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A Comparative Review of Fogg's Behavior Model (FBM) and the Hook Model in Education Sector at Higher level for Enhancing Gamified Learning

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ABSTRACT

This paper presents an overview of the integration and application of Fogg's Behavior Model (FBM) and the Hook Model in gamified learning experiences within higher education, focusing on their role in enhancing student engagement. By reviewing a broad range of academic studies and practical case analyses, the study examines how these models contribute to creating engaging and effective educational environments. The studies were selected based on inclusion criteria aligned with the research questions of this review. The findings reveal that both FBM and the Hook Model can be effectively incorporated into digital learning environments. FBM emphasizes stimulating motivation, improving abilities, and setting triggers, while the Hook Model fosters user habits through cycles of triggering actions, offering variable rewards, and encouraging investment.

Key words: Fogg's Behavior Model (FBM), Hook Model, Gamified Learning, Student Engagement, Digital Learning Environment

INTRODUCTION

In contemporary higher education, as digital transformation reshapes learning environments, educators are constantly exploring new methods to enhance student engagement and improve learning outcomes (Akour & Alenezi, 2022). Gamification, which incorporates game design elements into non-game contexts to spark interest and boost engagement, has emerged as a leading strategy in educational innovation (Saleem et al., 2022). In this context, understanding and applying effective behavior change models are essential for designing impactful gamified learning experiences. Two widely recognized frameworks in behavioral science—the Fogg Behavior Model (FBM) and the Hook Model—are powerful tools for promoting behavior change (Ali et al., 2023). These models offer systematic approaches to analyze and design educational interventions that can motivate and sustain student behaviors (Zekry & McKee, 2023).

The FBM identifies three critical components for behavior to occur: motivation, ability, and triggers. It posits that these elements must be present simultaneously for behavior to be effectively prompted (Fogg, 2009; Fuß et al., 2014). In educational settings, FBM has proven particularly useful for designing accessible and engaging teaching activities, showcasing strong potential for broader applications.

In contrast, the Hook Model focuses on habit formation through four core stages: triggers, actions, variable rewards, and investments (Eyal, 2014). Applied to education, this model offers a framework to design courses and activities that not only capture students' attention in the short term but also cultivate lasting learning habits. The integration of these two models provides a robust theoretical foundation for developing strategies to continually engage and motivate students, ultimately enhancing educational outcomes (Filippou et al., 2016; Troyer et al., 2020; Maushagen & Troyer, 2021).

This review aims to explore the integration of FBM and the Hook Model within gamification strategies in higher education. By systematically evaluating existing literature, we analyze the individual and combined effects of these models on student behavior change. Additionally, we discuss their potential impact on improving student engagement and teaching effectiveness, while addressing the challenges of implementing these models in a gamified educational environment. This review provides insight into optimization strategies and future directions for research and practice.

Understanding Fogg's behavior model (FBM)

The Fogg Behavior Model (FBM) offers a theoretical framework for designing persuasive systems that effectively influence individual behaviors (Takács et al., 2023). The model emphasizes that a behavior occurs when three core factors—motivation, ability, and triggers—converge (Ashtari & Taylor, 2021; Salim et al., 2023). According to the FBM, a target behavior is realized through the intersection of these elements. The model provides guiding principles to foster behavior change by enhancing an individual's motivation, improving their ability to perform a specific behavior, and using appropriate triggers to initiate actions. In educational contexts, FBM serves as a tool to encourage students to adopt desired behaviors and habits (Jurgelaitis et al., 2019).

As shown in Figure 1, behavior occurs at the intersection of motivation, ability, and triggers (Plak et al., 2023; Daghestani et al., 2020). The area where these elements overlap visually represents the conditions for behavior to take place. For instance, the overlap between motivation and ability is termed the "Enabled Action Zone," suggesting that individuals are ready to act when they have sufficient motivation and capability, provided a trigger is present. The intersection between motivation and triggers is called the "Opportunistic Action Zone," indicating that individuals are more likely to act when highly motivated and presented with a timely trigger. The overlap between ability and triggers is known as the "Facilitated Action Zone," where behavior can occur even if motivation is low, as long as the person has the ability and is exposed to an appropriate trigger. The central zone, where all three elements intersect, represents the optimal conditions for behavior change. The FBM underscores that target behaviors can only be achieved when motivation, ability, and triggers are all present simultaneously (Fogg, 2009).

The Hook Model: Building habits through gamified learning

The Hook Model is a framework designed to build habits by guiding users through four sequential stages: triggers, actions, variable rewards, and investments (Eyal, 2014). This model is particularly useful in educational settings, where it can be employed to design gamified learning experiences that not only attract students' attention but also foster long-term engagement and learning habits.

Triggers are cues that prompt behavior, either externally (e.g., notifications or reminders) or internally (e.g., emotional states). Once triggered, students are encouraged to perform an action, which refers to the simplest behavior that results in a reward. The third stage, variable rewards, is critical for keeping students engaged. Unlike fixed rewards, variable rewards introduce an element of unpredictability, making students more likely to return for the next learning experience. Finally, the investment stage encourages students to commit to the learning process by contributing time, effort, or resources, thus increasing the likelihood of future engagement. In educational design, the Hook Model can be applied to create learning platforms and activities that continuously engage students. For example, online learning platforms might use quizzes or badges (variable rewards) to motivate students to complete tasks. The investment phase could involve encouraging students to reflect on their learning or create personal study goals, reinforcing their commitment to the course.

Figure 2: Adapted from the Hook Model.

As illustrated in Figure 2, the Hook Model operates as a closed-loop cycle with four core components: Trigger, Action, Variable Reward, and Investment. This model aims to shape and reinforce user habits over time. It begins with the Trigger phase, which initiates user behavior through both external cues, such as notifications and icons, and internal cues triggered by emotions and previous behaviors (Salim et al., 2023). Once users form an intrinsic connection with these triggers, habitual behaviors are automatically activated by specific emotional states.

Next, the Action phase represents the user's immediate response to these triggers. At this stage, designers work to ensure that users can easily perform the desired actions by simplifying processes and enhancing motivation. For instance, on the language-learning platform Duolingo, users are prompted to begin short learning modules through regular emails and notifications. This demonstrates how external triggers are effectively converted into user actions.

The Variable Reward phase plays a crucial role in sustaining user engagement by offering unpredictable rewards. After completing an action, users receive randomized feedback, which taps into their curiosity and desire for exploration. The uncertainty of rewards encourages continuous participation, as users are driven to seek out the next reward.

Finally, the Investment phase involves the user's commitment to the product, whether through time, data, social capital, or even monetary contributions (Filippou et al., 2016). This investment lays the groundwork for the next cycle of triggers, making future triggers more appealing, actions easier to complete, and rewards more enticing. Over time, this deepens the user's habitual engagement with the product.

Through the ongoing repetition of these four stages, users gradually develop a dependency on the product, leading to sustained behavioral habits.

By applying the Hook Model to education, educators can design effective cycles of triggers, actions, rewards, and investments within the learning process. This approach helps attract and maintain students' interest, offering a structured framework for developing strategies that foster and sustain learning habits (Magnotta et al., 2021).

In comparison, the Fogg Behavior Model (FBM) focuses on the motivational factors that initiate behaviors. FBM promotes active student participation by establishing appropriate trigger conditions and lowering the difficulty of target behaviors (Zekry & McKee, 2023). Meanwhile, the Hook Model emphasizes creating engaging and immersive content, using techniques like emotional stimulation, storytelling, and visual design to capture students' attention and sustain their interest, thereby increasing engagement.

Together, these models hold great potential in higher education, making learning more engaging and enjoyable while boosting student enthusiasm and participation (Filippou et al., 2016). By integrating the FBM and Hook Model into gamified learning experiences, educators can create more dynamic and effective educational environments.

Gamification in education

Gamification refers to the integration of game design elements and principles into non-game contexts, such as education. This approach builds on the theoretical foundations of both the Fogg Behavior Model (FBM) and the Hook Model, incorporating motivational elements like points, badges, and leaderboards (Neugebauer et al., 2023), which align with FBM's focus on motivations and triggers. Additionally, it creates engagement cycles with variable rewards, a central feature of the Hook Model (Cheong et al., 2014). Through these strategies, gamification transforms the learning process into an active, dynamic, and engaging experience (Saleem et al., 2022).

The application of gamification enhances both intrinsic and extrinsic motivation by creating a learning environment that is more enjoyable and rewarding. This approach facilitates sustained engagement and promotes habit formation in educational settings. By motivating students through well-designed triggers, simplified actions, and rewarding feedback, gamification helps them stay committed to learning tasks over the long term.

Research demonstrates that incorporating gamification elements can significantly boost student engagement and intrinsic motivation, leading to improved learning outcomes. When educators integrate game elements into course design, they not only make the learning process more enjoyable but also support the development of learning habits that are often hard to foster in traditional educational models (Ohn et al., 2018).

By strategically applying the principles of the FBM and Hook Model, gamification motivates students to learn and cultivates sustainable learning habits. This approach has the potential to transform traditional educational environments, turning learning from a task-oriented activity into a continuous, self-driven process. The use of gamification elements ensures that learning becomes not just an act of acquiring knowledge but a habit that students naturally sustain over time.

Rationale of the Study

As higher education continues to evolve through digital transformation, educators are increasingly looking for innovative methods to enhance student engagement and learning outcomes. Gamification—the application of game design elements in non-game contexts—has gained significant attention as an effective strategy for fostering student motivation, engagement, and retention in learning environments. Despite the growing interest in gamification, the theoretical frameworks that guide its implementation are not always fully explored or integrated. Two well-established behavior change models, the Fogg Behavior Model (FBM) and the Hook Model, offer valuable insights into how behavior can be influenced and sustained over time. However, while both models have demonstrated success in various domains, their combined application in gamified learning environments within higher education remains underexplored.

The FBM focuses on the interplay of motivation, ability, and triggers to prompt behaviors, making it ideal for understanding how to lower barriers and encourage student participation in educational activities. The Hook Model, on the other hand, emphasizes habit formation through a cycle of triggers, actions, variable rewards, and investment, offering a framework for designing long-term engagement. Both models provide a structured approach to behavior change, but their integration into educational gamification has not been systematically examined, especially in the context of developing sustainable learning habits and improving teaching effectiveness.

This study aims to fill this theoretical gap by examining how the FBM and Hook Model can be combined to create more effective gamified learning experiences in higher education. By exploring their joint application, this study seeks to provide educators with actionable strategies for enhancing student engagement, motivation, and learning outcomes.

Although there is substantial research on the benefits of gamification in education, there is a lack of studies that critically analyze the combined application of the Fogg Behavior Model and the Hook Model in the design of gamified learning environments. Existing studies often focus on either one of these models independently or address general gamification strategies without drawing on behavior change theories. Furthermore, much of the research on gamification tends to emphasize short-term engagement metrics, such as student participation and immediate feedback, rather than focusing on long-term behavioral outcomes like sustained motivation, habit formation, and deeper learning engagement.

This study seeks to address these gaps by:

1. Exploring how the integration of FBM and the Hook Model can create a more comprehensive framework for designing gamified educational experiences.
2. Investigating the long-term effects of gamification strategies on student behavior, particularly in relation to habit formation and sustained engagement.
3. Offering insights into the challenges and opportunities associated with implementing these models in real-world educational settings, thus providing a clearer path for future research and practical application in higher education.

Research Questions

In the process of promoting innovative teaching strategies in higher education, un-derstanding and applying the FBM and the Hook Model is crucial for fostering positive changes in student behavior (Zekry & McKee, 2023). This study aims to explore the role of these two models in stimulating specific behavioral changes and enhancing student engagement, particularly in terms of how they affect the dynamics of student participation in educational environ-ments. Additionally, the research will examine how these models can enhance learning outcomes by boosting active student participation, as active engagement is a key factor in teaching success. Given the challenges associated with integrating the FBM and Hook Model to enhance the gamified teaching experience, this paper poses the following re-search questions:

(1) What are the patterns and trends of FBM and Hook Model applications in higher education from 2014

to 2024?

(2) What are the roles of FBM and Hook Model in promoting student engagement?

(3) How can the FBM and Hook Model be effectively integrated to optimize the gam-ified experience in higher education?

Through a systematic analysis of these key questions, this study will provide insights into how both behavioral models can be effectively utilized in higher education to enhance student engagement and learning outcomes. This will not only contribute to theoretical advancements but also offer guidance to practitioners, helping them design more effective teaching strategies and learning environments.

Research Methods

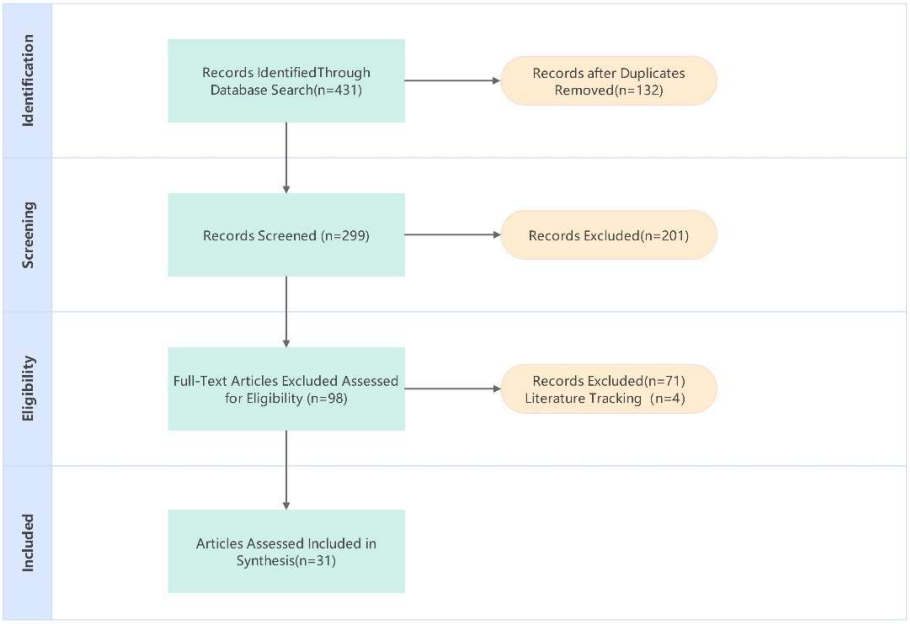

Figure 3: Overview of literature search process utilizing PRISMA.

Methodology

This review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure the rigor and transparency of the evidence integration process (Sarkis-Onofre et al., 2021). By adhering to the PRISMA framework, the review systematically identifies, evaluates, and synthesizes relevant literature, ensuring the credibility and replicability of the study's findings (Page & Moher, 2017). The process consists of several key steps:

1. Literature Search: Relevant literature was identified from multiple databases, including Web of Science, IEEE, Wiley, Springer, ScienceDirect, and Scopus, using specific keywords such as "Fogg's Behavior Model AND higher education AND student engagement," "Hook Model AND gamification AND higher education," and "behavioral change AND gamification AND models AND higher education."
2. Inclusion and Exclusion Criteria: After retrieving 431 articles, 132 duplicates were removed, leaving 299 articles for initial screening. During this phase, article titles, keywords, and abstracts were reviewed based on the following inclusion criteria:
    - Written in English,
    - Peer-reviewed articles, book chapters, reports, or feature articles,
    - Published between 2014 and 2024.
3. Screening and Eligibility: The remaining 299 articles underwent a preliminary screening to assess relevance. Articles that did not meet the inclusion criteria were excluded, leaving 98 studies. In the next phase, detailed content reviews were conducted, with additional exclusion criteria including:
    - Non-English language studies,
    - Lack of full-text availability.

After applying these criteria, 27 articles were identified as fully meeting the research standards.

4. Reference Tracking: To ensure a comprehensive review, reference lists of the 27 selected studies were examined, identifying 4 additional relevant articles. Thus, a total of 31 articles were included in the final analysis.
5. Quality Assessment and Data Extraction: Each selected study was assessed for quality and thematic relevance. Data was systematically extracted from these studies, which contributed to the qualitative

summaries and, where applicable, quantitative meta-analyses.

6. Transparency and Documentation: The entire review process, including rationale for decision-making and potential impacts on findings, was meticulously documented to ensure completeness and replicability.

As depicted in Figure 3, this systematic approach ensured that the most relevant and high-quality studies on the application of the FBM and Hook Model in higher education were included. Table 1 provides a detailed summary of the year of publication and the specific contributions of each article to the understanding of these models in gamified learning environments.

Reference	Year	Contributions
1 Beardsley et al.	2020	Validates FBM's motivational dimension in student behavior differences
2 Plak et al.	2023	FBM's motivational dimension in explaining student behavior
3 Wang et al.	2022	Develops questionnaire measuring FBM triggers for Chinese college students
4 Zhou et al.	2021	Using FBM to analyzes low-carbon consumption behavior in university
5 de Toledo et al.	2024	Proposes FBM transcription as a computer tool
6 Filippou et al.	2015	Combines FBM and Hook model to enhance study habits
7 Heinrich et al.	2023	Analyzes privacy behavior based on the FBM
8 Daghestani et al.	2019	Applies FBM to determine gamification elements
9 Andrés et al.	2022	Applies FBM's trigger in behavioral change
10 Alhasani et al.	2024	Applies FBM as one of supporting theories
11 Balakrishna et al.	2023	Motivates desired behaviors using game mechanics stated by FBM
12 Fuß et al.	2014	Uses FMB to promote motivation in game
13 Wen et al.	2023	Uses FMB to improve learning effects
14 Takács et al.	2023	Applies FBM for Enhancing behavior through intrinsic and extrinsic motivation with triggers in gamification
15 Ashtari et al.	2021	Applies FBM for Enhancing student engagement
16 Jurgelaitis et al.	2018	Applies FBM for Enhancing student engagement and motivation
17 Lopez et al.	2017	Analyzes the elements relevant to gamification that motivate individuals to perform a task based on FBM
18 Salim et al.	2023	Applies FBM for behavior change and promoting student engagement
19 AL-Smadi	2015	Applies FBM in gamification to improve student engagement
20 Filippou et al.	2015	Proposes 8-step process to improve student habits based on FBM
21 Alshammari et al.	2023	Proposes a theoretical framework to design a persuasive game based on FBM
22 Bouchrika et al.	2019	Applies FBM in gamification to improve student engagement
23 Aldemir et al.	2017	Applies FBM in gamification elements to improve learning
24 Ohn et al.	2018	Proposes a conceptual learning model in online gamified platform based on FBM
25 Rahayu et al.	2022	Applies Hook model in gamification elements to improve student engagement
26 Neugebauer et al.	2023	Applies FBM in gamification to improve motivation and performance
27 Zekry et al.	2023	Proposes a model for creating a more engaging learning environment based on FBM and Hook model
28 Cheong et al.	2014	Applies Hook model in gamification elements to improve student engagement
29 De Troyer et al.	2020	Applies FBM and Hook model in gamification for improving application usage

30 Maushagen et al.	2021	Applies FBM and Hook model in mobile learning application
31 Putri et al.	2021	Proposes a gamified microlearning framework based on FBM and Hook model

Table 1: Overview of included studies.

DISCUSSION

Current Patterns and Trends of Behavior Models Application in Higher Education Research

Figure 4 systematically summarizes the theoretical models, research methods, research objectives, and technologies used in 31 relevant articles within the field of higher education. Regarding the application of theoretical models, the FBM was used in 24 articles, demonstrating its widespread application in analyzing students' motivations, abilities, and triggers. Comparatively, the Hook Model was independently used in only 2 articles, but it was applied together with the FBM in 5 articles, indicating that researchers are exploring the potential advantages of combining these two models. The research primarily utilized FBM to analyze and optimize the key drivers of student behavior—motivation, ability, and triggering factors (Ashtari & Taylor 2021; Salim et al., 2023). Although the usage frequency of the Hook Model is lower, it shows unique advantages in discussing how educational products can induce habitual behaviors in users (Filippou et al., 2016).

Both the FBM and the Hook Model are considered effective in enhancing student engagement within the higher education environment (Ashtari & Taylor 2021; Rahayu et al., 2022). However, the specific application and strategy design require further research and practice based on the particular educational context and student needs (Filippou et al., 2016). Additionally, these models provide a solid theoretical foundation for gamification in education, emphasizing the critical interplay between triggers, ability, and motivation for effectively changing learner behavior. By integrating the FBM and Hook Model, educators can design highly attractive and motivational gamified learning experiences, significantly increasing student engagement (Ohn et al., 2018).

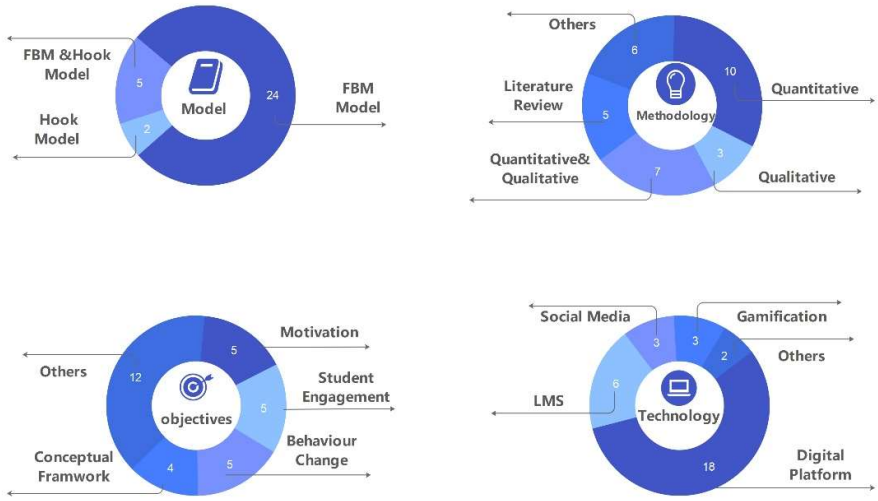

Figure 4: Findings from the review of included studies.

Figure 4 illustrates the diverse range of research methodologies employed, including quantitative methods for statistical hypothesis testing, qualitative methods for exploring student experiences in depth, and literature reviews to provide a broad understanding of existing knowledge. These varied approaches enhance the reliability and richness of the research outcomes. Seven studies adopted mixed methods, integrating quantitative data analysis with qualitative student feedback to assess the behavioral impacts of these models (Wang & Kang, 2022; Alhasani & Orji, 2024). These impacts include heightened student engagement, the development of consistent learning habits, and proactive learning behaviors.

As indicated by Figure 4, despite the differences in research objectives, they converge on core themes such as boosting student motivation, enhancing engagement, and fostering behavioral change—demonstrating a collective focus on addressing learners' needs in the educational environment. In terms of technological application, six studies examined the influence of Learning Management Systems (LMS), underscoring their pivotal role in higher education (Takács et al., 2023; Jurgelaitis et al., 2019; Andrés, 2022). Additionally, social media and gamification technologies were discussed in three studies, focusing on increasing interactivity and the appeal of learning experiences. Notably, 18 articles explored the use of digital platforms, reflecting the broad adoption of educational technology and its central importance in modern teaching (Beardsley et al., 2020). These tools are not just supplementary; they have become integral to the design of dynamic and accessible learning environments (Troyer

et al., 2020).

The Role of Behavior Models in Student Engagement

In higher education, the **Fogg Behavior Model (FBM)** and the **Hook Model** offer essential frameworks for understanding and influencing student behavior, particularly for increasing engagement and fostering learning habits (Filippou et al., 2016; Plak et al., 2023). These models help educators identify key factors impacting engagement and develop strategies to improve it.

Figure 4 shows that the **Hook Model** is used less frequently than the FBM in higher education, suggesting that while both models are effective in promoting behavioral change, challenges remain in establishing learning as a natural, self-sustaining habit. Although Ohn et al. (2016) highlight the Hook Model's ability to promote long-term engagement, empirical research on its use in higher education is limited (Lopez & Tucker, 2017). This indicates that while the FBM is widely applied due to its holistic approach to motivation, ability, and triggers, the specific emphasis of the Hook Model on habit formation has yet to be fully explored in educational settings, highlighting an opportunity for further research.

According to the **FBM**, increasing students' motivation toward a task is crucial for boosting engagement (Toledo et al., 2018). Teachers can enhance intrinsic motivation by clarifying the relevance and value of tasks, leading to more active student involvement (Jurgelaitis et al., 2019). The FBM also aids in recognizing students' abilities and learning needs, allowing for personalized support (Filippou et al., 2015). By aligning teaching methods and content with students' capabilities, engagement, satisfaction, and a sense of achievement are enhanced (Filippou et al., 2016).

The **Hook Model** further drives engagement through gamified rewards. Implementing systems that reward students for task completion or reaching milestones can heighten engagement and participation. This model particularly emphasizes fostering success through habitual learning and regular participation (Rahayu et al., 2022). By incorporating feedback loops and meaningful challenges, educators can help students maintain sustained engagement (Cheong et al., 2014).

In summary, the FBM and Hook Model provide a robust set of tools for understanding and shaping student behavior in higher education. By focusing on enhancing motivation, leveraging technology, and fostering habits, these models offer strong theoretical support for crafting strategies that attract and maintain student engagement (Lopez & Tucker, 2017).

Integration of Behavior Models in Gamification

The integration of gamification elements in higher education, particularly through the combined use of the FBM and Hook Model, offers a comprehensive approach to enhancing student engagement and promoting long-term learning behaviors (Ashtari & Taylor, 2021; Jurgelaitis et al., 2019). The FBM, by focusing on motivation, ability, and triggers, provides a theoretical foundation for understanding the drivers of student behavior and is especially effective for designing initial gamified activities that capture student interest and participation (Ashtari & Taylor, 2021; Rahayu et al., 2022).

The **Hook Model**, with its four core elements—triggers, actions, variable rewards, and investments—emphasizes creating lasting learning habits (Cheong et al., 2014). In gamified higher education environments, this model can design experiences that not only engage students initially but also sustain their interest. By incorporating variable rewards and encouraging personal investment, it nurtures curiosity and ownership, supporting prolonged engagement (Maushagen & Troyer, 2021).

By combining these models, educators can create gamified learning environments that both stimulate motivation and foster habit formation (Filippou et al., 2016; Troyer et al., 2020). For instance, a platform could apply FBM principles to design activities aligned with students' motivations and use Hook Model strategies to encourage regular participation and positive learning habits. This could involve timely reminders, rewards that align with students' goals, and personalized learning experiences, encouraging ongoing commitment (Zekry & McKee, 2023).

In conclusion, applying the FBM and Hook Model together creates a more engaging and sustained gamified learning experience. This integrated approach not only captures students' attention initially but also supports their long-term educational goals by understanding the dynamics of motivation, ability, triggers, and habit formation (Troyer et al., 2020). Through this, educators can design systems that address both immediate engagement needs and foster sustained learning behaviors.

CONCLUSIONS

This review examined the application of the FBM and Hook Model in higher education and how these models enhance student engagement and behavior change through gamification strategies. The study demonstrates that the FBM effectively drives student behavior by focusing on motivation, ability, and triggers. Conversely, while the Hook Model is less frequently used, it offers unique advantages in establishing lasting learning habits through its cycle of triggers, actions, variable rewards, and investments.

Despite the potential of both models, challenges remain in fully integrating them to promote long-term learning behaviors. Future research should explore their effects across various educational settings and examine how they interact to foster sustained student engagement and improved learning outcomes. By optimizing the application

of these models and integrating empirical insights, higher education can design more dynamic and engaging learning experiences that enhance motivation, engagement, and long-term educational success.

Implications

The implications of applying the Fogg Behavior Model (FBM) and Hook Model in higher education are significant for enhancing student engagement, motivation, and long-term learning behaviors. These models provide a theoretical foundation for designing more effective teaching strategies that align with students' intrinsic motivations and capabilities. By leveraging the FBM's focus on motivation, ability, and triggers, educators can create personalized learning environments that address individual needs, thereby increasing student participation and satisfaction. The integration of the Hook Model further emphasizes the importance of habit formation, suggesting that learning experiences designed with consistent feedback loops, variable rewards, and opportunities for personal investment can lead to sustained engagement and better academic outcomes.

Moreover, the use of these models highlights the critical role of technology, such as Learning Management Systems (LMS), gamification, and digital platforms, in creating more dynamic and interactive educational experiences. The success of these technologies in fostering engagement indicates that they are no longer optional but central to modern education. However, while the FBM has been widely adopted, the underutilization of the Hook Model in higher education suggests that further exploration is needed to fully realize its potential in habit-building and long-term engagement. Future research should focus on how both models can be integrated more effectively to not only capture students' initial interest but also support continuous learning and behavioral transformation. Ultimately, the successful application of these models can lead to a more engaging, personalized, and sustainable educational experience, improving overall student outcomes and preparing learners for future challenges.

Limitations and Suggestions for Further Studies

While this study provides valuable insights into the application of the Fogg Behavior Model (FBM) and Hook Model in higher education, several limitations should be acknowledged. First, the research primarily focuses on theoretical applications, and there is a lack of extensive empirical evidence demonstrating the long-term effectiveness of these models in various educational settings. The scarcity of studies specifically applying the Hook Model limits our understanding of its potential for habit formation and sustained student engagement in educational contexts. Additionally, most of the reviewed studies rely on self-reported data, which may introduce bias, as students' perceptions of engagement and motivation can be influenced by various external factors. Furthermore, the diversity of technological tools and gamification strategies examined in different studies makes it challenging to generalize findings across different institutions, disciplines, and student demographics. This variability suggests that the impact of FBM and Hook Model implementations might differ depending on the context, which limits the universal applicability of the findings.

To address these limitations, future research should prioritize longitudinal studies that empirically investigate the effects of integrating FBM and Hook Model strategies in higher education over extended periods. Such research would offer more comprehensive insights into the sustainability of student engagement and the formation of long-term learning habits. Additionally, more controlled experimental studies are needed to isolate the specific impacts of the FBM and Hook Model from other variables, providing clearer evidence of their effectiveness.

Given the underutilization of the Hook Model, further studies should explore its full potential in educational environments, especially in fostering habitual learning behaviors through digital platforms and gamified systems. Future research could also investigate how the FBM and Hook Model interact in different cultural, institutional, and disciplinary contexts to determine whether certain environments are more conducive to their successful application. Finally, research should explore how personalized learning technologies, such as adaptive learning systems or artificial intelligence-based educational tools, can be integrated with these behavioral models to enhance both engagement and learning outcomes. By addressing these areas, future studies can deepen our understanding of how these models can be optimized to create more effective and engaging educational experiences.

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