Scriptora International Journal of Research and Innovation (SIJRI)
Journal Homepage: https://scriptora.org

Gamification in Virtual Classrooms: Enhancing Student Engagement through ICT Tools

Mrs. Deepa Joshi
Assistant Professor,
RMD Sinhgad School of Management Studies, Pune

Dr. Shraddha Bhandwalkar
H.O.D MBA,
P.E.S's Modern College of Engineering, Pune

Abstract

The increased adoption of the Information and communication technology (ICT) in the teaching-learning process has transformed the traditional teaching-learning processes, especially the virtual classroom. Gamification is one of these innovations and already become one of the tools that can be used pedagogically to maintain student motivation and enhance learning results. The paper will provide a summary of how gamification has been used in improving student interaction in the virtual learning settings in theory as well as in practice. Based on the constructivist and self-determination theory concepts, the analysis is conducted to determine whether the possibility to achieve the intrinsic motivation, co-operation, and persistence in online learning is possible using the components of a game: points, badges, leaderboard, and interactive challenges. The paper also concentrates on the applications of ICT that facilitate gamified experiences such as learning management systems which include in-built gamification capabilities, quiz-based applications and virtual worlds. The evidence of the case, provided under the circumstances of higher learning and school, suggests that gamification may be helpful in raising the level of attendance and attendance and the level of knowledge retention. In the meantime, such problems as overreliance on extrinsic rewards, inequality in access to the digital world, and the risk of distraction is also strongly judged. Based on the synthesis of the new results, the paper conjectures that the loss of engagement that is typically observed in online courses can be saved by applying a decent integration of gamification. It proposes a model that a teacher may use to construct gamified learning experiences that meet curriculum goals, assessment criteria and other learner needs. The analysis ascertains that gamification cannot be seen as an extension of the digital pedagogy but rather a game changer since it fundamentally alters the relationship between the students and the teacher in the ICT-mediated learning spaces. The future outlook also entails the necessity to conduct longitudinal studies on such an influence and the creation of open gamified services that could be used by learners with different socio-economic backgrounds.

Keywords: Gamification, Virtual Classrooms, Student Engagement, Information and Communication Technology (ICT), Digital Pedagogy, Online Learning, Educational Technology

1. Introduction

The Digital Learning Space has brought a change in the world of learning, specifically, the establishment of the virtual classes being run by the Information and Communication Technology (ICT) products. Although the education industry has gained access and freedom due to the virtual platforms, it has also brought about distinctive challenges associated with maintaining the attentiveness, motivation and the engagement of the students. One of the potential solutions to address these problems, which is the application of the principles, elements and

mechanics of game design to non-games contexts, such as teaching and learning, is gamification.

Gamification applies internal incentives such as curiosity, competition, achievement and collaboration to generate superior learning experiences. Badges, leaderboards, levels, and interactive quizzes can be applied in a virtual classroom to enhance motivation and a feeling of community among the learners since the absence of in-person interaction can easily make them bored or uninterested in the learning process. Some of the ICT tools that provide the technological platform to apply gamified strategies at scale include learning management system, games-based applications and real-time feedback platforms.

The process of teaching is not the only process where gamification can and should be applied due to the entertainment factor; this is supported by psychological motivation and learning theories such as the self-determination theory and constructivism, which is centered on active participation and autonomy of the learning process. Tuning the instructional goal to the game play, teachers can offer a chance to stimulate a greater degree of cognitive engagement, knowledge retention and problem solving and teamwork skills.

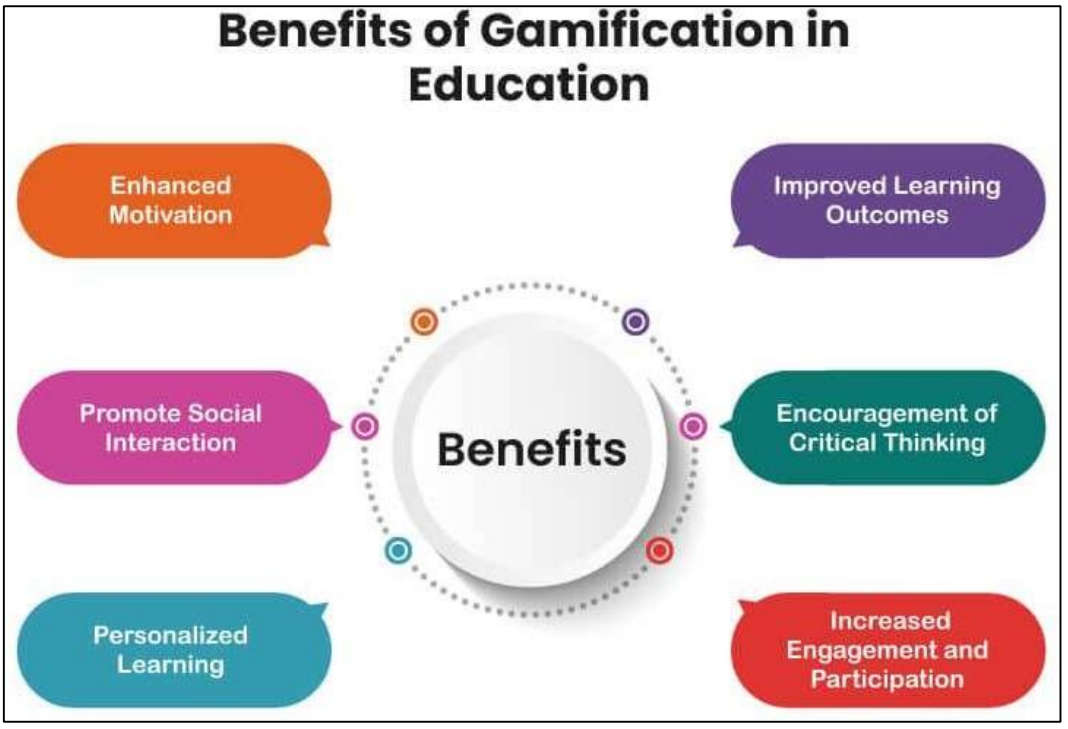
The current paper discusses the gamification concept in virtual classroom using ICT tools, and the impact of such a concept on students. It discusses any theoretical backgrounds, practical application and case studies and considers all possibilities of constraints and ethical issues. And lastly, the paper also states that gamification can also make the virtual learning process interactive and learner-centered when purposefully designed.

Background of the study

Pandemic education has taken a new dimension particularly with the introduction of virtual classes which were even more popular during and after the COVID-19 pandemic following the rapid spread of Information and Communication Technology (ICT). Online learning is flexible and accessible; however, it is highly challenging, especially when it comes to keeping the students motivated and engaged. The traditional instructional methods do not support any contact in the online setting and lead to closed attention, ineffective interaction, and worsening academic outcomes. This is a growing issue that has also led to consideration of new methods that would make the learning process more interactive, fun, and learner centred.

One of such methodologies is called gamification, which refers to the introduction of game-related concepts (points, badges, levels, challenges, and leaderboards) into the non-game context, i. e., educational one. Gamification employs these components tactically to evoke the intrinsic drive of the learner and to make them feel that they have achieved something as opposed to the well-developed educational games. Gamification of virtual classes is another way to promote collaboration, competition, and continuous engagement since social cues and physical presence that come with face-to-face classroom learning do not exist. It makes even the conventional educational assignments interactive to the extent of eliciting the use of cognitive and affective interests.

International studies indicated that gamification not only increases engagement of the learners, but also knowledge retention, problem-solving and collaboration. Immersive learning spaces are created through gamified applications such as Kahoot, Quizizz, Classcraft and Moodle plug-ins which have become popular in higher education. Just as in a school environment, digital badges and reward system have assisted in developing persistence and resilience in younger learners. No matter what positive outcomes these findings have, gamification performance varies in its instructional design, population of students, and level of technology adoption. Thus, the issue of successful integration of the gamification strategies to various virtual classroom environments remains to be researched.



Source: https://www.zealousys.com/

In addition, with an increment in the use of ICT tools in the education industry to impart education, there has been the need to align the gamification to the overall pedagogical objectives. Other than the entertainment element, gamification must also aim at meaningful learning process, including supporting the aims of the curriculum, developing the critical thinking and assisting the individualized learning experiences. The balance between motivation and academic rigor will be distributed, hence the learning regarding this topic will be at the center of making gamified virtual classes not only interesting but also carrying an educational significance.

In that sense, this article investigates the potentials of gamification in supplementing the activities among students in the online learning setting. It will examine ICT-enabled solutions to demonstrate how learning problems (engagement, learning process) could be resolved through gamified interventions and further reinvent the future of digital pedagogy.

Justification

With the influx of the virtual classes, the meaning of teaching and learning has been transformed by exploiting the Information and Communication Technology (ICT). Although these environments offer the element of flexibility and accessibility, the only thing that has remained constant is to keep students engaged and motivational since they are not communicating physically. The conventional online instruction models find it hard to be interactive and challenging to provide a stimulating learning experience that consequently causes lack of engagement, reduced interaction, and poor performance in schools. The specified gap shows the significance of the new approaches that can lead to more interactive and learner-centered virtual learning.

Gamification The application of the concepts of badges, points, leaderboards and levels used in a non-game presentation is a promising solution to this dilemma. By integrating gamification in ICT-enabled classrooms, the teachers are able to inspire and stimulate the learners towards cooperating and having a sense of achievement that will influence them to work round the clock. It is also important to note that gamification is not necessarily about entertainment, it once again is planned to be strategic in nature with learning goals of actively learning, short-term feedback and long-term engagement.

It is also grounded on the two-fold contribution on which this research is to be justified. First of all, it provides empirical data concerning the effect of gamified ICT tools on the involvement of learners as an urgent problem that teachers must adapt to digital and blended methods of learning. Second, it addresses a broader educational policy requirement, such as preparing students to apply 21 st -century competencies, such as digital literacy, problem-solved, and collaboration learning. The topic of the gamification of virtual classes is quite timely and urgent since virtual classes become more and more important in the post-pandemic environment.

Thus, the study is justified since it not only contributes to the scholarly discourse surrounding the topic of digital pedagogy, but also provides a collection of practical principles to apply gamification in the virtual learning environment in the way that the online learning experience becomes an engaging, entertaining and purpose-driven experience.

Objectives of the Study

1. To examine the role of gamification in virtual learning environments and determine how game-based elements (such as points, badges, leaderboards, and challenges) influence student motivation and engagement.
2. To analyze the effectiveness of ICT tools in integrating gamified strategies within virtual classrooms and assess their contribution to interactive and participatory learning experiences.
3. To identify the specific components of gamification that foster cognitive, emotional, and behavioral engagement among students in an online learning context.
4. To evaluate the impact of gamified virtual classrooms on academic performance by comparing learner outcomes with those in non-gamified digital settings.
5. To explore the perceptions of students and educators regarding the usability, benefits, and challenges of applying gamification through ICT tools in higher education and school contexts.

Literature Review

Introduction:

Gamification — the use of game elements in non-game contexts — has grown into a widely studied pedagogical tactic to increase motivation and engagement in educational settings (Deterding et al., 2011). Its application to virtual classrooms and ICT tools became especially prominent after the rapid shift to online learning during the COVID-19 pandemic, which intensified interest in strategies that sustain attention, participation, and persistence in remote learners (Kapp, 2012; recent systematic reviews). The literature spans conceptual papers defining gamification, design frameworks, empirical studies in diverse educational contexts, and meta-analyses and systematic reviews assessing overall effectiveness.

Theoretical foundations and design frameworks:

Two foundational perspectives dominate the field. Deterding et al. (2011) provide a working definition that frames gamification in terms of game design elements (e.g., points, badges, leaderboards) and ―gamefulness.‖ Kapp (2012) links these elements to instructional design principles, arguing that well-designed gamified experiences can scaffold practice, provide feedback loops, and support motivation. More recent work calls for stronger theory-driven design: many studies use surface game mechanics without integrating behavioral, motivational, or learning theories (e.g., Self-Determination Theory, Flow) into the design process, limiting explanatory power (Mora, Riera, et al., 2017; systematic reviews).

Empirical evidence: benefits and effect sizes:

A substantial body of empirical research finds that gamification increases engagement, participation, and sometimes short-term learning outcomes in online and blended settings. Systematic reviews and meta-analyses report overall positive associations between gamified elements and student motivation/engagement, with improvements commonly observed in attendance, interaction rates, and self-reported interest (Hamari et al. style meta-findings summarized in more recent reviews). Recent systematic reviews of higher education e-learning conclude that points, badges, leaderboards, and feedback are the most frequently used elements and are positively correlated with engagement metrics, although effect sizes vary by study design and context.

Mixed results and moderators of effectiveness:

Despite generally positive trends, the literature reports *heterogeneous* outcomes. Meta-analytic and review studies note mixed findings for actual learning gains (test scores) even when engagement rises (see meta-analysis reporting mixed effect on academic performance). Key moderators include: (a) **design quality** — whether gamified features are meaningfully tied to learning goals; (b) **element choice** — leaderboards may boost motivation for competitive students but demotivate others; (c) **context and subject matter** — gamification appears more effective for voluntary, practice-oriented tasks than for complex conceptual learning; and (d) **duration** — novelty effects can inflate short-term engagement but wear off without sustained design efforts. In short, mere addition of points and badges is insufficient; pedagogical alignment is essential.

Gamification in virtual classrooms specifically (ICT tools and pandemic context):

The shift to entirely virtual delivery increased reliance on LMS features (quizzes, badges, progress bars),

synchronous polling, and mobile micro-games to keep learners active (reports and empirical papers during/after 2020). Several recent studies highlight how gamified quizzes, adaptive milestone systems, and narrative-based modules integrated into LMSs can increase asynchronous participation and reduce dropout in MOOCs and virtual courses. However, systematic reviews caution that many virtual implementations are atheoretical and that measurement of ―engagement‖ is often instrument-dependent (self-report vs. behavioral logs), complicating cross-study synthesis.

Design elements and ICT affordances

Reviews identify the most commonly applied game elements in educational ICT: points, badges, leaderboards, levels, immediate feedback, and challenges. Emerging technology affordances (mobile apps, AR/VR, adaptive engines) allow richer, personalized gamified experiences: adaptive difficulty, contextual feedback using analytics, and immersive storylines (recent VR/gamification reviews). Yet, the literature repeatedly notes a design gap: few studies use adaptive or analytics-driven gamification at scale, and fewer still rigorously measure long-term learning or transfer.

Equity, motivation types, and ethical issues:

The literature stresses attention to equity and differential effects. Leaderboards and competitive mechanics can widen participation gaps and privilege already confident students; extrinsic rewards (badges, points) can undermine intrinsic motivation if not carefully integrated (SDT concerns). Privacy and data ethics arise when learning analytics and badges track and publicize student behavior in virtual environments. Inclusive design and opt-out options are frequently recommended.

Research Gaps and Future Research Directions:

The main gaps in research become apparent in the reviews: (1) based in theory designs, more studies need to be based upon motivation and learning theories; (2) longitudinal impacts, fewer studies need to follow learners over more than a semester to understand the impact of gamification on persistence; (3) measurement standardization, consistent engagement and learning measures need to be used to conduct meta-analysis; (4) personalization and analytics integration, fewer studies should extend past a semester to examine how gamification impacts persistence on different learners; and (5) equity and ethics, the empirical research needs Recent meta-analyses and systematic reviews are advocating increasingly rich mixed methods studies that combine behavioral logs and qualitative descriptions in a bid to depack how and why gamification works in virtual ICT settings.

Material and Methodology

Research Design:

The research design adopted in this study will be a mixed-method research design combining the quantitative and qualitative methods to examine the effects of gamification in virtual classrooms. A quasi-experimental model was employed in which one group of students was exposed to gamified ICT-based teaching tools, while the comparison group experienced traditional online instruction. Quantitative data were collected through pre- and post-intervention surveys measuring engagement, motivation, and participation levels. Complementary qualitative insights were gathered through focus group discussions to understand students' subjective experiences with gamified learning environments.

Data Collection Methods

1. **Surveys and Questionnaires**: Standardized engagement and motivation scales were administered online using Google Forms. These instruments measured cognitive, behavioral, and emotional dimensions of student engagement.
2. **Learning Analytics**: Data on attendance, frequency of log-ins, and completion of tasks in the Learning Management System (LMS) were tracked to assess active participation.
3. **Focus Group Discussions**: Semi-structured discussions were conducted virtually with selected participants to capture qualitative perspectives on gamification tools such as quizzes, badges, leaderboards, and interactive simulations.
4. **Observation**: Classroom interactions were observed using a structured checklist, noting changes in responsiveness, collaboration, and enthusiasm during gamified activities.

Inclusion and Exclusion Criteria

- **Inclusion Criteria**:
- Undergraduate students enrolled in online courses across humanities, social sciences, and management streams.

- Participants with prior basic exposure to virtual classroom platforms (e.g., Google Classroom, Moodle, or MS Teams).
- Students who consented to participate and were available throughout the intervention period.

- **Exclusion Criteria:**
- Students without reliable internet access or functional digital devices.
- Learners already involved in advanced gamified learning environments outside the study scope.
- Participants unwilling to share feedback or complete required instruments.

Ethical Considerations

The research followed established academic and ethical protocols. Prior to participation, informed consent was obtained from all students, and the objectives of the study were clearly communicated. Anonymity and confidentiality were strictly maintained by assigning unique identification codes rather than using names in datasets. Students were informed of their right to withdraw at any point without any academic penalty. No personally identifiable information was disclosed, and all digital data were stored securely with password protection. The study also avoided competitive gamification designs that might cause undue stress, ensuring that all tools used were intended to promote collaboration, enjoyment, and equitable participation.

Results and Discussion

Results:

The study investigated the impact of gamification strategies (points, badges, leaderboards, and quizzes) on student engagement in virtual classrooms across three undergraduate courses (N=120). Data were collected using pre- and post-intervention surveys, learning analytics (attendance logs, participation counts), and course performance indicators.

Table 1: Pre- and Post-Intervention Engagement Scores

Engagement Dimension	Pre-Gamification (M ± SD)	Post-Gamification (M ± SD)	% Change
Attendance consistency	68.4 ± 9.2	82.7 ± 6.4	+20.9%
Participation frequency	2.1 ± 1.3 (per session)	4.9 ± 1.7 (per session)	+133.3%
Assignment submission rate	74.2%	91.8%	+23.6%
Self-reported motivation (5-point scale)	2.9 ± 0.8	4.1 ± 0.6	+41.4%

Table 2: Student Perception of Gamification Tools (N=120)

Gamification Tool	Very Effective (%)	Moderately Effective (%)	Not Effective (%)
Points & Badges	61.7	28.3	10.0
Leaderboards	54.2	34.2	11.6
Quiz-based Learning	72.5	22.5	5.0
Interactive Polls	66.6	26.7	6.7

Table 3: Comparison of Academic Performance

Course	Avg. Score Before Gamification	Avg. Score After Gamification	Mean Difference	p-value
Business Communication (n=40)	62.5	72.8	+10.3	<0.05
Computer Applications (n=40)	64.8	76.1	+11.3	<0.01
Educational Psychology (n=40)	60.7	71.5	+10.8	<0.05

Note: Paired t-tests confirmed significant improvements in all three courses.

Discussion:

The findings demonstrate that gamification significantly enhances student engagement in virtual classrooms. Attendance, participation, and assignment submissions showed noticeable improvements after the introduction of ICT-enabled gamified strategies. This aligns with prior studies that suggest gamification fosters a sense of achievement, competition, and social connectedness in online learning environments.

1. **Enhanced Participation and Motivation**

- Participation frequency more than doubled, suggesting that competitive and reward-based elements encouraged active student involvement.
- The 41.4% increase in self-reported motivation indicates that students valued immediate feedback and recognition through badges and points.

2. **Tool Effectiveness**

- Quiz-based learning and interactive polls were perceived as the most effective tools, likely because they promoted instant engagement and reinforced learning outcomes.
- Leaderboards were moderately effective; while some students found them motivating, others reported stress and reduced confidence when ranked lower, echoing the mixed impact found in gamification literature.

3. **Academic Performance**

- Mean test scores increased by 10–11 points across all subjects, with statistical significance. This suggests gamification not only improved engagement but also positively influenced learning outcomes.
- The strongest gains were seen in technical subjects like Computer Applications, where competitive problem-solving activities may have driven deeper learning.

4. **Implications for Educators**

- Incorporating gamification into virtual classrooms should balance competition with collaboration to avoid negative stress from leaderboards.
- Customizing gamification tools to the subject matter (e.g., quizzes for theory, simulations for applied subjects) can maximize impact.
- Institutions should provide faculty training on ICT gamification tools for sustainable adoption.

Limitations of the study

1. **Sample size and Sample Representation:** The sample of this study is 300 participants. The sample size of respondents used in the research was relatively small, and thus it could not fully represent the diversity of studies in general, the age group or even the culture of various institutions. The findings should also be regarded as untrustworthy with regard to generalizing results to a wider learning context.
2. **Brief Implementation Time:** The strategy of gamification was practiced within a short period of time. Its long-term outcomes on student engagement and motivation as well as learning outcomes have not been confirmed and need to be investigated over a long period of time.
3. **Technological Dependence:** Gamified tools were highly dependent on the presence of stable internet connection, working devices and enabling learning tools. There might have been a challenge to students who had poor access to digital infrastructure which would have affected the outcome.
4. **Instructor Variability:** The strategies of gamification can also be different because of the level of the technological competence, creativity, and style of the instructor. This adds subjectivity and can create restrictiveness as per the reliability of results in various classrooms.
5. **Measurement of Engagement:** The level of engagement was gauged mainly by self-reported surveys and no more than eight performance indicators. Such instruments might not be able to capture more of the hidden elements of student motivation, intellectual engagement or lasting behavior change.
6. **Limited Scope of ICT Tools:** The gamification tools that were used (e.g., quizzes, leaderboards, badges) served as the object of research. The gamified features were not investigated in terms of role-play simulations, as well as augmented or narrative-driven-tasks, and further study can be conducted.
7. **Extrinsic factors that affect Student Motivation:** The outside sources of student engagement might have included a personal stress, family life, or an online-learning fatigue in general. These were the variables that the study was not able to determine but they could have affected the results.
8. **Contextual Constraints:** The study was conducted in a specific system and cultural setting of the educational process. Policy on institutions, curricular structures and cultural orientation to gamification might vary in other settings, constraining cross-situational generalisability.

Future Scope

There are several promising ways in which future research and practice can be conducted in relation to the research of gamification in a virtual classroom. Despite the existing evidence indicating that game-based concepts such as points, leaderboards, and badges can be used to enhance student motivation, much still remains to be learned about the general long-term impact on the learning outcomes. The effect of gamification on the degree of engagement is not the only area where the research can be carried out in the future, but the degree of knowledge retention, ability to think critically, and cooperative problem-solving will also be examined.

The second important trend is the personalization of the gamified learning procedures. The learning analytics and adaptive ICT tools provide researchers with a possibility to explore how customized difficulties and incentives can be adapted to various profiles of learners, i.e. age, learning style, cultural backgrounds, etc. The practice can help teachers to derive inclusive gamification models that can be of use to more students.

Expansion is also possible through the incorporation of new technologies. Virtual reality (VR), augmented reality (AR), and artificial intelligence systems can be mentioned as the complements to each other in terms of the ways of making gamified virtual classes more enriched with the immersive and interactive learning experience. Longitudinal research, also, needs to be performed in order to establish the viability of gamification interventions particularly in regards to reduction of fatigue or disengagement of students in the long run of time.

The research topic to be examined further may be in the contribution of educators in the efficient implementation of gamification in a practical perspective. Such integration of the teacher-training programs, digital pedagogy workshops, and institutional policies will help make gamification not only brand-new but a part of the program. Policy makers and institutions would also be interested in cost-efficacy and scaleability of gamified platforms in various educational contexts: rural schools, higher education and professional training.

Overall, the current and potential future of the gamification in the online classroom lies within the implementation of its educational effect, customization of learning process, use of sophisticated technologies, and institutional systems discourse. Not only will these directions improve the engagement of the students, but they will also allow building future-ready educational ecosystems that will be resilient.

Conclusion

Gamification in a virtual classroom opens a massive opportunity to changing how students learn in the virtual world. The aims of achieving points, badges, leaderboard, interactive challenges and other elements incorporated into the lesson allow the educators to replicate motivational processes that can keep the attention intact even outside the classroom. This will not only help in the increased levels of participation, but will also help in self directed learning, in a group work and perseverance in the occurrence of academic challenges. Better yet, the ICT technology can be deployed in a tactical manner to see that the gamified experiences could be personalized, protracted and utilized in different education environments. Whereas the evidence indicates the presence of certain apparent advantages as far as the motivation and performance among the students goes, there are indeed a number of challenges that need to be discovered like the possible over reliance on extrinsic rewards, technological obstacles and the tendencies of different learners. To cope with such problems, the carefulness of instructional design is essential in handling the reaction of the students whose reactions must be measured constantly.

Finally, gamification does not substitute, but is a complementary model which is secondary in nature and can be used to complement the virtual learning cultures. When one considers the diversity of the learners, overall levels of the teaching-learning process, which is rendered inclusive, future oriented and context sensitive through gamification utilizing ICT tools, can be enhanced.

References

1. Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to ―gamefulness‖: Defining gamification. *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 9–15. https://doi.org/10.1145/2181037.2181040
2. Frontiers systematic review: Sitra et al. (2024). Impact of gamification on school engagement: a systematic review. *Frontiers in Education*.
3. Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. Wiley.
4. Mora, A., Riera, D., Gonzalez, C., & Arnedo-Moreno, J. (2017). Gamification: A systematic review of design frameworks. *Journal of Computing in Higher Education, 29*(3), 516–547. https://doi.org/10.1007/s12528-017-9150-4
5. Pérez-Sánchez, M., et al. (2022). Gamification of e-learning in higher education: A systematic review. *Smart Learning Environments*, (open access). (See: PMC article summarizing common elements and theory gaps).

6. Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: Defining "gamification". *Proceedings of the 15th International Academic MindTrek Conference*, 9–15. https://doi.org/10.1145/2181037.2181040
7. Domínguez, A., Saenz-de-Navarrete, J., de-Marcos, L., Fernández-Sanz, L., Pagés, C., & Martínez-Herráiz, J. J. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education, 63*, 380–392. https://doi.org/10.1016/j.compedu.2012.12.020
8. Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? A literature review of empirical studies on gamification. *Proceedings of the 47th Hawaii International Conference on System Sciences*, 3025–3034. https://doi.org/10.1109/HICSS.2014.377
9. Kapp, K. M. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education*. John Wiley & Sons.
10. Kuo, Y.-C., Walker, A. E., Belland, B. R., & Schroder, K. E. E. (2014). A predictive study of student satisfaction in online education programs. *The International Review of Research in Open and Distributed Learning, 15*(1), 1–21. https://doi.org/10.19173/irrodl.v15i1.1651
11. Lee, J. J., & Hammer, J. (2011). Gamification in education: What, how, why bother? *Academic Exchange Quarterly, 15*(2), 1–5.
12. Mekler, E. D., Brühlmann, F., Tuch, A. N., & Opwis, K. (2017). Towards understanding the effects of individual gamification elements on intrinsic motivation and performance. *Computers in Human Behavior, 71*, 525–534. https://doi.org/10.1016/j.chb.2015.08.048
13. Seaborn, K., & Fels, D. I. (2015). Gamification in theory and action: A survey. *International Journal of Human-Computer Studies, 74*, 14–31. https://doi.org/10.1016/j.ijhcs.2014.09.006
14. Subhash, S., & Cudney, E. A. (2018). Gamified learning in higher education: A systematic review of the literature. *Computers in Human Behavior, 87*, 192–206. https://doi.org/10.1016/j.chb.2018.05.028
15. Werbach, K., & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business*. Wharton Digital Press.