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The Motivation Threshold: Examining the Impact of E-Learning Motivation on Academic Achievement in Higher Education

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Abstract: Motivation plays a critical role in determining students' engagement and success in online learning environments. Despite the growing adoption of e-learning in higher education, empirical evidence regarding the relationship between students' motivation toward e-learning and academic achievement remains limited in the Indian context. This study examined the relationship between motivation toward e-learning and academic achievement among undergraduate students and investigated differences in motivation across gender and academic stream. A quantitative survey design was employed. Data were collected from 600 undergraduate students enrolled in Arts and Science programmes using the Motivation to Learn Online Questionnaire (MLOQ). Pearson correlation, independent samples t-tests, and one-way analysis of variance (ANOVA) were used to analyse the data. The findings revealed a significant moderate positive relationship between motivation toward e-learning and academic achievement ($r = .41$, $p < .01$). Significant differences in academic achievement were also observed across motivation levels ($F = 52.62$, $p < .001$, $\eta^2 = .15$), with highly motivated students demonstrating better academic performance than their moderately and low-motivated counterparts. No significant differences were found in overall motivation across gender or academic stream. However, female students reported higher levels of extrinsic goal orientation and perceived instructor support, while Science students scored higher on intrinsic goal orientation and social engagement. The study concludes that motivation toward e-learning is an important factor associated with academic achievement in higher education. The findings underscore the need for higher education institutions to strengthen motivational support, promote self-regulated learning, and develop engaging digital learning environments to enhance students' academic achievement.

Keywords: E-learning, Student motivation, Academic achievement, Higher education, Online learning environments, Gender differences

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Introduction

The use of digital technologies in higher education has increased rapidly over the past decade. Students increasingly rely on online platforms, learning management systems, and various digital resources to support their learning processes. This mode of learning commonly referred to as e-learning, offers several advantages, including flexibility, broader access to educational materials, and opportunities for self-paced learning. As a result, students across the world are increasingly integrating e-learning into their academic activities to enhance learning outcomes.

However, the effectiveness of e-learning does not depend solely on the availability of technology or internet access. The success of digital learning environments largely depends on how actively and meaningfully students engage with online learning platforms. One of the most significant factors influencing such engagement is students' motivation. Motivation encourages learners to participate in learning activities, persist in completing academic tasks, and effectively utilize the learning resources available to them (Reeve, 2018).

The role of motivation becomes even more critical in e-learning environments. Unlike traditional classrooms, online learning often requires students to work more independently and regulate their own learning processes. In the absence of adequate motivation, students may experience difficulties in maintaining concentration, completing assignments, and actively participating in online learning activities. Consequently, motivation plays a crucial role in determining students' learning effectiveness and academic success in digital learning environments (Hartnett, 2016).

In recent years, the adoption of e-learning has expanded significantly in India, particularly following the rapid transition to online teaching during the COVID-19 pandemic. Universities and colleges increasingly utilize digital platforms to deliver lectures, share learning materials, and conduct assessments. Although the use of online learning systems has grown rapidly, empirical research examining how students' motivation toward e-learning influences academic achievement in the Indian higher education context remains limited.

Furthermore, students' motivation toward e-learning may vary across different demographic and academic groups. Previous research suggests that factors such as gender and academic discipline can influence how students interact with and benefit from online learning systems (Ong & Lai, 2006; Scherer et al., 2019). Students from different academic streams may also have distinct experiences, expectations, and levels of engagement with digital learning tools, which may influence their motivation toward e-learning.

Research Problem

Despite the widespread adoption of e-learning in higher education, there is limited empirical evidence regarding the relationship between students' motivation toward e-learning and their academic achievement in the Indian context. Furthermore, existing research provides insufficient insight into whether motivation toward e-learning differs across demographic and academic groups, such as gender and academic stream. This gap in the literature constitutes the central research problem addressed in the present study.

Purpose of the Study

The purpose of this study is to examine the relationship between students' motivation toward e-learning and their academic achievement among undergraduate students in Haryana, India. The study also aims to investigate whether motivation toward e-learning differs according to gender and academic stream. By addressing these objectives, the study seeks to contribute to the

growing body of knowledge on e-learning and provide insights that may support the development of effective digital learning practices in higher education.

Research Questions

The study addresses the following research questions:

1. What is the relationship between students' motivation toward e-learning and their academic achievement?
2. Do students with different levels of motivation differ significantly in academic achievement?
3. Are there significant gender differences in motivation towards e-learning?
4. Are there significant differences in motivation towards e-learning between Arts and Science students?

Theoretical Background

The present study is grounded in established theories of academic motivation, particularly Self-Determination Theory (SDT) developed by Edward L. Deci and Richard M. Ryan. Self-Determination Theory provides a comprehensive framework for understanding how different types of motivation influence students' learning behaviour and academic outcomes. According to this theory, motivation can broadly be categorized into two forms: intrinsic motivation and extrinsic motivation. Intrinsic motivation occurs when students engage in learning activities because they find them interesting, enjoyable, or personally meaningful. In contrast, extrinsic motivation arises when students are driven by external factors such as grades, rewards, recognition, or academic requirements (Ryan & Deci, 2020).

Self-Determination Theory further proposes that motivation is influenced by the satisfaction of three fundamental psychological needs: autonomy, competence, and relatedness. Autonomy refers to students' sense of control over their learning activities and the ability to make independent choices. Competence relates to students' belief in their ability to successfully perform academic tasks and master learning materials. Relatedness refers to the sense of connection and belonging that students experience with instructors and peers. When these psychological needs are fulfilled, students are more likely to develop higher levels of motivation, engagement, and persistence in learning activities.

In addition to Self-Determination Theory, the present study is also informed by Social Cognitive Theory proposed by Albert Bandura. This theory emphasises the role of cognitive and social factors in shaping learning behaviour (Bandura ,1986). A central concept within this theory is self-efficacy, which refers to individuals' beliefs about their capability to successfully perform specific tasks (Bandura, 1997). Students with higher self-efficacy tend to demonstrate greater effort, persistence, and resilience when facing academic challenges.

Both theoretical perspectives highlight the importance of motivational and psychological factors in influencing students' learning behaviour and academic performance. In e-learning environments, where students often engage in self-directed and independent learning, motivational factors such as intrinsic interest, perceived competence, and self-efficacy become particularly important. Therefore, these theoretical frameworks provide a useful basis for understanding how students' motivation toward e-learning may influence their engagement with digital learning environments and ultimately affect their academic achievement.

Literature Review

Motivation refers to the psychological processes that energize, direct, and sustain behaviour toward achieving specific goals. In educational settings, student motivation plays a crucial role in determining the level of engagement, persistence, and performance in learning activities,

including technology-mediated environments such as e-learning (Deci &Ryan, 2000).Motivation is widely recognised as one of the most important psychological factors influencing students' learning behaviour and academic performance. It determines the level of effort, persistence, and engagement students demonstrate during the learning process. One of the most influential frameworks used to understand motivation in education is the Self-Determination Theory. This theory explains that students are more motivated when their basic psychological needs for autonomy, competence, and relatedness are fulfilled (Ryan & Deci, 2020). In higher education settings, motivated learners generally participate more actively in academic activities and demonstrate better learning outcomes.

With the rapid growth of digital technology, e-learning has become an important mode of instruction in higher education institutions. However, unlike traditional classrooms, online learning environments require students to take greater responsibility for managing their learning. This makes motivation a critical factor in determining whether students actively participate in digital learning activities. Several scholars argue that the effectiveness of e-learning depends not only on technological infrastructure but also on students' motivational readiness and engagement (Bond et al., 2020).

Earlier research has consistently shown that motivation influences students' participation and persistence in online courses. For instance, Martin and Bolliger (2018) found that meaningful interaction, instructor feedback, and collaborative activities significantly enhance student engagement in online learning. Similarly, Hartnett (2016) emphasised that motivation acts as a key driver of persistence in online courses, as motivated students are more likely to complete learning tasks and remain engaged throughout the course duration. These findings highlight that motivation is not only an individual psychological factor but also influenced by the design of the learning environment.

Recent research has further explored how specific motivational factors influence engagement in digital learning environments. Bond et al. (2020), in their systematic mapping of student engagement research, found that students who are intrinsically motivated tend to interact more frequently with learning management systems, online discussions, and digital learning resources. This suggests that motivation strengthens students' active involvement in online learning processes.

Studies also demonstrate a positive relationship between motivation and academic achievement in e-learning contexts. For example, Adam et al. (2023) examined the role of teaching presence and psychological need satisfaction in blended learning environments. Their findings indicate that when students perceive strong instructional support and interaction, their autonomous motivation increases, leading to higher engagement and improved academic outcomes. For instance, Ferrer et al. (2022) found that students with higher levels of intrinsic and extrinsic motivation showed stronger engagement in online learning environments, indicating that motivation plays a significant role in promoting active participation and learning in digital courses..

Technological innovations in online education have also been found to influence student motivation. García-Martínez et al. (2024) analysed the impact of interactive digital tools in higher education and reported that collaborative learning platforms and interactive technologies can enhance students' motivation and improve knowledge retention. Similarly, Alj and Bouayad (2024), in their systematic review of Massive Open Online Courses (MOOCs), observed that motivational strategies such as personalised learning pathways, peer collaboration, and instructor feedback significantly improve learner engagement and reduce dropout rates in online courses.

More recent studies have examined additional factors that influence motivation in e-learning environments. Yang et al. (2025) investigated the role of social support and self-regulated learning in digital learning contexts. Their findings show that students who experience greater autonomy and competence demonstrate stronger motivation and higher levels of participation in online learning activities. Similarly, Mekheimer (2025) highlighted that technological self-efficacy plays an important role in shaping students' motivation, as learners with higher confidence in using digital tools tend to adopt more effective learning strategies and experience higher academic satisfaction.

In the Indian context, research on e-learning and student motivation has expanded significantly following the rapid adoption of online education during and after the COVID-19 pandemic. Several studies have examined how students engage with digital learning platforms and the motivational factors influencing their participation. For example, Dhawan (2020) analysed the rapid shift to online education in India and highlighted that students' motivation, digital readiness, and access to technology play a crucial role in the effectiveness of online learning environments. Similarly, research conducted among Indian students reported that intrinsic motivation significantly influences students' engagement in virtual classrooms. The study found that higher levels of intrinsic motivation lead to greater participation and interaction in online learning activities, indicating that motivated learners benefit more from digital learning environments (Prakasha et al., 2023).

Recent studies in Indian higher education also emphasize the importance of technological infrastructure and student perceptions in shaping e-learning outcomes. For instance, research examining e-learning platforms in Indian universities found that students' perceptions of usefulness, ease of use, and satisfaction significantly influence their engagement with online learning systems (Singh et al., 2024). Furthermore, recent analyses of online education research in India indicate a substantial growth in studies focusing on digital learning, student engagement, and motivation in the post-pandemic period, highlighting the increasing importance of understanding motivational factors in digital learning environments (Alrefaee et al., 2025).

These findings suggest that although e-learning offers flexible and accessible learning opportunities in Indian higher education, students' motivation remains a critical factor determining their engagement and academic success in digital learning environments.

Research gap

Despite the growing body of research on e-learning motivation, several limitations remain in the existing literature. Existing studies have predominantly examined student engagement, satisfaction, technology acceptance, and online learning experiences. However, comparatively fewer studies have investigated the relationship between students' motivation toward e-learning and their academic achievement, particularly within the Indian higher education context. Furthermore, evidence regarding variations in e-learning motivation across gender and academic streams remains limited. These gaps indicate the need for further empirical investigation into motivational factors in digital learning environments.

Methodology

This study employed a quantitative descriptive survey design**.**

Population and Sample

The target population consisted of (2nd and 3rd year) undergraduate students aged 19–24, enrolled in Arts (B.A.) and Science (B.Sc. Medical/Non-Medical) programs in government and

government-aided colleges across five districts of Haryana, India**:** Kurukshetra, Karnal, Kaithal, Ambala, and Yamunanagar.

A stratified random sampling technique was used to ensure proportional representation by gender, academic stream, and district. A sample of 600 undergraduate students was randomly selected. From each district, 120 students were selected (60 from Arts and 60 from Science). Each stream had equal representation of males and females (30 each), resulting in a final sample of 300 Arts and 300 Science students.

- Students' motivation towards e-learning, measured using the *Motivation to Learn Online Questionnaire (MLOQ).*
- Academic achievement operationalized through students' previous semester examination scores.

Instrument

The *Motivation to Learn Online Questionnaire (MLOQ)* (Fowler, 2007, 2018) was adapted for the Indian context. To ensure cultural appropriateness, items were translated into Hindi. The instrument consists of 38 items across seven subscales of motivation**,** rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). One item was reverse coded. The MLOQ comprises 38 questions.

The questionnaire evaluates seven dimensions of motivation, each of which plays a critical role in influencing learner engagement and success:

- Intrinsic Goal Orientation: Measures motivation driven by internal interest or the desire to master content for personal satisfaction.
- Extrinsic Goal Orientation: Assesses the extent to which students are motivated by external outcomes such as grades or career benefits.
- Control of Learning Beliefs: Reflects students' belief that their own effort and strategies determine academic success.
- Self-Efficacy: Gauges students' confidence in their ability to complete academic tasks in online settings.
- Task Value: Captures students' perceptions of the usefulness, relevance, or importance of the learning material.
- Social Engagement: Examines motivation related to peer interaction and collaborative learning.
- Instructor Support: Assesses the motivational role of teacher feedback, encouragement, and presence in online environments.

Each dimension is assessed using multiple items on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

The selection of the Motivation to Learn Online Questionnaire (MLOQ**)** developed by Kevin S. Fowler is conceptually aligned with the theoretical foundations of this study. The instrument measures learners' motivational orientation toward online learning, including aspects related to engagement, persistence, and attitudes toward digital learning environments (Fowler, 2007, 2018). These dimensions correspond with the principles of Self-Determination Theory proposed by Edward L. Deci and Richard M. Ryan, which emphasise the role of intrinsic motivation, autonomy, and competence in shaping students' learning behaviour. Similarly, the focus on learners' confidence and persistence in online learning contexts resonates with the concept of self-efficacy within Social Cognitive Theory developed by Albert Bandura. Therefore, the use of the MLOQ provides an empirically appropriate tool for examining students' motivation toward e-learning.

Validity of the Instrument

To ensure the suitability of the Motivation to Learn Online Questionnaire (MLOQ) for the Indian higher education context, the instrument was translated into Hindi and adapted to reflect the linguistic and cultural characteristics of the target population. The translated version was reviewed by experts in education to evaluate the clarity, relevance, and appropriateness of the items. Based on their feedback, minor modifications were made to improve the wording and comprehensibility of certain items.

Reliability of the Instrument

The reliability of the adapted MLOQ was assessed using Cronbach's alpha and split-half reliability. The overall scale demonstrated high internal consistency ($\alpha = 0.87$), indicating strong reliability. The split-half reliability coefficient was 0.79 ($p < .01$), further confirming the consistency of the instrument for the present sample.

Ethical Considerations

Participation in the study was voluntary, and all participants were informed about the purpose and nature of the research before completing the questionnaire. Informed consent was obtained from the participants, and they were assured that their responses would be treated confidentially and used solely for academic research purposes. No personally identifiable information was collected, and anonymity was maintained throughout the study.

Data Collection

Data were collected through Google Forms, distributed with institutional consent. A total of 822 responses were collected. After screening for completeness, 600 fully completed questionnaires were retained for analysis.
Respondents were asked to rate their motivation towards e-learning on a 5-point Likert scale ranging from 'Strongly Disagree' to 'Strongly Agree' as described above.

Data Analysis

All statistical analyses were conducted using IBM SPSS Statistics version 27.0. The level of significance was set at $p < .05$ for all tests.

Establishment of Norms for the Interpretation of Motivation Levels

To facilitate meaningful interpretation of scores on the *Motivation to Learn Online Questionnaire (MLOQ)*, norms were established using percentile ranks. Students' scores were categorized into three levels of motivation: high, moderate, and low. This categorization allows for the differentiation of learners based on their relative standing within the sample distribution.

Table-1: Norms for Motivation Levels towards E-Learning

Interpretation	Range of Scores	Percentile Criterion
High Positive Motivation	140-177	Above 75th percentile
Moderate Positive Motivation	118-139	Between 25th-75th percentile
Low Positive Motivation	38-117	Below 25th percentile

Interpretation of Norms

- High Positive Motivation (140–177): Students whose scores fall within the range of 140 to 177 on the Motivation to Learn Online Questionnaire (MLOQ) were placed in the high positive motivation category. These scores correspond to values above the 75th percentile of the score distribution.

- Moderate Positive Motivation (118–139): Students obtaining scores between 118 and 139 were classified under the moderate positive motivation category. This range represents scores between the 25th and 75th percentile**.**
- Low Positive Motivation (38–117): Students whose scores fall between 38 and 117 were categorized as having low positive motivation, corresponding to scores below the 25th percentile**.**

Distribution of Students across Different Levels of Motivation towards E-learning

The collected data on Motivation to Learn Online scale (N=600) were categorized into three levels: low, moderate, and high.

Table-2: Students' Motivation Levels towards E-learning

Motivation towards E-learning Level	**Range of Scores**	**No. of Students (Frequency)**	**Percentage**
High Positive Motivation	140-177 (Above 75th Percentile)	145	24%
Moderate Positive Motivation	118-139 (Between 25th & 75th Percentile)	317	53%
Low Positive Motivation	38-117(Below 25th Percentile)	138	23%
Total		600	100%

The findings presented in Table-2 indicate that a majority of students (53%) demonstrated a *moderate* level of positive motivation towards e-learning, with scores ranging between 118 and 139. Approximately one-fourth of the participants (24%) reported a *high* level of positive motivation, scoring above the 75th percentile (140–177), while 23% fell within the *low* motivation category, with scores below the 25th percentile (38–117).

The distribution of motivation levels indicates that a majority of students fall within the moderate motivation category, while comparatively fewer students are classified in the high motivation category. A smaller proportion of students are also observed in the low motivation group. This distribution reflects the variation in students' motivation towards e-learning within the sample.

Relationship between students' motivation towards e-learning and their academic achievement

The Pearson product-moment correlation coefficient was applied to examine the strength and direction of the relationship between students' motivation towards e-learning and their academic achievement.

Table-3: Correlation Analysis between Students' Motivation towards E-learning and their Academic Achievement

Variables	**N**	**Coefficient of Correlation (r)**	**Level of significance**
Motivation towards e-learning and Academic achievement	600	0.413	Significant at 0.01 level

Table-3 shows that the significant positive correlation ($r = .41$, $p < .01$) indicates that higher motivation toward e-learning is associated with better academic performance. Although the relationship is moderate rather than strong, it suggests that motivation is an important, but not sole, predictor of achievement, implying that other factors may also play a role.

These findings highlight that motivation towards e-learning plays a meaningful role in enhancing students' academic performance, underscoring the importance of fostering motivational strategies in digital learning environments.

Analysis of Academic Achievement across Levels of E-Learning Motivation

A one-way Analysis of Variance (ANOVA) was conducted to examine whether students' academic achievement varied across three motivation levels: Low, Moderate, and High.

Table-4: ANOVA Results – Academic Achievement across Motivation Levels

Source	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig. (p)**	**Effect Size (η^2)**	**Result**
Between Groups	7912.449	2	3956.224	52.617	< .001	0.15	Significant
Within Groups	44887.549	597	75.189				
Total	52799.998	599					

Table-4 shows that the ANOVA results revealed a statistically significant difference in academic achievement across the three motivation groups ($F = 52.617$, $p < .001$. The effect size ($\eta^2 = 0.15$) indicates a moderate effect, suggesting that approximately 15% of the variance in academic achievement can be explained by differences in students' motivation towards e-learning.

To further identify which groups differed significantly, a Tukey HSD post-hoc test was performed.

Table-5: Post-Hoc Analysis: Tukey HSD Test

Comparison	**Mean Difference**	**Sig. (p)**	**Interpretation**
Low vs. Moderate	-1.46	0.227	No Significant difference

Comparison	Mean Difference	Sig. (p)	Interpretation
Low vs. High	-9.39	<.001	significant difference
Moderate vs. High	-7.93	<.001	significant difference

As shown in Table-5, students with high motivation scored significantly higher in academic achievement than both low- and moderately-motivated students ($p < .001$). However, the difference between low and moderate groups was not statistically significant.

Table-6: Group Means – Academic Achievement by Motivation Level

Group	N	Mean Academic Achievement
Low Motivation	138	58.54
Moderate Motivation	317	60.00
High Motivation	145	67.93

Table -6 further illustrates that students with high motivation (M = 67.93) achieved considerably higher academic scores compared to both moderately motivated students (M = 60.00) and low motivated students (M = 58.54).

Students with high motivation obtained the highest mean academic achievement scores, followed by students with moderate motivation, whereas students with low motivation recorded the lowest scores. This pattern suggests a positive relationship between motivation towards e-learning and academic achievement.

Gender-wise Comparison of E-Learning Motivation

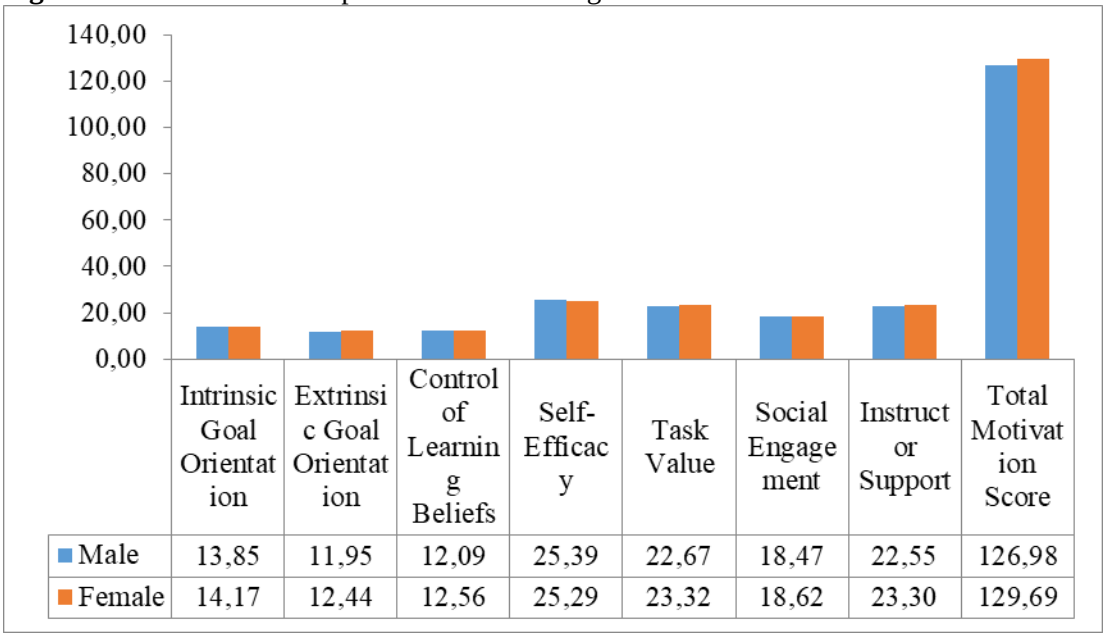
An independent samples t-test was conducted to examine gender differences in motivation towards e-learning across seven dimensions: Intrinsic Goal Orientation, Extrinsic Goal Orientation, Control of Learning Beliefs, Self-Efficacy, Task Value, Social Engagement, and Instructor Support.

Table-7: Gender-Wise Comparison of E-Learning Motivation

Dimensions	Gender	N	Mean	SD	Std. Error Mean	t	Sig. (p)	Result
Intrinsic Goal Orientation	Male	300	13.85	2.892	0.167	1.351	0.177	Not significant
	Female	300	14.17	2.788	0.161			
Extrinsic Goal Orientation	Male	300	11.95	2.819	0.163	2.101	0.036	Significant
	Female	300	12.44	2.894	0.167			
Control of Learning Beliefs	Male	300	12.09	2.920	0.169	1.934	0.054	Marginally Significant
	Female	300	12.56	3.115	0.180			
Self-Efficacy	Male	300	25.39	4.621	0.267	0.278	0.781	Not Significant
	Female	300	25.29	4.480	0.259			
Task Value	Male	300	22.67	4.394	0.254	1.850	0.065	Marginally Significant
	Female	300	23.32	4.211	0.243			
Social Engagement	Male	300	18.47	3.780	0.218	0.477	0.634	Not significant

Dimensions	Gender	N	Mean	SD	Std. Error Mean	t	Sig. (p)	Result
	Female	300	18.62	3.751	0.217			
Instructor Support	Male	300	22.55	4.130	0.238	2.121	0.034	Significant
	Female	300	23.30	4.448	0.257			
Overall Motivation Score	Male	300	126.98	19.216	1.109	1.806	0.071	Marginally Significant
	Female	300	129.69	17.596	1.016			

Figure-1: Gender-wise Comparison of E-Learning Motivation



Interpretation:

- **Intrinsic Goal Orientation:** Female students (M = 14.17, SD = 2.78) scored slightly higher than males (M = 13.85, SD = 2.89), but the difference was not significant (t = 1.35, p = 0.177).

- **Extrinsic Goal Orientation:** Female students (M = 12.44, SD = 2.89) reported significantly higher scores than males (M = 11.95, SD = 2.81; t=2.10, p = 0.036), suggesting stronger motivation driven by external rewards and recognition.

- **Control of Learning Beliefs:** Females (M = 12.56, SD = 3.11) scored higher than males (M = 12.09, SD = 2.92), with results approaching significance (t=1.93, p = 0.054). This trend suggests that females may place more emphasis on effort and control in determining learning outcomes.

- **Self-Efficacy:** No significant gender difference was observed (t=0.27, p = 0.781), indicating that both male and female students demonstrated similar confidence in their ability to succeed in e-learning. Females scored (M = 25.29, SD = 4.48) whereas males scored (M = 25.39, SD = 4.62).

- **Task Value:** Females (M = 23.32, SD = 4.21) reported higher perceived task value than males (M = 22.67, SD = 4.39), with results approaching significance (t=1.85, p = 0.065), suggesting that females may view e-learning tasks as more useful and important.

- **Social Engagement:** No significant gender difference was found (t=0.47, p = 0.634), with nearly identical mean scores for males and females. Females scored (M = 18.62, SD = 3.75) whereas males scored (M = 18.47, SD = 3.78).

- **Instructor Support:** Females (M = 23.30, SD = 4.44) reported significantly higher instructor support compared to males (M = 22.55, SD = 4.13; t=2.12, p = 0.034).

- **Overall Motivation:** Females (M = 129.69, SD = 17.59) scored higher than males (M = 126.98, SD = 19.21), with results marginally significant (t=1.80, p = 0.071), indicating a general trend of greater motivation among females.

Statistically significant differences were observed for Extrinsic Goal Orientation and Instructor Support, both favoring female students. Marginally significant trends were noted for Control of Learning Beliefs, Task Value, and Overall Motivation, again favoring females. No significant gender differences were found in Intrinsic Goal Orientation, Self-Efficacy, and Social Engagement.

While gender differences were minimal overall, female students consistently showed slightly higher motivation across most dimensions, with meaningful differences in extrinsic motivation and perceived instructor support.

Figure -1 visually illustrates these patterns, showing consistently higher mean scores for female students across several motivation dimensions, particularly Task Value, Control of Learning Beliefs, and Instructor Support**.**

Stream-wise Comparison of E-Learning Motivation

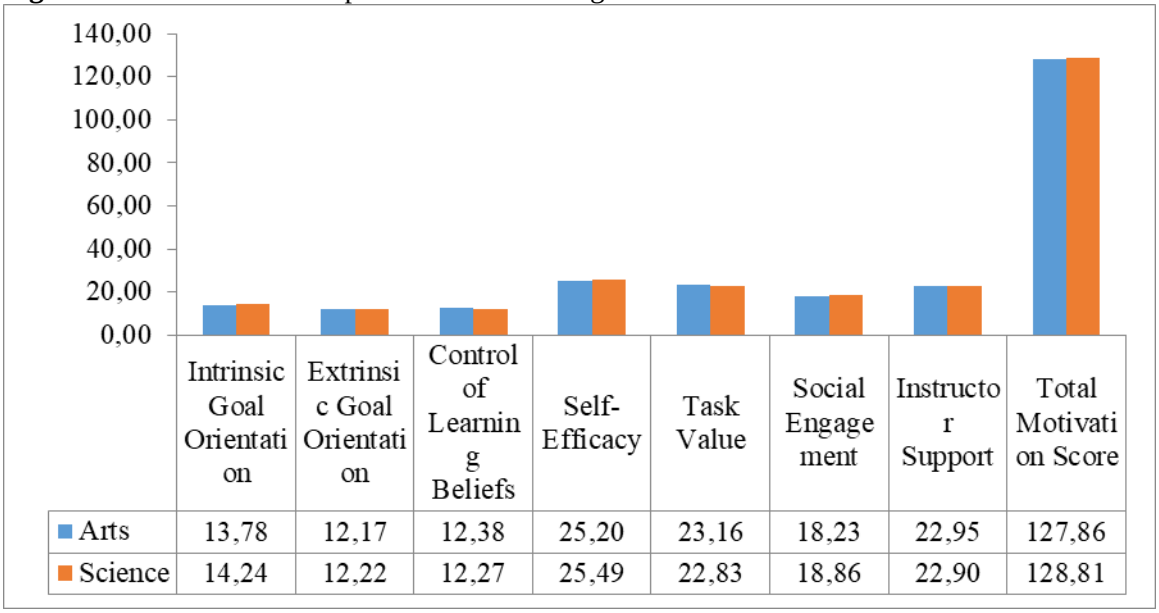
To assess whether motivation towards e-learning differs between Arts and Science stream students, an independent samples t-test was conducted across seven motivational dimensions.

Table-8: Stream-Wise Comparison of E-Learning Motivation

Dimensions	**Stream**	**N**	**Mean**	**SD**	**Std. Error Mean**	**t**	**Sig. (p)**	**Result**
Intrinsic Goal Orientation	Arts	300	13.78	2.911	0.168	1.987	0.047	Significant
	Science	300	14.24	2.758	0.159			
Extrinsic Goal Orientation	Arts	300	12.17	2.967	0.171	0.214	0.831	Not Significant
	Science	300	12.22	2.764	0.160			
Control of Learning Beliefs	Arts	300	12.38	3.071	0.177	0.418	0.676	Not significant
	Science	300	12.27	2.985	0.172			
Self-Efficacy	Arts	300	25.20	4.675	0.270	0.781	0.435	Not Significant
	Science	300	25.49	4.420	0.255			
Task Value	Arts	300	23.16	4.536	0.262	0.937	0.349	Not significant
	Science	300	22.83	4.077	0.235			

Dimensions	Stream	N	Mean	SD	Std. Error Mean	t	Sig. (p)	Result
Social Engagement	Arts	300	18.23	3.938	0.227	2.067	0.039	Significant
	Science	300	18.86	3.558	0.205			
Instructor Support	Arts	300	22.95	4.462	0.258	0.123	0.902	Not significant
	Science	300	22.90	4.148	0.239			
Overall Motivation Score	Arts	300	127.86	19.604	1.132	0.634	0.526	Not significant
	Science	300	128.81	17.257	0.996			

Figure-2: Stream-Wise Comparison of E-Learning Motivation



Interpretation:

- **Intrinsic Goal Orientation:** Science students (M = 14.24, SD = 2.758) reported significantly higher intrinsic motivation than Arts students (M = 13.78, SD = 2.911), (t = 1.98, p = 0.047). This indicates that Science students are more internally driven to engage with e-learning for *p*ersonal interest and satisfaction.

- **Extrinsic Goal Orientation:** No significant difference was observed between Arts (M = 12.17) and Science students (M = 12.22), (t = 0.21, p = 0.831). Both groups are similarly influenced by external motivators such as grades or recognition.

- **Control of Learning Beliefs:** Arts (M = 12.38) and Science students (M = 12.27) showed no significant difference (t = 0.41, p = 0.676), reflecting comparable beliefs in controlling learning outcomes through effort.

- **Self-Efficacy:** No significant difference was found between Arts (M = 25.20) and Science (M = 25.49) students (t = 0.78, p = 0.435). Both streams reported similar confidence levels in their ability to succeed in e-learning tasks.

- **Task Value:** Arts students (M = 23.16) perceived slightly greater value in e-learning tasks compared to Science students (M = 22.83). However, the difference was not significant (t = 0.93, p = 0.349).

- **Social Engagement:** Science students (M = 18.86, SD = 3.558) reported significantly higher social engagement than Arts students (M = 18.23, SD = 3.938), (t = 2.06, p = 0.039), suggesting that Science students are more inclined to collaborate and interact in e-learning environments.

- **Instructor** Support**:** Arts (M = 22.95) and Science students (M = 22.90) reported nearly identical perceptions of instructor support, with no significant difference (t = 0.12, p = 0.902).

- **Overall Motivation Score:** No significant difference emerged between Arts (M = 127.86) and Science students (M = 128.81), (t = 0.63, p = 0.526), indicating similar overall motivation levels across streams.
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Significant differences were found in Intrinsic Goal Orientation and Social Engagement, with Science students reporting higher scores in both dimensions. For all other motivational factors, no significant differences were observed, indicating that Arts and Science students are largely similar in their overall motivation towards e-learning.

Figure-2 illustrates the mean comparisons across dimensions, showing that Science students scored slightly higher in most areas—particularly in Intrinsic Goal Orientation and Social Engagement**,** where differences reached statistical significance.

Discussion

The present study examined the relationship between undergraduate students' motivation toward e-learning and their academic achievement while also analysing whether motivational differences exist across gender and academic streams. The findings provide important insights into how motivational processes influence learning outcomes in technology-mediated educational environments and contribute to the growing body of research on student engagement in digital higher education.

Motivation as a Mechanism Linking E-Learning Participation and Academic Achievement

The study revealed a statistically significant moderate positive relationship between motivation toward e-learning and academic achievement (r = .41). This finding indicates that students with stronger motivational orientations toward digital learning environments tend to achieve better academic outcomes. The result reinforces the argument that motivation plays a critical role in determining how effectively students engage with online learning systems and translate digital learning opportunities into meaningful academic performance.

This interpretation is consistent with the principles of Self-Determination Theory, which emphasises that students are more likely to demonstrate sustained engagement when their psychological needs for autonomy, competence, and relatedness are supported. According to Richard M. Ryan and Edward L. Deci (2020), learning environments that satisfy these psychological needs foster autonomous motivation, which subsequently promotes persistence, engagement, and improved academic outcomes.

Recent studies support this interpretation. For example, research by Xie et al. (2023) reported that the satisfaction of psychological needs in blended learning environments significantly increases autonomous motivation, which subsequently enhances student engagement and learning outcomes. Similarly, Yang et al. (2025) demonstrated that motivation functions as a mediating mechanism between self-regulated learning and academic success in online

education. These findings collectively suggest that motivation operates not merely as a personal disposition but as a dynamic process shaped through the interaction between learners and their digital learning environments.

The present findings can also be interpreted through the perspective of Social Cognitive Theory proposed by Albert Bandura. According to this theory, students' learning behaviour is strongly influenced by their beliefs about their capabilities, commonly referred to as self-efficacy (Bandura, 1997). In digital learning environments, students with higher confidence in their ability to navigate online platforms and complete academic tasks are more likely to persist in learning activities and achieve better academic outcomes. The positive association observed between motivation toward e-learning and academic achievement in the present study may therefore reflect the role of self-efficacy in shaping students' engagement and persistence in online learning contexts. Previous research has similarly shown that learners with stronger self-efficacy demonstrate greater participation in digital learning activities and employ more effective self-regulated learning strategies (Zimmerman, 2000; Schunk & DiBenedetto, 2020). Thus, the findings of the present study support the view that motivational processes in e-learning are closely intertwined with students' beliefs about their academic capabilities.

Motivational Threshold in Digital Learning Environments

Another important contribution of this study is the identification of differences in academic achievement across varying levels of motivation. The ANOVA results demonstrated that students with high motivation achieved significantly higher academic performance compared to students with moderate and low motivation levels. This pattern suggests that motivation may function as a threshold variable in digital learning contexts.

Unlike traditional classroom environments, e-learning environments often require students to demonstrate higher levels of self-regulation, time management, and independent learning behaviour. As a result, moderate levels of motivation may not always be sufficient for students to fully benefit from online learning opportunities. Highly motivated learners are more likely to actively explore digital learning resources, participate in online discussions, and persist in completing learning tasks.

Recent research provides support for this interpretation. Zheng et al. (2023) reported that students who demonstrate stronger intrinsic motivation and enjoyment in online learning environments exhibit higher persistence and better learning outcomes. Similarly, Mekheimer (2025) found that students with higher technological self-efficacy and intrinsic motivation adopt more effective learning strategies and demonstrate higher academic satisfaction in online courses.

These findings suggest that digital learning environments may amplify differences between highly motivated and less motivated learners. While motivated students are able to capitalise on the flexibility and autonomy provided by online learning platforms, students with lower motivation may experience challenges related to self-regulation, engagement, and sustained participation.

Motivation within the Digital Learning Ecosystem

Although motivation was found to significantly influence academic achievement, the moderate effect size ($\eta^2 \approx .15$) indicates that motivation alone does not fully determine students' academic outcomes. Instead, motivation appears to function within a broader digital learning ecosystem that includes instructional design, technological infrastructure, and institutional support mechanisms.

Previous research has increasingly emphasised the importance of this systemic perspective. Bond et al. (2020), in their systematic mapping of student engagement research in

technology-enhanced learning, demonstrated that engagement emerges through the interaction of learner motivation, teaching strategies, and institutional learning environments. Similarly, Ma and Ismail (2025) concluded that students' motivation in digital learning environments is closely connected with factors such as digital competence, accessibility of learning technologies, and the pedagogical design of online courses.

From this perspective, motivation should not be viewed solely as an individual psychological attribute but rather as a component of a broader educational system where learner characteristics interact with technological and pedagogical factors. The present findings therefore support the argument that the effectiveness of e-learning initiatives depends on the coordinated integration of motivational support, instructional design, and institutional resources.

Gender Differences in Motivation toward E-Learning

The study also examined potential gender differences in motivational dimensions associated with e-learning. While overall motivation levels were broadly similar across genders, statistically significant differences were observed in extrinsic goal orientation and perceived instructor support, both favouring female students. Marginal differences were also observed in control of learning beliefs, task value, and overall motivation.

These findings suggest that female students may respond more positively to structured learning environments that provide clear academic expectations, external incentives, and consistent instructional guidance. Research on online learning engagement has similarly highlighted the importance of instructor presence, feedback, and communication in sustaining student motivation in digital environments (Martin & Bolliger, 2018).

At the same time, the absence of major gender differences in intrinsic motivation, self-efficacy, and social engagement indicates that male and female students possess broadly comparable motivational orientations toward digital learning. Earlier studies often reported gender disparities in technology use and digital confidence (Ong & Lai, 2006). However, more recent research suggests that such differences are gradually diminishing as digital technologies become increasingly embedded in everyday learning experiences. A meta-analysis conducted by Scherer et al. (2019) found that gender differences in technology acceptance among students have decreased significantly over time.

The findings of the present study therefore support the emerging view that contemporary university students, regardless of gender, are developing similar levels of digital learning engagement and technological familiarity.

Academic Stream Differences in Motivation toward E-Learning

The analysis of academic stream differences revealed that Science students reported significantly higher levels of intrinsic goal orientation and social engagement compared to Arts students, while no significant differences were observed for other motivational dimensions. These results suggest that although overall motivation toward e-learning may be comparable across disciplines, certain motivational components may vary depending on disciplinary learning practices.

Science education frequently emphasises problem-solving, inquiry-based learning, and collaborative experimentation, which may encourage greater intrinsic engagement and peer interaction in digital learning environments. Research in higher education pedagogy has demonstrated that active learning approaches commonly used in science disciplines can significantly enhance student engagement and motivation (Freeman et al., 2014).

Similarly, studies examining technology-supported learning environments have found that collaborative digital tools can foster stronger peer interaction and motivation across disciplinary contexts (García-Martínez et al., 2024). The present findings therefore suggest that disciplinary learning cultures may shape specific motivational dimensions even when overall levels of motivation remain broadly similar across academic streams.

Implications for Higher Education Practice

The findings of this study have several important implications for higher education institutions seeking to strengthen the effectiveness of e-learning environments.

First, universities should recognise motivation as a central component of successful digital learning design. The results demonstrate that students' motivational orientation significantly influences their ability to translate digital learning opportunities into academic achievement. Consequently, instructional design should incorporate strategies that promote autonomy, competence, and meaningful student interaction in accordance with principles derived from Self-Determination Theory.

Second, instructor presence plays a crucial role in sustaining student motivation in online learning environments. Regular feedback, interactive discussions, and supportive communication can enhance students' sense of relatedness and engagement, thereby strengthening their motivation to participate in digital learning activities (Martin & Bolliger, 2018).

Third, higher education institutions should develop structured support systems that strengthen students' digital learning readiness. Initiatives such as digital literacy training, academic mentoring, and collaborative learning communities can help students develop the self-regulation skills and technologic

al confidence necessary for effective participation in e-learning environments.

Fourth, emerging technologies such as AI and personalized learning systems can further enhance motivation in e-learning environments**.** AI-driven platforms can analyse students' learning behaviour and provide personalized feedback, adaptive learning pathways, and targeted support. Such personalization can strengthen students' sense of autonomy and competence. Consequently, integrating AI-supported personalization into digital learning systems may help increase student engagement and improve academic outcomes in higher education.

Overall, the findings indicate that the success of digital learning initiatives depends not only on technological infrastructure but also on the extent to which educational environments actively cultivate and sustain student motivation. Future e-learning environments in higher education may therefore benefit from integrating motivational pedagogy with intelligent learning technologies that support personalized, engaging, and student-centred digital learning experiences.

Contribution of the Study

The present study makes several contributions to the literature on motivation and digital learning in higher education. First, it extends the application of Self-Determination Theory in the context of e-learning by demonstrating that higher levels of motivation are significantly associated with improved academic achievement among undergraduate students. Second, the findings provide empirical support for the relevance of Social Cognitive Theory in digital learning environments by suggesting that motivational engagement and academic performance are closely linked with students' confidence and persistence in online learning tasks. Third, by examining differences across gender and academic streams, the study contributes to the emerging understanding that motivational processes in digital learning may operate similarly across demographic and disciplinary contexts. Finally, the identification of distinct motivation

levels and their association with academic outcomes provides a more nuanced understanding of how motivational intensity influences learning success in e-learning environments, thereby offering new directions for future research on student engagement in higher education.

Limitations and Future Research

Despite providing important insights into the relationship between motivation toward e-learning and academic achievement, the present study has several limitations that should be considered when interpreting the findings.

First, the study was conducted among undergraduate students from selected districts of Haryana, India. Although this regional focus allowed for a detailed examination of the local higher education context, the findings may not be fully generalisable to students from other regions of India or to international contexts where digital infrastructure, institutional support, and learning cultures may differ. Future research could extend this investigation to a broader national sample or conduct cross-regional comparisons to better understand how contextual factors influence students' motivation toward e-learning.

Second, the study relied on self-reported measures of motivation. While self-report questionnaires are widely used in educational research to assess motivational constructs, they may be influenced by response bias or social desirability. Future studies could employ mixed-method approaches, combining survey data with qualitative interviews, classroom observations, or learning analytics from digital platforms to provide a more comprehensive understanding of students' motivational experiences in e-learning environments.

Third, the present research adopted a cross-sectional design, which captures relationships between variables at a single point in time. Although the findings indicate a significant association between motivation and academic achievement, the design does not allow for strong causal conclusions. Longitudinal research designs could provide deeper insights into how students' motivation toward e-learning develops over time and how it influences academic outcomes across different stages of higher education.

Fourth, the study focused primarily on motivation as a key psychological factor influencing academic achievement. However, learning outcomes in digital environments are also shaped by additional variables such as technological self-efficacy, digital literacy, instructional design, and institutional support systems. Future research could adopt more comprehensive models that integrate these variables to better understand the complex interactions shaping student success in online and blended learning environments.

Finally, although the study examined differences across gender and academic streams, other potentially relevant demographic and contextual factors—such as socioeconomic background, access to digital resources, and prior experience with online learning—were not explored. Future studies may benefit from investigating how these factors interact with motivational processes to influence student engagement and performance in digital learning settings.

Overall, addressing these limitations in future research would contribute to a deeper and more comprehensive understanding of how motivational processes operate within evolving digital learning ecosystems in higher education.

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