and synthesize the existing body of literature) and bibliometric analysis (to identify the core research or authors, as well as their relationship) on the intersection between Flow Theory and gameful environments. By systematically examining a wide range of relevant studies, from a group of 207 studies (included in the review), we provide a comprehensive overview of the existing research landscape, especially identifying: *i*) a timeline of published studies, *ii*) the primary research approaches employed, and *iii*) the researchers and affiliations at the forefront of this research endeavor. This study serves as a foundation for further investigations and offers insights into the utilization of Flow Theory concepts within gameful environments.

The descriptive results reveal several noteworthy findings, *i*) exists an increase in the number of studies published in the last five years, showing the growing interest in the field, *ii*) most of the studies are concentrated in the field of education, corroborating the results of other recent secondary studies in correlated fields, *iii*) the authors focus on conducting quantitative studies, which can occur especially due to the very nature of the area, *iv*) 601 authors from 40 different countries have published studies in recent years, and *v*) only two countries are leading the publications in this field, with more than 50 studies.

By conducting a comprehensive scoping review and bibliometric analysis, we offer an overview of the studies that have explored the application of Flow Theory in gameful environments. This synthesis of existing literature provides valuable insights into the current state of research, identifies trends and research gaps, and informs future investigations. Our findings facilitate a deeper understanding of the relationship between Flow Theory and engagement in gameful contexts, and open space to conduct new studies in this context, thus, contributing to the fields of Human-computer Interaction, Game Studies, and Positive Psychology.

2. Background

In this section, we present the study's background (*i.e.*, the intersection between Flow Theory and gameful environments).

2.1. From the “flow” to a gameful experience

Csikszentmihalyi's original concept of Flow Theory (Csikszentmihalyi, 1975) is a pillar in the understanding of the best human experiences in a variety of circumstances, including game-like settings (Klasen

et al., 2012; Sharek and Wiebe, 2011; Yu et al., 2023). Flow (in practice), sometimes known as the “zone”, is a state of intense engagement and focus where people feel completely absorbed in an activity (Csikszentmihalyi, 2020; Csikszentmihalyi and Csikszentmihalyi, 2014b; Csikszentmihalyi, 1975). According to this notion, attaining flow requires striking a balance between the task's difficulty and the person's skill level (Csikszentmihalyi, 2020; Csikszentmihalyi, 1975; Jackson and Csikszentmihalyi, 1999). This translates into establishing situations where users' abilities are well-matched with the difficulties presented by a game-based approach, leading to a feeling of mastery and concentrated attention in the setting of gameful techniques (Csikszentmihalyi, 2020; Sampat et al., 2023). The pursuit of flow in game-like settings is consistent with the larger objective of developing interesting interactions that hold users' interest and encourage continuing engagement (Oliveira et al., 2022; Thomas et al., 2023).

Within the landscape of gameful experiences, achieving flow holds substantial importance (Hamari and Koivisto, 2014; Högberg et al., 2019). The key challenge lies in devising mechanisms that enable users to experience flow consistently (Högberg et al., 2019). This necessitates a nuanced understanding of the various elements that contribute to flow (*i.e.*, challenge-skill balance, action-awareness merging, clear goals, unambiguous feedback, concentration, sense of control, loss of self-consciousness, transformation of time, and *autotelic* experience) (Hamari and Koivisto, 2014; Högberg et al., 2019). In gameful contexts, these elements can be strategically embedded to guide users' experiences toward optimal engagement, recognizing the potential interplay between flow and other psychological concepts like motivation and enjoyment is essential for crafting holistic gameful designs (Högberg et al., 2019; Oliveira et al., 2021).

The realm of gameful design encompasses a diverse array of applications, from educational platforms to training simulations and beyond (Högberg et al., 2019). The central goal of these approaches is to leverage the inherent motivational and engaging qualities of games to achieve specific objectives (Alt, 2023). However, the application of Flow Theory within these gameful designs introduces a multi-dimensional challenge (Oliveira et al., 2021).

In conclusion, the synthesis of Flow Theory and gameful approaches is an intricate endeavor that promises substantial rewards in terms of engagement and transformative experiences (Alt, 2023; Hamari and Koivisto, 2014; Högberg et al., 2019; Oliveira et al., 2021). By delving into the intricacies of

flow experience and its alignment with gameful design principles, researchers and practitioners hold the key to creating experiences that not only entertain but also empower and educate users across various domains.

3. Method

In this study, we conducted a scoping review (Mak and Thomas, 2022) as a technique to identify and synthesize the existing body of literature in the intersection between Flow Theory and gameful environments and a bibliometric analysis (Donthu et al., 2021) to identify the core research and authors (as well as their relationship) in the same field.

We conducted the study based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Page et al., 2021). Next, we present the steps followed in the study (following the PRISMA protocol). All subjective definitions of the process (*e.g.*, definition of the search string and data to be collected) were made by two researchers with about 10 years of experience in gameful studies and Flow Theory. They also have experience in conducting secondary studies.

3.1. Objectives and eligibility criteria

The main objective of this study was to identify *i*) the main fields addressed in the studies in the intersection between Flow Theory and gameful environments, *ii*) identify the most frequent type of studies, and *iii*) identify the most active researchers conducting studies on the topic.

To achieve the objectives, the following eligibility criteria were defined:

- **Inclusion criteria:** *i*) Primary/empirical studies about Flow Theory and gameful environments; *ii*) studies published in the five years (2018-2022).
- **Exclusion criteria:** *i*) Secondary or tertiary studies, *ii*) gray literature (non-peer-reviewed studies), *iii*) non-English written studies.

3.2. Information sources and search strategy

In this study, following the example of recent secondary studies in this field (Cosio et al., 2023; Mattinen et al., 2023; Oliveira et al., 2021), we are using the Scopus¹ database, which includes all the main databases in the field of gameful studies and Flow Theory (*e.g.*, ACM Digital Library, IEEE Xplorer, Science Direct, and Springer Link).

¹<https://www.scopus.com/>

Table 1. Search string

(TITLE-ABS-KEY (flow) AND TITLE-ABS-KEY (gamif*) OR TITLE-ABS-KEY ("game-based") OR TITLE-ABS-KEY ("serious game*") OR TITLE-ABS-KEY (exergame*) OR TITLE-ABS-KEY ("simulation game*") OR TITLE-ABS-KEY ("persuasive techno*") OR TITLE-ABS-KEY (games-with-a-purpose) OR TITLE-ABS-KEY("educational game*") OR TITLE-ABS-KEY("game* for lear*") OR TITLE-ABS-KEY ("learning game*")) AND (EXCLUDE (DOCTYPE,"cr") OR EXCLUDE (DOCTYPE,"ch") OR EXCLUDE (DOCTYPE,"re") OR EXCLUDE (DOCTYPE,"er") OR EXCLUDE (DOCTYPE,"bk") OR EXCLUDE (DOCTYPE,"cd")) AND (LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018)) AND (LIMIT-TO (LANGUAGE,"English"))

Next, we defined the search strategy (*i.e.*, search string). We used the method PICOC (Population, Intervention, Comparison, Outcomes, and Context) Richardson et al., 1995 to define our search string. Thus, the following PICOC was defined:

- **Population:** studies that describe, apply or evaluate gameful environments to provide users' flow experience;
- **Intervention:** methods used to provide or evaluate users' flow experience in gameful environments;
- **Comparison:** not applicable, since the purpose of this study is to provide scoping review and bibliometric analysis;
- **Outcomes:** general aspects related to research on the intersection between Flow Theory and gameful environments;
- **Context:** studies in the intersection between Flow Theory and gameful environments.

After applying the PICOC method, we defined the search string (the generated search string was validated by comparison with topics presented in recent studies in this field). We limited the publication time (2018-2022), and removed secondary/tertiary studies, gray literature, and non-English written studies automatically in the string itself. Table 1 presents the original search string used in the search process.

3.3. Data selection and data collection process

Title and abstract reading were used to define whether a study met the inclusion criteria of the review. An automation tool (*i.e.*, Parsifal²) was used to identify duplicate studies. Full article reading was used to collect data. No automation tool was used in the process. For this study, the following information was extracted from the studies: *i*) field, *ii*) sub-field, *iii*) type of study,

²<https://parsif.al/>

iv) type of intervention, v) number of participants, vi) authors name, vii) authors institution, and viii) authors country. The data collection process was conducted in April (2023).

4. Results

From a total of 668 studies identified in the initial analysis, in the end, 207 studies were identified as eligible and included in the review (full reader for data extraction). Figure 1 shows an overview of the analysis performed (step by step) following the PRISMA diagram (Page et al., 2021). The full dataset³ is available to identify the details of all studies included in the review (including the full list of accepted and analyzed studies).

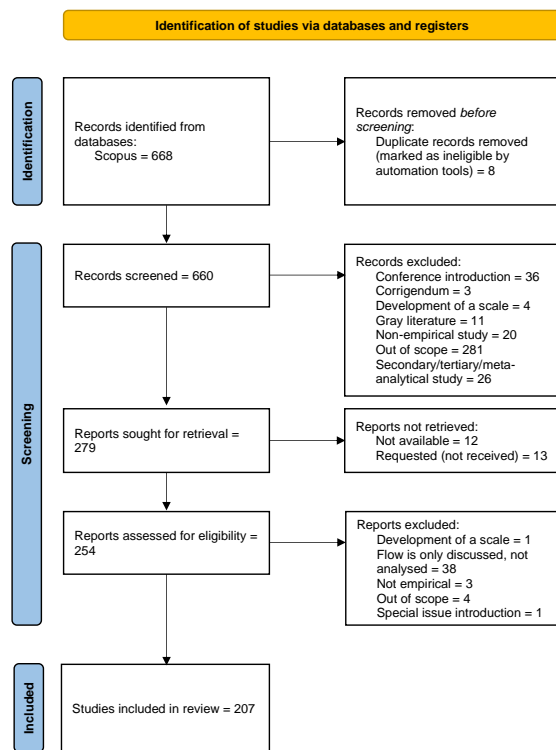


Figure 1. PRISMA diagram (adapted from Page et al., 2021)

The results show an evolution in the number of publications over the last few years, with special growth in 2021. These results demonstrate a growing community interest in the topic. The drop in 2022 is possibly due to the fact that the indexing process is slow

³<https://osf.io/3845q/>

in some cases and that part of the studies published in 2022 will only be indexed in the second half of 2023. Figure 2 presents the evolution in the number of publications over the years.

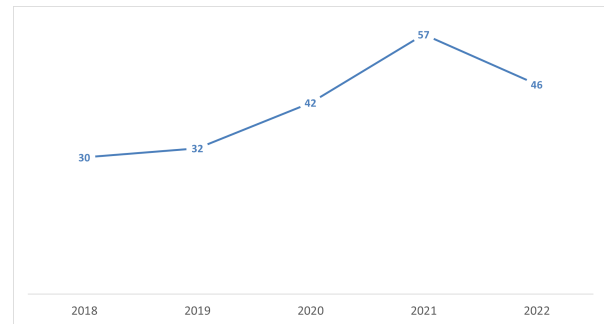


Figure 2. Evolution per year

4.1. Scoping review results

Studies have been published in different domains, in total, studies published in eight different domains were identified (*i.e.*, Education, Gaming, Health, Business, Marketing, Tourism, Entertainment, Artificial Intelligence, and Environment). Following the same line of results found in other secondary studies in the field of gamification (Koivisto and Hamari, 2019; Oliveira et al., 2021), most of the studies (131 studies (63%)) were published in the field of education. Table 2 presents a complete analysis of the published studies according to the field.

The vast majority of published studies are quantitative (which may be due to the fact that the main methods for analyzing the flow experience are more suited to quantitative analyses). In total, 192 (93%) purely quantitative studies were published. However, some qualitative or mixed-method studies have also been published over the last few years. Table 3 organize the studies according to the type of study.

4.2. Bibliometric analysis results

Most of the studies published in the last five years were published in journals (149 studies (72%)). Only 58 (less than half of the publications) were published at conferences. Thus, most studies tend to present more robust results, with greater details in relation to the study conducted (*e.g.*, type of analysis performed). Table 4 present which studies were published in journals and which were published at conferences.

In total, 601 different authors contributed to the field in the last five years. This number demonstrates interest from a broad community, with diverse characteristics.

Table 2. The number of studies published in each field.

Field	N	field. Studies
Education	131	S1, S8, S10, S15, S16, S17, S18, S21, S27, S28, S30, S31, S32, S35, S37, S38, S39, S42, S43, S44, S45, S47, S48, S52, S53, S54, S56, S57, S58, S61, S62, S63, S64, S65, S66, S67, S72, S73, S74, S75, S76, S77, S79, S80, S81, S82, S83, S84, S85, S89, S94, S95, S96, S97, S98, S99, S100, S101, S105, S107, S108, S110, S111, S112, S113, S114, S118, S119, S122, S126, S127, S128, S129, S130, S131, S132, S133, S135, S139, S140, S144, S145, S146, S147, S148, S149, S150, S152, S153, S154, S155, S156, S157, S158, S162, S163, S164, S167, S168, S169, S171, S172, S173, S174, S176, S177, S178, S179, S181, S182, S183, S186, S187, S188, S189, S190, S191, S192, S193, S196, S197, S198, S199, S200, S201, S202, S203, S204, S205, S206, S207
Gaming	31	S4, S11, S14, S22, S24, S33, S34, S36, S49, S50, S59, S60, S68, S69, S70, S71, S78, S86, S87, S88, S90, S91, S93, S102, S106, S115, S123, S134, S136, S137, S166
Health	24	S2, S5, S9, S12, S13, S19, S20, S25, S29, S40, S46, S92, S103, S104, S116, S117, S124, S159, S160, S161, S170, S175, S184, S194
Business	10	S3, S23, S51, S109, S120, S121, S125, S141, S142, S143
Marketing	4	S6, S7, S138, S151
Tourism	3	S26, S41, S195
Entertainment	2	S165, S180
Artificial Intelligence	1	S185
Environment	1	S55

Key: N = number of studies in the field.

Table 3. Organization of studies per type

Type	N	Studies
Quantitative	192	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S30, S31, S32, S33, S34, S35, S36, S37, S38, S39, S40, S41, S42, S43, S44, S45, S46, S47, S48, S49, S50, S51, S52, S53, S54, S55, S56, S57, S58, S59, S60, S61, S62, S63, S64, S65, S66, S67, S68, S69, S70, S71, S72, S73, S74, S75, S76, S77, S78, S79, S80, S81, S82, S83, S84, S85, S86, S87, S88, S89, S90, S91, S92, S93, S94, S95, S96, S97, S98, S99, S100, S101, S102, S103, S104, S105, S106, S107, S108, S109, S110, S111, S112, S113, S114, S115, S116, S117, S118, S119, S120, S121, S122, S123, S124, S125, S126, S127, S128, S129, S130, S131, S132, S133, S134, S135, S136, S137, S138, S139, S140, S141, S142, S143, S144, S145, S146, S147, S148, S149, S150, S151, S152, S153, S154, S155, S156, S157, S158, S159, S160, S161, S162, S163, S164, S165, S166, S167, S168, S169, S170, S171, S172, S173, S174, S175, S176, S177, S178, S179, S180, S181, S182, S183, S184, S185, S186, S187, S188, S189, S190, S191, S192, S193, S194, S195, S196, S197, S198, S199, S200, S201, S202, S203, S204, S205, S206, S207
Mixed-method	7	S37, S74, S103, S152, S124, S163, S178
Qualitative	7	S26, S57, S139, S176, S196, S180, S184
Not specified	1	S46

Key: N = number of studies in the type.

Five authors stand out with the highest number of publications (more than five publications each). One author, in particular, is responsible for the vast majority of publications. In the Table 5, we present the 15 most productive authors.

Finally, it is also possible to notice that authors from a vast majority of countries have contributed to the evolution of the area. In total, authors from 40 countries have published studies in the last five years. In particular, Taiwan, the United States, Germany, France, and Switzerland (representing three different continents) are the countries with the most productive authors in the field. Figure 3 present a heat map of the countries while Table 6 present details about publication per countries.

4.3. Discussion

Promoting user engagement is fundamental in any gameful setting. Among the various experiences sought after and extensively examined, the flow experience is highly discussed. However, understanding the current state of employing Flow Theory in

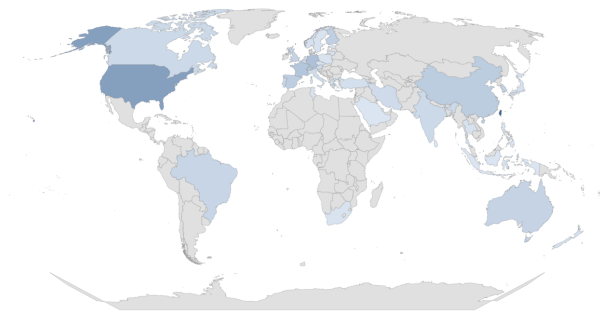


Figure 3. Map

gameful environments poses a considerable challenge. Addressing this gap, we conducted a scoping review and bibliometric analysis focusing on investigations that explore the intersection of Flow Theory and gameful environments. In our study, we provide the community with an overview of studies involving Flow Theory and gameful environments, demonstrating a timeline of the studies, the types of studies conducted, the domains where the studies have been carried out, and the prominent authors and institutions that publish on

Table 4. Journals and conferences

Type	N	Studies
Conference Paper	58	S3, S4, S5, S7, S8, S9, S10, S12, S14, S27, S29, S30, S31, S33, S34, S35, S36, S38, S39, S40, S46, S47, S55, S56, S59, S62, S63, S67, S76, S77, S78, S80, S82, S84, S86, S91, S93, S94, S95, S98, S101, S102, S103, S110, S113, S114, S125, S126, S130, S131, S136, S137, S147, S154, S155, S191, S202, S203.
Journal Article	149	S1, S2, S6, S11, S13, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S28, S32, S37, S41, S42, S43, S44, S45, S48, S49, S50, S51, S52, S53, S54, S57, S58, S60, S61, S64, S65, S66, S68, S69, S70, S71, S72, S73, S74, S75, S79, S81, S83, S85, S87, S88, S89, S90, S92, S96, S97, S99, S100, S104, S105, S106, S107, S108, S109, S111, S112, S115, S116, S117, S118, S119, S120, S121, S122, S123, S124, S127, S128, S129, S132, S133, S134, S135, S138, S139, S140, S141, S142, S143, S144, S145, S146, S148, S149, S150, S151, S152, S153, S156, S157, S158, S159, S160, S161, S162, S163, S164, S165, S166, S167, S168, S169, S170, S171, S172, S173, S174, S175, S176, S177, S178, S179, S180, S181, S182, S183, S184, S185, S186, S187, S188, S189, S190, S192, S193, S194, S195, S196, S197, S198, S199, S200, S201, S204, S205, S206, S207

Key: N = Number of published paper by type.

Table 5. Most productive authors

Authors' names	N
Hou HT	17
Isotani S; Li CT	7
Kiili K; Oliveira W	6
Kuo CC; Martin-Niedecken AL	5
Fang YS; Hamari J; Kannegieser E; Kojic T; Ninaus M; Schättin A; Voigt-Antons JN; and Wang SM	4

Key: N = Number of published papers by each individual author.

the topic.

The observed increase in the number of published studies in recent years indicates a growing interest and recognition of the significance of the flow experience in gameful contexts (see Figure 2). This trend suggests that researchers and practitioners are increasingly acknowledging the potential benefits of integrating Flow Theory into the design and evaluation of gameful interventions. Thus, it is also encouraging to witness this upward trajectory, as it signifies the importance of studying and harnessing the power of the flow state to enhance engagement and user experiences in gameful environments.

The concentration of studies in the field of education (following the trend of specific areas related to gameful environments (e.g., Koivisto and Hamari, 2019;

Table 6. Number of individual authors per country

Country	N
Taiwan	98
United States	53
Germany	28
France	24
Switzerland	20
China	19
Spain	18
Finland	17
South Korea	16
Australia and United Kingdom	14
Brazil and Hong Kong	13
Portugal	12
Canada and India	10

Key: N = Number of individual author per country.

Oliveira et al., 2021)) highlights the significance of incorporating flow principles in educational settings (Csikszentmihalyi and Csikszentmihalyi, 2014a). On one side, the educational context provides a fertile ground for applying gameful approaches to enhance student motivation, learning outcomes, and overall educational experiences Oliveira et al., 2022. However, on the other side, it is crucial to expand the scope of research beyond the education domain to explore the applicability of Flow Theory in different contexts such as healthcare, workplace environments, and personal development. Examining flow experiences in diverse settings can provide a more comprehensive understanding of its potential impact across various domains.

The field of Gaming emerges as a prominent area with a substantial number of publications, totaling 31 studies (see Table 2). This finding is indicative of the growing interest in exploring the intersection of gaming and Flow Theory (*i.e.*, games for flow). The popularity of gaming as a research topic can be attributed to several factors. Firstly, the widespread availability and accessibility of gaming platforms and technologies have opened new avenues for investigation and innovation. Researchers demonstrate to recognize the potential of games as immersive and engaging environments that can facilitate learning, behavior change, and psychological experiences such as flow (Koivisto and Hamari, 2019). Secondly, the integration of game elements into non-game contexts, such as educational systems and health interventions, has gained significant attention (Koivisto and Hamari, 2019). The application of gameful design approaches has shown promise in enhancing motivation, engagement, and flow experience. As a result, scholars from diverse

disciplines are increasingly drawn to the field of gaming, contributing to the proliferation of publications in this area.

Another noteworthy result of this secondary study is the observation that the field of Health ranks third in terms of the number of publications, with 24 studies identified (see Table 2). The presence of health-related studies in the context of gameful environments corroborates the growing recognition of the potential of games and game-like interventions in promoting health behaviors, patient engagement, and therapeutic outcomes (Damaševičius et al., 2023; Sardi et al., 2017; Xu et al., 2022). This trend can be attributed to the increasing use of technology and digital solutions in healthcare settings (Nielsen and Sahay, 2022). At the same time, the recognition of the impact of motivation, engagement, and immersive experiences on health-related behaviors and outcomes (Soltiyeva et al., 2023). The integration of gaming elements, such as rewards, challenges, and social interactions, into health interventions holds promise for improving adherence to treatment regimens, promoting physical activity, managing chronic conditions, and addressing mental health concerns (Cheng, 2020). Also, the substantial number of publications in the field of Health can indicate a dedication of researchers to explore the potential benefits and applications of gameful approaches in different healthcare contexts, relating it to the flow experience.

The predominance of quantitative studies among the identified publications indicates a preference for empirical investigations and objective measurements of flow in gameful environments (which may have to do with the very nature of the study). While quantitative studies offer valuable insights into the prevalence and patterns of flow experiences, it is crucial to complement these approaches with qualitative methodologies (mixed method approaches). Qualitative research can delve into the subjective experiences, perceptions, and interpretations of individuals engaging in gameful activities, providing a deeper understanding of the nuances and complexities of the flow phenomenon. By combining quantitative and qualitative approaches, researchers can gain a more holistic view of flow experiences and uncover rich insights that go beyond mere numerical data.

Most of the studies included in this review were published in journals rather than conference proceedings (see Table 4). This preference for journal publications follows a different trend than the general area of gamification (see Koivisto and Hamari (2019) to confirm) and may stem from several factors inherent to the nature of the research

conducted in this domain. Firstly, the complex and multidisciplinary nature of gameful environments and Flow Theory often requires in-depth exploration, rigorous methodology, and comprehensive reporting, which are better suited for the format of journal articles. Journals provide researchers with the space and opportunity to present their work in a more detailed and comprehensive manner, allowing for the inclusion of theoretical frameworks, methodological considerations, data analysis, and discussion of implications. By publishing in journals, researchers are more likely to reach a targeted audience of experts and scholars who share a common interest and expertise in gameful environments.

The presence of 601 authors from 40 different countries in recent publications within the field of gameful environments and flow could highlight a global reach and collaborative nature of research in this area. This diverse representation signifies the recognition and interest in gameful approaches across various cultural contexts, fostering a comprehensive understanding and advancing the field's knowledge. The involvement of scholars from different countries can facilitate cross-cultural exchange, enabling the exploration of the applications and implications of gameful environments worldwide, and promoting the continuous development of innovative strategies to address educational, social, and psychological challenges.

However, the observation that a significant proportion of studies are concentrated in only a few countries (see Table 6) raises questions about the generalizability and cross-cultural applicability of flow research in gameful environments. Cultural factors, societal norms, and contextual variations can influence the manifestation and facilitation of flow experiences (Csikszentmihalyi, 2020; Csikszentmihalyi and Csikszentmihalyi, 2014a; Csikszentmihalyi, 1975). Therefore, it is crucial to foster cross-cultural collaborations and encourage research from diverse geographical locations.

In summary, the results of this scoping review and bibliometric analysis provide valuable insights into the current landscape of research on Flow Theory in gameful environments. The findings underscore the growing interest in this field, particularly in the educational context, and the need for a more balanced research approach that includes qualitative investigations alongside quantitative studies. Moreover, the concentration of studies in a few countries highlights the importance of cross-cultural research to explore the universality and cultural nuances of the flow experience. By addressing these research gaps, we can further advance our understanding of flow in gameful

environments and unlock its potential for promoting engagement, motivation, and positive experiences in various domains.

4.4. Limitations

While conducting this study, some limitations were inherent to the type of study conducted. Initially, some important studies may have been left out of the review (because they were not indexed or unavailable). To mitigate this limitation, we use a database that encompasses the main venues in the area, indexing all studies that are part of other databases. In addition, we contacted the authors of all articles that were identified in the review, but their full version was unavailable. Most of the research was conducted by researchers, without the use of automation tools. Thus, during both phases of the project, mistakes may have been made (*e.g.*, when extracting the data). The review was conducted considering studies up to 2022, so more recent studies may have been left out.

4.5. Agenda for Future Studies

Based on the results obtained in our study, it is possible to identify nuances that allow us to contribute with suggestions for future studies for the community. Thus, in this section, we focus on offering suggestions for studies for the community (especially gamification, games, and Positive Psychology communities).

Mixed-method approaches: While the predominance of quantitative studies demonstrates the maturity of the field, the studies are mostly empirical. Thus, a way to evolve the field is to conduct mixed-method studies, mixing quantitative and qualitative (*e.g.*, interviews and observations) approaches, thus capturing a more nuanced understanding of the subjective experiences and perceptions of individuals engaging in gameful environments. These studies can provide valuable insights into the intricacies of flow experience and shed light on the underlying psychological processes involved.

Explore different gameful environments: Results demonstrate that most of the studies are conducted in some specific type of environment. Broaden the scope of research by investigating the application of Flow Theory in various gameful environments beyond the most traditional environment. Understanding how flow manifests and is influenced in different types of gameful environments can contribute to the development of tailored experiences for diverse user groups.

Cross-cultural studies: In our study, we identified that only a few countries (institutions) are involved in

the studies about Flow Theory in gameful environments. Thus, is important to extend the investigation beyond the three countries that have been leading in this field to explore cultural variations in the application of Flow Theory in gameful environments (*e.g.*, by comparing different cultural contexts). Table 7 presents a summary of the proposed agenda.

Table 7. Agenda

Suggestion	Summary	Expected result
Mixed-method approaches	Conducting mixed-method studies combining quantitative and qualitative approaches (interviews, observations, behavior data) to gain a deeper understanding of subjective experiences and psychological processes in gameful environments.	Provides a more nuanced understanding of the flow experience, capturing subjective experiences and psychological processes, contributing to the field's knowledge, and improving the design of gameful environments.
Explore different gameful environments	Broadening the scope of research to investigate the application of Flow Theory in various gameful environments beyond the traditional ones.	Enhances understanding of how flow manifests and is influenced in different types of gameful environments, enabling tailored experiences for diverse user groups and fostering innovation in gameful design.
Cross-cultural studies	Expanding the investigation of Flow Theory in gameful environments to different cultural contexts beyond the current dominant countries, facilitating cross-cultural comparisons.	Provides insights into cultural variations in the application of Flow Theory, enhances inclusivity, and contributes to a more comprehensive understanding of the impact of cultural factors on flow experiences in gameful environments.

5. Concluding Remarks

This scoping review and bibliometric analysis shed light on the state of research regarding the application of Flow Theory in gameful environments. The findings of this study revealed an increasing interest in this area, as evidenced by the growing number of publications in recent years. However, several gaps and opportunities for further investigation have also been identified. Additionally, future studies should address the limitations of publication bias. Finally, as future studies, we aim to investigate the long-term effects and sustainability of flow experiences in gameful environments. For this, we aim to improve by providing a systematic literature review and meta-analysis about the use of Flow Theory in gameful environments.

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