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Students' Perceptions of Gamification and Virtual Reality in Higher Education: Associations with Student Engagement and Learning Motivation

A Cross-Sectional Survey of Higher Education Students in Kupwara District, Jammu and Kashmir

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Abstract
Purpose: This study examines higher education students' perceptions of gamification and virtual reality (VR) in the teaching-learning process and explores how these perceptions are associated with student engagement and learning motivation.
Methodology: A quantitative, cross-sectional survey design was employed. Data were collected through a structured Google Forms questionnaire comprising 30 five-point response items organised into four dimensions: gamification (8 items), student engagement (7 items), learning motivation (7 items), and VR (8 items). The final analytical sample consisted of 275 complete responses. Composite scores were calculated as the mean of the items in each dimension. Analyses comprised descriptive statistics, Cronbach's alpha, Pearson correlations, and two multiple linear regression models.
Findings: Mean scores were 3.54 (SD = 1.24) for gamification, 3.56 (SD = 1.24) for engagement, 3.32 (SD = 1.11) for learning motivation, and 3.32 (SD = 1.06) for VR. Subscale Cronbach's alpha coefficients ranged from .869 to .920. Gamification was positively correlated with engagement ($r = .883$, $p < .001$) and motivation ($r = .738$, $p < .001$). VR perceptions were positively correlated with engagement ($r = .828$, $p < .001$) and motivation ($r = .795$, $p < .001$). In regression models, gamification and VR together accounted for 83.4% of the variance in engagement and 67.0% of the variance in motivation.
Originality: The study examines perceived gamification and VR together in relation to two distinct learner outcomes within a regional higher education sample. The findings concern self-reported perceptions and statistical associations; they do not establish causal effects or objectively measured learning gains.
Keywords: gamification; virtual reality; student engagement; learning motivation; higher education; Jammu and Kashmir; cross-sectional survey

1. Introduction

The expanding use of digital technologies has broadened the range of instructional approaches available to higher education institutions. Among these approaches, gamification and virtual reality (VR) have attracted attention because they can create interactive, participatory, and experiential learning environments. Gamification is commonly defined as the use of game-design elements in non-game contexts (Deterding et al., 2011). In education, these elements may include points, badges, progress indicators, challenges, feedback, and opportunities for collaboration or competition. Their educational value depends on how they are aligned with instructional objectives and learner needs.

Evidence published suggests that gamification can support cognitive, motivational, and behavioural outcomes, although effects vary with design and context. Sailer and Homner (2020) reported positive effects across these outcome domains, while Zainuddin et al. (2020) identified engagement, motivation, academic achievement, and social connection as recurring themes in educational gamification research. These findings support further examination of students' perceptions, particularly in settings where access to digital resources and institutional support may vary.

VR provides a different set of educational affordances. It can place learners in simulated environments and enable them to explore objects, spaces, and processes that may be difficult to experience directly. Merchant et al. (2014) reported positive overall effects of VR-based instruction on learning outcomes. Radianti et al. (2020), however, observed that higher education VR research had often focused on application design and usability, with less consistent attention to learning theory and outcome evaluation. Makransky and Petersen (2019) showed that learning in desktop VR involves affective and cognitive processes, indicating that immersion alone does not guarantee learning.

Engagement and motivation are related but distinct dimensions. Engagement concerns attention, effort, participation, and involvement, whereas motivation concerns the reasons and willingness that energise and sustain learning. Self-determination theory highlights autonomy, competence, and relatedness as important conditions for high-quality motivation (Ryan & Deci, 2000). Gamified activities may support these needs through meaningful choices, achievable challenges, feedback, and social connection. VR may contribute through presence, exploration, and experiential interaction, although usability, accessibility, and cognitive demands remain important.

The present study examines whether students' perceptions of gamification and VR are associated with their engagement and learning motivation in the higher education institutions of Kupwara district, Jammu and Kashmir. It does not test an instructional intervention or measure academic achievement. Its purpose is to analyse relationships among four dimensions and estimate the combined statistical contribution of gamification and VR perceptions to engagement and motivation.

2. Review of Related Literature

2.1 Gamification and learning

Deterding et al. (2011) define gamification as the application of game-design elements in non-game contexts. In education, this commonly involves points, badges, leaderboards, challenges, levels, progress feedback, and narrative structures. These features can make progress visible and provide short-term goals, but their usefulness depends on alignment with learning tasks and learner needs. Hamari et al. (2014) found that empirical studies frequently reported positive outcomes, while emphasising context dependence. Sailer and Homner (2020) reported positive effects on cognitive, motivational, and behavioural outcomes. Zainuddin et al. (2020) similarly highlighted the potential to support engagement and motivation, while noting variation in theoretical grounding and implementation. Gamification is therefore best understood as an instructional design approach rather than a guaranteed motivational intervention.

2.2 Virtual reality in higher education

VR-based learning environments can support spatial visualisation, simulated practice, and interaction with representations of complex phenomena. Merchant et al. (2014) reported a positive overall effect

of VR-based instruction on learning outcomes. Makransky and Petersen (2019) identified affective and cognitive processes involved in desktop VR learning. Radianti et al. (2020) identified broad applications in higher education but noted that many studies emphasised usability and system development more than theoretically grounded evaluation. Hamilton et al. (2021) also identified pedagogical potential alongside limitations in research design, outcome measurement, and intervention duration. VR may enrich learning, but its value depends on instructional design and task suitability.

2.3 Engagement and motivation in technology-supported learning

Student engagement includes behavioural participation, attention, effort, and involvement. Motivation concerns the willingness and reasons that sustain learning. Self-determination theory proposes that contexts supporting autonomy, competence, and relatedness can foster more self-determined motivation (Ryan & Deci, 2000). Gamified learning may support competence through feedback and progress indicators, autonomy through meaningful choice, and relatedness through collaborative tasks. VR may encourage engagement through exploration and interaction, although technical difficulties, excessive cognitive demands, or novelty effects may constrain benefits. Huang et al. (2021) examined motivation, engagement, and performance across multiple VR sessions and levels of immersion, highlighting the importance of immersion level and learning context.

2.4 Research gap

The related literature provides a substantial basis for examining gamification and VR, but three issues remain relevant. First, the two approaches are often investigated separately, although students may encounter them as overlapping forms of technology-supported learning. Second, context-specific evidence about students' perceptions in regional higher education settings remains useful for institutional planning. Third, engagement and motivation are often discussed together, but they are distinct learner-related constructs. This study examines perceived gamification, student engagement, learning motivation, and perceived VR value within one survey dataset. It investigates bivariate relationships and the combined predictive contribution of gamification and VR perceptions to engagement and motivation without claiming causal effects.

3. Theoretical and Conceptual Framework

The study is informed primarily by self-determination theory (Ryan & Deci, 2000), which explains how learning environments may support motivation through autonomy, competence, and relatedness. Gamification features such as meaningful challenges, feedback, progress indicators, and collaborative tasks may be perceived as supporting competence and relatedness. VR may provide opportunities for exploration and experiential participation that can contribute to interest and engagement. This framing is consistent with research emphasising instructional design and cognitive support in immersive learning (Makransky & Petersen, 2019). The conceptual model treats gamification perception and VR perception as predictors, and student engagement and learning motivation as outcomes. Given the cross-sectional self-report design, the proposed relationships are associational rather than causal.

Predictor construct	Outcome construct	Proposed relationship
Gamification perception	Student engagement	Positive association
Gamification perception	Learning motivation	Positive association
Virtual reality perception	Student engagement	Positive association
Virtual reality perception	Learning motivation	Positive association

4. Objectives of the Study

1. To assess students' perceptions of gamification, student engagement, learning motivation, and virtual reality in learning.

2. To examine relationships between perceived gamification and student engagement and learning motivation.
3. To examine relationships between perceived virtual reality and student engagement and learning motivation.
4. To determine the combined predictive contribution of perceived gamification and virtual reality to student engagement and learning motivation.

5. Research Hypotheses

1. H1: Students' perceptions of gamification are positively associated with student engagement.
2. H2: Students' perceptions of gamification are positively associated with learning motivation.
3. H3: Students' perceptions of virtual reality are positively associated with student engagement.
4. H4: Students' perceptions of virtual reality are positively associated with learning motivation.

6. Research Methodology

6.1 Research design and setting

The study adopted a quantitative empirical research design using a cross-sectional survey method. It examined higher education students' perceptions of gamification and VR in learning and the associations of these perceptions with engagement and learning motivation. The study was conducted in Kupwara district, Jammu and Kashmir, India. A cross-sectional design enabled data to be collected at one point in time and relationships among the study variables to be examined; it does not permit causal conclusions.

6.2 Population, sampling and participants

The target population comprised undergraduate and postgraduate students enrolled in higher education institutions of Kupwara district. Non-probability convenience sampling was used to collect the data. The questionnaire was circulated electronically through WhatsApp, email, and academic networks, and participation was voluntary. The response sheet contained 275 respondent records. All 275 records had complete responses to the 30 questionnaire items and valid numeric values within the 1–5 range; therefore, the final analytical sample was N = 275.

Participant characteristic	Category	n	%
Gender	Male	138	50.2
	Female	135	49.1
	Other	2	0.7
Study level	Undergraduate	146	53.1
	Postgraduate	129	46.9
Discipline	Arts	152	55.3
	Science	89	32.4
	Education	14	5.1
	Other	13	4.7
	Commerce	6	2.2
	Law	1	0.4
Prior VR technology experience	Yes	87	31.6
	No	188	68.4
Prior game-based learning experience	Yes	54	19.6
	No	221	80.4

6.3 Research instrument and scoring

Data were collected using a structured questionnaire comprising 30 statements organised into four sections: gamification (Q1–Q8; 8 items), student engagement (Q9–Q15; 7 items), learning motivation (Q16–Q22; 7 items), and virtual reality (Q23–Q30; 8 items). The sections addressed perceptions of game-based elements and feedback; attention, participation, and involvement; interest and willingness to learn; and the perceived educational value of VR.

Dimension	Items	No. of items	Scoring
Gamification	Q1–Q8	8	Mean of Q1–Q8
Student engagement	Q9–Q15	7	Mean of Q9–Q15
Learning motivation	Q16–Q22	7	Mean of Q16–Q22
Virtual reality	Q23–Q30	8	Mean of Q23–Q30

Responses were stored as numeric values from 1 to 5. The questionnaire draft identifies the anchors as 1 = strongly disagree and 5 = strongly agree. Composite scores were calculated as the arithmetic mean of the items assigned to each dimension, retaining the 1–5 metric. Higher scores indicate more favourable perceptions if the stated coding direction is confirmed.

6.4 Reliability and measurement considerations

Internal consistency was assessed separately for each dimension using Cronbach's alpha. The coefficients ranged from .869 to .920, indicating good internal consistency in this sample. The questionnaire was treated as a study-specific instrument. Alpha coefficients provide evidence of internal consistency but do not establish content, convergent, discriminant, or factorial validity. Further exploratory and confirmatory factor analyses would be appropriate in a subsequent validation study.

6.5 Data collection

Data were collected using a structured questionnaire administered through Google Forms. The questionnaire was circulated electronically among the target participants through WhatsApp, email, and academic networks. Participation was voluntary. Upon completion of the survey, the responses were exported to a spreadsheet for data organization, coding, and subsequent statistical analysis. The collected responses were examined for completeness and accuracy before being included in the final dataset.

6.6 Statistical analysis

Means and standard deviations were calculated for the four composite dimensions, while Cronbach's alpha was used to assess their internal consistency. Pearson product–moment correlations were conducted to examine the bivariate relationships among gamification, student engagement, learning motivation, and virtual reality (VR) perceptions. Two multiple linear regression models were estimated to examine the combined predictive contribution of gamification and VR perceptions to student engagement and learning motivation. In the first model, student engagement was treated as the dependent variable, while in the second model, learning motivation was the dependent variable. Gamification and VR perceptions were entered simultaneously as predictors in both models. Heteroskedasticity-consistent HC3 standard errors were used for coefficient inference. All statistical tests were two-tailed, with $p < .05$ considered the threshold for statistical significance. The analyses examined statistical associations and predictive relationships and were not intended to establish causal effects.

7. Results

7.1 Data screening and sample profile

The response sheet comprised 275 respondent records. All records contained valid responses to Q1–Q30, with no missing or out-of-range item values. The four composite scores matched the means recalculated from their respective item sets. As shown in Table 1, undergraduate students represented 53.1% of the sample and postgraduate students 46.9%. The largest disciplinary groups were Arts

(55.3%) and Science (32.4%). Prior VR technology experience was reported by 31.6%, while 19.6% reported prior participation in game-based learning activities.

7.2 Descriptive statistics and reliability

Construct	Items	N	Mean	SD	Cronbach's α
Gamification	8	275	3.54	1.24	.919
Student engagement	7	275	3.56	1.24	.920
Learning motivation	7	275	3.32	1.11	.875
Virtual reality	8	275	3.32	1.06	.869

Student engagement had the highest mean (M = 3.56, SD = 1.24), followed by gamification (M = 3.54, SD = 1.24). Learning motivation and VR perceptions had equal mean scores of 3.32, with standard deviations of 1.11 and 1.06, respectively. Cronbach's alpha coefficients ranged from .869 to .920, indicating good internal consistency for the four dimensions in this sample.

7.3 Correlations among the study variables

Variable	1	2	3	4
1. Gamification	1			
2. Student engagement	.883***	1		
3. Learning motivation	.738***	.818***	1	
4. Virtual reality	.771***	.828***	.795***	1

Note. *** $p < .001$ (two-tailed).

All four dimensions were positively and significantly correlated. Gamification was strongly associated with engagement ($r = .883$, $p < .001$) and positively associated with motivation ($r = .738$, $p < .001$). VR perceptions were strongly associated with engagement ($r = .828$, $p < .001$) and motivation ($r = .795$, $p < .001$). Gamification and VR perceptions were correlated ($r = .771$, $p < .001$), as were engagement and motivation ($r = .818$, $p < .001$).

7.4 Multiple regression analyses

In the first model, gamification and VR perceptions were entered simultaneously to predict student engagement. The model explained 83.4% of the variance in engagement ($R^2 = .834$; adjusted $R^2 = .832$), $F(2, 272) = 681.70$, $p < .001$. Both predictors had positive, statistically significant coefficients.

Predictor	B	HC3 SE	Standardised β	t	p
Gamification	0.605	0.050	0.603	12.02	< .001
Virtual reality	0.427	0.059	0.363	7.22	< .001

In the second model, gamification and VR perceptions jointly predicted learning motivation. The model explained 67.0% of the variance in motivation ($R^2 = .670$; adjusted $R^2 = .668$), $F(2, 272) = 276.51$, $p < .001$. Both predictors were statistically significant and positive.

Predictor	B	HC3 SE	Standardised β	t	p
Gamification	0.278	0.063	0.309	4.44	< .001
Virtual reality	0.587	0.067	0.557	8.76	< .001

Gamification had the larger standardised coefficient in the engagement model, whereas VR perceptions had the larger standardised coefficient in the motivation model. These coefficients represent statistical prediction within the sample and should not be interpreted as causal effects.

7.5 Hypothesis testing

Hypothesis	Evidence	Decision
H1: Gamification–engagement	$r = .883$, $p < .001$; $\beta = .603$, $p < .001$	Supported
H2: Gamification–motivation	$r = .738$, $p < .001$; $\beta = .309$, $p < .001$	Supported
H3: VR–engagement	$r = .828$, $p < .001$; $\beta = .363$, $p < .001$	Supported
H4: VR–motivation	$r = .795$, $p < .001$; $\beta = .557$, $p < .001$	Supported

8. Discussion

The findings indicate positive associations among students' perceptions of gamification, VR, engagement, and learning motivation. Mean scores were above the numerical midpoint of the five-point scale across all four dimensions, with engagement and gamification receiving the highest average ratings. The standard deviations nevertheless indicate variation in respondents' views.

The strong association between gamification and engagement is consistent with literature describing how game elements can make learning tasks more participatory and goal-oriented. Sailer and Homner (2020) reported positive behavioural and motivational outcomes, while Zainuddin et al. (2020) identified engagement and motivation as recurring outcomes in educational gamification research. The present results add a regional survey perspective: respondents with more favourable perceptions of gamification also tended to report higher engagement.

Gamification was also positively associated with learning motivation. This pattern is compatible with self-determination theory, which proposes that contexts supporting competence, autonomy, and relatedness can facilitate motivation (Ryan & Deci, 2000). However, the questionnaire did not directly measure these psychological needs. The results should therefore be understood as evidence that perceived gamification and self-reported motivation covary in this dataset, rather than as a direct test of the theory.

VR perceptions were positively associated with engagement and motivation. This is broadly consistent with research examining affective and experiential dimensions of VR learning. Makransky and Petersen (2019) emphasised cognitive and affective processes involved in VR learning, while Huang et al. (2021) examined motivation and engagement across repeated VR sessions.

The regression results provide a differentiated pattern. Gamification had the larger standardised coefficient in the engagement model, whereas VR had the larger standardised coefficient in the motivation model. One possible interpretation is that students associate game-based structures with participation and involvement, while they may associate VR's experiential potential with interest and willingness to learn. This interpretation is tentative because the survey is cross-sectional and based on self-reports.

The findings support a learner-centred approach to educational technology. Gamification and VR should not be treated as stand-alone solutions. They should be selected where they serve clear learning objectives, provide appropriate feedback and interaction, and are accessible to students. This is consistent with reviews cautioning that usability, immersion, and novelty are not substitutes for sound pedagogical design (Radianti et al., 2020; Hamilton et al., 2021).

9. Educational and Institutional Implications

i. Teachers may use gamification selectively through meaningful challenges, progress feedback, and collaborative tasks aligned with course outcomes.

ii. VR should be introduced where simulation, spatial visualisation, or experiential practice adds clear instructional value, rather than solely for novelty.

iii. Institutions should provide orientation and faculty development so students and teachers can use digital and immersive tools confidently.

iv. Equitable access, device availability, connectivity, accessibility, and technical support should be considered before VR-based activities are scaled.

v. Evaluation should measure engagement, motivation, usability, and actual learning achievement separately rather than relying on a single perception score.

10. Limitations and Future Research

Despite its contributions, the present study has certain limitations that should be considered when interpreting the findings. First, the cross-sectional research design captures students' perceptions at a single point in time and therefore does not establish causal relationships between gamification, virtual reality (VR), student engagement, and learning motivation. The findings indicate statistical associations rather than evidence of the direct effects of these technologies on students' learning experiences or academic performance.

Second, the study relied on self-reported questionnaire responses, which may be influenced by individual perceptions, response tendencies, and social desirability. Consequently, the reported findings may not fully reflect students' actual engagement, motivation, or learning outcomes.

Third, the use of non-probability convenience sampling may limit the representativeness of the sample and the generalizability of the findings beyond the participating students and institutions. The results should therefore be interpreted within the geographical and institutional context of the study.

Fourth, the questionnaire was developed around the four dimensions examined in the study. Although the scales demonstrated satisfactory internal consistency, further validation through exploratory and confirmatory factor analysis would strengthen the evidence concerning their underlying construct structure. Additionally, the study primarily examined students' perceptions and did not distinguish in detail between different forms, levels, or durations of exposure to gamified learning and VR-based educational activities.

Future research could address these limitations through longitudinal and experimental designs to investigate how the integration of specific gamification strategies and VR applications relates to changes in student engagement, learning motivation, and academic achievement over time. Studies involving larger and more diverse samples across multiple higher education institutions and geographical locations would improve the generalizability of the findings. The use of validated measurement instruments, objective indicators of academic performance, classroom observations, and qualitative interviews could also provide a more comprehensive understanding of students' experiences. Further investigations may examine how institutional infrastructure, disciplinary differences, digital accessibility, and prior technological experience influence the acceptance and educational use of gamification and virtual reality in higher education.

11. Conclusion

This study examined the associations between higher education students' perceptions of gamification and virtual reality (VR) and their reported engagement and learning motivation. The findings demonstrated good internal consistency across all four dimensions and significant positive relationships among them. Regression analysis further indicated that gamification and VR perceptions jointly accounted for substantial variation in student engagement and learning motivation. Gamification showed a stronger association with engagement, whereas VR perceptions showed a stronger association with motivation.

Overall, students with more favourable perceptions of these technologies tended to report higher levels of engagement and motivation. These findings highlight the potential relevance of gamification and VR in higher education. However, their effective use requires sound pedagogical planning, equitable access, and continuous evaluation rather than technology adoption alone.

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