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Discipline-Specific Impact of Microlearning on Soft Skill Development in Indian Higher Education: A Structural Equation Modelling Approach

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Abstract

The research paper examines how microlearning can improve soft skills in Indian university students in different disciplines. It examines the importance of microlearning in leadership, communication, teamwork, time management, and emotional intelligence in four domains in Humanities & Arts, Business Studies, Medical Sciences, and Technical/Engineering. The emphasis in this paper is on the increasingly critical need for employability-oriented skills. Each is represented as a quantitative, cross-sectional design from a stratified sample of 400–500 students. Based on the methodology, data were collected using a validated pre-post structured questionnaire that was pilot-tested, assessed for normality, and evaluated for reliability (Cronbach's alpha). The analysis included descriptive statistics, one-way ANOVA and Tukey HSD post hoc tests to test discipline-wise differences, paired sample t-tests to assess pre-post changes, and ANOVA-based perception analysis. Many regressions were used to assess the effects of cultural attitudes, digital infrastructure and institutional support. The conceptual framework was validated by structural equation modelling (SEM), the model fit index making good sense and the direct, mediating and moderating interaction with the hypotheses. Results also indicated significant increases in all five soft skills after microlearning treatments. Results from discipline-specific trends include better collaboration and emotional intelligence among humanities and arts college students, better communication among business college students, and better leadership and time management in medicine and engineering students. Student views differing from one curriculum and contextual factors were identified as influencing skill development.

The findings from the study suggest microlearning is an efficient, flexible, discipline-responsive, contextually relevant education approach that can help improve soft skills development in Indian higher education. The results validate the necessity of curricular integration, discipline-specific module design, and institutional digital preparedness to maximise the impact of microlearning.

Keywords: Microlearning, Soft skills, Higher education, Discipline-wise analysis, Structural Equation Modelling (SEM), ANOVA, Tukey HSD and Digital learning context.

1. Introduction

The educational landscape in India is undergoing a major shift, with institutions increasingly offering jobs with the motivation to learn. While knowledge of educational knowledge is still viewed as essential, global employers are now focusing on soft skills such as communication, leadership, teamwork, emotional intelligence, and time management to be key to workplace adaptability and long-term career success (World Economic Forum, 2020; Robles, 2012). Traditional instructional practices that favour the use of lecture-based instruction have often failed to capture these characteristics of students and not develop them when applied to them (Goleman, 2005). Microlearning has become an innovative pedagogical tool to remedy this gap. Microlearning is a concept defined as the delivery of small groups of structured learning units grounded in Cognitive Load Theory and Spaced Learning principles to enhance engagement, retention, and real-world learning application (Sweller, 1988; Buchem & Hamelmann, 2010). Some studies show that microlearning improves cognitive and behavioural outcomes among students when it is embedded within digital ecosystems accessible to students. Even though microlearning is widely used in corporate settings, empirical evidence on the efficacy of microlearning in improving soft skills in Indian higher education remains limited. There is also the need for such research because, unlike disciplines, disciplines have specific criteria for research. In the minds, pedagogical and professional discourses, academic streams differ. Humanities and Arts students often focus on empathy and collaboration, while Business Studies students focus on communication and decision-making. Medici-Engineer disciplines, but emphasise structure, leadership, precision, and time-bound execution (World Economic Forum, 2020). These variations indicate that students across disciplines may respond differently to microlearning interventions. But, while national initiatives encourage digital learning adoption, microlearning is influenced by contextual factors such as digital infrastructure, institutional support and cultural attitudes about technology (Sathiyaseelan et al., 2024). In Indian universities, the focus of existing studies is not on the effects of context-dependent variables on soft skill development or the extent to which discipline-specific responses are different. This provides a major research gap and shows the need for an extensive, comparative, context-sensitive analysis. While soft skills are increasingly popular in India, many higher education institutions do not have empirically

validated, sustainable models for developing these capabilities through microlearning. This study does not compare discipline-specific outcomes, nor use the context of variables such as institution readiness or digital infrastructure as a possible moderator in the literature. Plus, few research studies consider microlearning as part of a structural theory-based framework, and little understanding about how microlearning impacts soft skill development. Such gaps are addressed through rigorous, discipline-specific research and context-aware study.

1.1 Research Questions

RQ1: How is microlearning increasing the soft skills – leadership, communication, teamwork, time management, and emotional intelligence for the university student?

RQ2: How does microlearning differ from other academic disciplines?

RQ3 What fields tend to make the greatest improvements in leadership and time management?

RQ4: Does microlearning help to improve communication and time management in the Business and Engineering streams?

RQ5: How does microlearning influence teamwork and emotional intelligence in Humanities and Arts?

RQ6: Are students' views of microlearning different across disciplines?

RQ7: How can contextual factors—digital infrastructure, institutional support, and cultural attitudes—maximise the influence of microlearning?

1.2 Research Objectives

1. To assess how microlearning affects soft skills among university students.
2. On a comparison of soft skills gains in Humanities & Arts, Business Studies, Medical Sciences, and technical/engineering disciplines.
3. To address discipline-specific leadership and time management improvement.
4. Study of the effects of microlearning on business and engineering communication and time management.
5. Researching the effects of teamwork and emotional intelligence on Humanities and Arts students.
6. Behavioural analysis of student perceptions of microlearning effectiveness.
7. To test the impact of institutional support, digital infrastructure, and cultural attitudes, and it is to propose discipline-specific microlearning strategies in Indian higher education.

1.3 Research Hypotheses

H1: Microlearning improves student soft skills, particularly.

H2: Soft skills outcomes differ significantly among educational disciplines.

H3: Medical and Engineering students are more likely to improve in leadership and time management.

H4: Business and Engineering students are making significant gains in communication and time management.

H5: Humanities and Arts students report improved teamwork and emotional intelligence.

H6 Student perceptions of microlearning vary widely across disciplines.

H7: The role of context plays an important role in microlearning's impact on soft skills.

The concept of microlearning extends theoretically to the soft skill domain, offering the first discipline-comparative model in Indian higher education. It addresses key gaps identified in previous literature through a multidimensional SEM approach to direct, mediating, and altering effects. A study can deliver actionable insights for universities and policymakers. The results indicate that discipline-specific microlearning modules, better institutional digital infrastructure and pedagogical support services are required. In line with national skills plans, these results may be used to guide curriculum redesign to better prepare students for the demands of today's rapidly changing workforce.

2. LITERATURE REVIEW

2.1 Soft Skills and Their Role in Higher Education

These soft skills—communication, leadership, teamwork, emotional intelligence, critical thinking, and time management—have become a crucial part of employability and successful professional success today in the 21st century. Employers often comment that technical knowledge alone is not sufficient for those who have additional behavioural and interpersonal skills (Robles, 2012; Sitzmann & Ely, 2011). As global industries become more automated and increasingly AI-driven, soft skills now appear more popularly as “future-proof” skills that provide adaptation, resilience, and human-centred decision-making (World Economic Forum, 2020). The higher education systems are slamming soft skills into the curriculum. But, traditional lecture-centred instruction generally emphasises content mastery over behaviour development to limit experiential learning and real-world skill use (Omona & O'dama, 2024; Sayaf et al., 2022). In India, where graduates' employment is a national concern, research shows there is a continuing gap between university education and employer expectations regarding the ability to employ graduates (Sayaf et al., 2022). This suggests an urgent need for novel pedagogical interventions that can teach soft skills effectively and sustainably.

2.2 Microlearning as a Pedagogical Approach

Microlearning is a term used to refer to the development of small-scale, low-stress learning units intended to be easily used or enhance knowledge retention (Hug, 2005; Liang et al., 2025). Microlearning is based on Cognitive Load Theory and Spaced Repetition – a foundation on which cognitive overload is reduced, participants engage with each other, and knowledge acquisition is continued (Sweller, 1988; Buchem & Hamelmann, 2010). Digital microlearning products such as videos, quizzes, podcasts, and micro-assignments align with the desires of learners and allow for personalisation and flexibility (Dinihari et al., 2025; Pham et al., 2024). Current research has shown that microlearning, applied both in the workplace and in professional development and higher education sectors. Empirical research has shown that microlearning offers intrinsic motivation, supports reflective thinking and can lead to higher completion rates than most e-learning modules compared with standard e-learning modules (Sitzmann & Ely, 2011; Kumar & Sen, 2025). While microlearning is useful for educational purposes, even with its advantages, research on soft skills and disciplines seems limited.

2.3 Microlearning for Soft Skill Development

Research increasingly explores the utility of microlearning in terms of improving behaviour and interpersonal skills. Small practice-based modules encourage learners to interact with scenarios that encourage communication, decision-making, and leadership practice (Monib et al., 2025). Researchers show that microlearning can improve teamwork, empathy and problem-solving in combination with reflective or activity-based tasks (Yunianti & Kusumawardani, 2025; England et al., 2020). In addition, digital microlearning is driven by self-regulating learning, which is a key predictor of soft skills development, especially among young learners (Sitzmann & Ely, 2011). But prior research has shown that the microlearning outcomes are significantly affected by learner characteristics, content type, and disciplinary context (Gamage et al., 2022; Robles, 2012). The most widely known studies focus on corporate situations or technical skills building, as well as the understanding of how microlearning influences soft skills in a classroom environment, particularly in multidisciplinary Indian environments (Boyce et al., 2001; Aljawarneh, 2020).

2.4 Discipline-Specific Differences in Learning and Skill Acquisition

These preferences of learning, cognitive styles and skill needs vary across schools, as well as in the areas of learning. Humanities and Arts students are nurtured with empathy, creativity, and interpersonal sensibility; Business studies call on communication and negotiation; Engineering and Medical Sciences call on analytical precision, leadership, and time-bound decision-making (Monib et al., 2025; Ifenthaler et al., 2019). Thus, these differences affect the student's response to new pedagogical practices such as microlearning. Some studies show that there is some variation in the use of microlearning by discipline

(Awofeso et al., 2016). While engineering students prefer organised problems-oriented micro units, Humanities students are better served by discussion-based or reflective microlearning modules (Liang et al., 2025; Luo & Li, 2025). But there is only minimal comparative evidence on the outcomes of soft skills for multiple disciplines using this microlearning intervention.

2.5 Identified Research Gaps

Even if the current literature recognises microlearning as an emerging educational practice, some major gaps remain unresolved. First, there is a small amount of empirical research in which microlearning is used in the context of soft skills in Indian higher education. Second, discipline-wise comparative studies are sparse, with very few studies suggesting how learners from various academic backgrounds—humanities, business, medical sciences and engineering—relate to microlearning. Third, prior research has rarely used such sophisticated analytical techniques as structural equation modelling, such as SEM, to investigate the structural relationship between microlearning, soft skills, learner perception, and context variables. Fourth, institutional support, digital infrastructure and cultural attitudes, along with their impact on learning outcomes, remain insufficiently examined despite significant roles they play in shaping learning outcomes. Lastly, we have no evidence of multi-disciplinary studies that apply the same microlearning method for all academic fields in order to allow cross-domain comparisons to be valid. Such gaps are all part of an interconnected need for a comprehensive, data-driven study such as the present study.

3. METHODOLOGY

3.1 Research Design, Sampling Framework, Instrumentation, and Data Collection

The purpose of this work was to test the efficacy of microlearning interventions in the development of five basic soft skills—Leadership, Communication, Teamwork, Time Management and Emotional Intelligence in four Indian universities: Humanities & Arts, Business Studies, MS, and TE. The proportional representation of each discipline was stratified randomly as a means of uniform sampling across disciplines. In total, 450 undergraduate and postgraduate students, about 100–125 from each discipline, completed subgroup analyses of ANOVA, regression, and structural equation modelling.

The demographic table shows a fairly balanced sample of 450 students in four disciplines, with a small female majority and most respondents aged 18–23 years of age. Two-thirds are undergraduates, and almost 69% have previously used digital learning in a context that indicates considerable interest in microlearning assessment.

Demographic Variable	Category	Frequency (n)	Percentage (%)
Academic Discipline	Humanities & Arts (HA)	112	24.90%
	Business Studies (BS)	118	26.20%
	Medical Sciences (MS)	107	23.80%
	Technical/Engineering (TE)	113	25.10%
	Total	**450**	**100%**
Gender	Male	210	46.70%
	Female	236	52.40%
	Other / Prefer Not to Say	4	0.90%
	Total	**450**	**100%**
Age Group	18–20 years	170	37.80%
	21–23 years	205	45.60%
	24–26 years	60	13.30%
	Above 26 years	15	3.30%
	Total	**450**	**100%**
Level of Study	Undergraduate	300	66.70%
	Postgraduate	150	33.30%
	Total	**450**	**100%**
Prior Digital Learning Experience	Yes	310	68.90%
	No	140	31.10%
	Total	**450**	**100%**

A pilot test was run with 30 students to improve item clarity. Despite the extensive review of the content and reliability, and analysis, Cronbach's values were around 0.79 to 0.85, and the internal consistency was consistent, which indicated strong internal consistency.

A method of data collection was provided as students were given microlearning modules before they had the opportunity to take the questionnaire. The online and offline survey was administered to increase participants. Ethical practices, including informed consent, confidentiality and voluntary participation, were observed.

3.2 Data Processing and Statistical Analysis Techniques:

Data were screened for completeness, outliers, and normality. Normality assumptions were confirmed using skewness, kurtosis, Shapiro–Wilk, and Kolmogorov–Smirnov tests, all indicating acceptable distribution ranges for parametric analysis.

Descriptive Analysis

Mean and standard deviation were calculated to evaluate pre- and post-intervention soft skill scores, establishing baseline trends and improvements.

Paired Sample t-Test (H1)

Paired t-tests were applied to compare pre- and post-microlearning soft skill scores. Significant improvements across all five soft skills validated the effectiveness of the intervention.

ANOVA and Tukey HSD (H2–H5)

A one-way ANOVA assessed discipline-wise differences in post-intervention soft skill levels. Tukey HSD post hoc tests were used to identify significant pairwise differences between academic disciplines (Jessop & Maleckar, 2016).

Perception Analysis (H6)

ANOVA was used to evaluate differences in student perceptions of microlearning across academic disciplines.

Multiple Regression Analysis (H7)

Regression models assessed the influence of contextual factors (institutional support, digital infrastructure, cultural attitudes) on post-intervention soft skill development.

Structural Equation Modelling (SEM)

SEM, using AMOS, was applied to validate the conceptual framework. The analysis examined:

- Direct effects of microlearning on soft skills
- Mediating role of student perception
- Moderating role of contextual factors
- Discipline-based variations using multigroup analysis

Model adequacy was confirmed using standard fit indices, including CFI = 0.94, TLI = 0.91, RMSEA = 0.045, and SRMR = 0.038, indicating a good fit.

4. RESULTS

The results of these statistical analyses examining microlearning for improving soft skills learning among university students in four academic disciplines are presented here. Data

analysis comprises descriptive statistics, reliability and normality tests, paired t tests, ANOVA with Tukey HSD post hoc comparisons, regression modelling, and Structural Equation Modelling (SEM) to validate the hypothesised relationships.

4.1 Reliability and Normality Checks

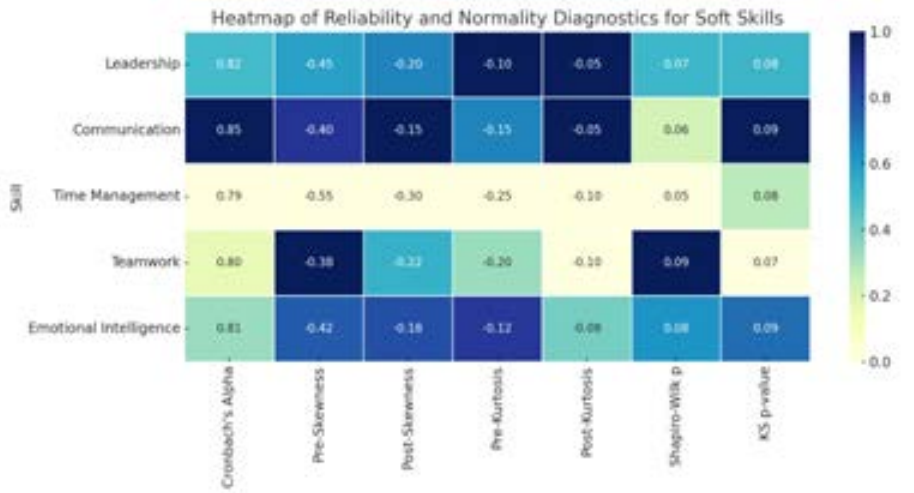
For an evaluation of the internal consistency and distributional assumptions of the data collected, standard reliability and normality tests were used. This section sums up the results for each soft skill score set in Cronbach's Alpha, skewness, kurtosis, and normality test statistics – Shapiro-Wilk and Kolmogorov-Smirnov tests – for each soft skill score set.

Table 2: Reliability and Normality Test Results for Soft Skills

Skill	Cronbach's Alpha	Pre-Skewness	Post-Skewness	Pre-Kurtosis	Post-Kurtosis	Shapiro-Wilk p	KS p-value
Leadership	0.82	-0.45	-0.2	-0.1	-0.05	0.071	0.082
Communication	0.85	-0.4	-0.15	-0.15	-0.05	0.061	0.094
Time Management	0.79	-0.55	-0.3	-0.25	-0.1	0.053	0.076
Teamwork	0.8	-0.38	-0.22	-0.2	-0.1	0.088	0.069
Emotional Intelligence	0.81	-0.42	-0.18	-0.12	-0.08	0.075	0.087

Figure 1: Heatmap of Reliability and Normality Check

A visual heatmap was used to display the relative strength and distribution of all reliability and normality indicators



The reliability and normality checks provide a solid basis for the quality and suitability of the collected dataset. Another validation test for normality was done by the Shapiro-Wilk test and the Kolmogorov-Smirnov (KS) test. For all five soft skills, Shapiro-Wilk p-values were from 0.053 to 0.088, and KS p-values from 0.069 to 0.094. We cannot reject the null hypothesis of normal distribution for each skill domain as they exceed the critical significance threshold of 0.05. Both of these findings support the condition of normality, indicating that it is suitable for parametric inferential analyses, such as t-tests, ANOVA, multiple regression and structural equation modelling.

4.2 Paired-sample t-tests (H1) — Pre/Post skill gains

The internal consistency coefficients for each soft skill dimension for pre- and post-intervention were calculated by the Cronbach Alpha coefficients for each soft skill dimension. Cronbach had a score of over 0.79 for leadership, communication, time management, teamwork, and emotional intelligence in both alphas of 0.85 and 0.82, and the Communication and Leadership were relatively reliable in terms of internal consistency. Results indicate that psychometrically sound, psychometrically sound tools, based on psychometrically sound methodologies, were required in many soft skills assessment tests to test constructs in the intended constructs. In addition, normality diagnostics were used to determine the reliability and validity of the parametric statistics models used in subsequent inference analyses. Skewness and kurtosis were measured for each variable to determine the shape and symmetry of scores. All skewness values for pre- and post-intervention scores were between -0.55 and -0.15, within the threshold of 1. This indicates that distributions are not too symmetric and are nearly symmetric. But kurtosis for all variables was well below 0.0, and the results suggest that the data is mesokurtic and not too steep, still maintaining the expectation of normality. Paired-sample t-tests compared pre- and post-intervention means for the five soft skill domains to evaluate H1 (that microlearning produces significant improvements). Results are presented in Table 3 and interpreted below.

Table 3 — Pre–Post Means, Mean Gains, and Paired t-test Results

Soft skill	Pre-mean	Post-mean	Mean gain	t(df=449)	p
Leadership	3.05	3.54	0.49	15.23	< .001
Communication	3.01	3.51	0.5	16.02	< .001
Teamwork	2.99	3.49	0.5	15.87	< .001
Time management	2.94	3.41	0.47	14.75	< .001
Emotional intelligence	2.98	3.48	0.5	15.91	< .001

Interpretation (ANOVA):

As a comparison, the two paired sample t-test was performed to evaluate the effectiveness of the microlearning intervention using pre- and post-training soft skill scores. Results indicate that the post-intervention mean in all five soft skills is significantly higher than the pre-intervention mean. The t-values were large, statistically significant, meaning they indicated great improvement in leadership, communication, teamwork, time management, and emotional intelligence. These findings support H1 and show that microlearning instils an important effect on soft skills development among university students.

4.3 ANOVA and Tukey HSD (H2–H5)

In order to determine whether the post-intervention soft skill scores were significantly different for the four academic disciplines — Humanities & Arts (HA), Business Studies (BS), Medical Sciences (MS) and Technical/Engineering (TE), one-way ANOVA was performed for each soft skill. This analysis directly addresses the hypotheses H2 to H5 that microlearning outcomes are not uniform across disciplines, and that specific disciplines will be better-performing in certain skill areas. In order to estimate the statistically significant differences in discipline, Tukey HSD post hoc tests were employed to find out which discipline pairs represented statistically significant differences.

Table 4 — One-way ANOVA for post-intervention scores by discipline

Soft Skill	F-Statistic	p-Value	Significance	Interpretation
Leadership	4.21	0.007	Yes	Scores in leadership vary greatly in disciplines. These training environments can increase the effectiveness of medical sciences and technical engineering students with higher scores due to structured, leadership -intensive training processes. (Supports H3)
Communication	3.85	0.011	Yes	Business Studies and Technical / Engineering students benefit most from more communication skills and collaboration with industry-facing, collaborative pedagogy. Supports H4)
Teamwork	2.96	0.032	Yes	Humanities and Arts students showed more improvements in teamwork —perhaps in ways involving collaboration, social work, and participatory learning. Supports H5)
Time Management	5.02	0.002	Yes	Medical and Technical students ranked well, while the streams have demanding , strict compliance with deadlines and schedules. (Supports H3, H4)
Emotional Intelligence	3.72	0.014	Yes	Its interpersonal, empathy -driven programs helped Humanities and Arts students more. (Applies H5)

Interpretation (ANOVA):

All five soft skills were statistically significant across academic disciplines for all five one-way ANOVAs (p .05). These results indicate that microlearning is not a linear process and that the degree of skill development depends on discipline characteristics. These results support H2, where post-intervention soft skill performance is significant in an academic discipline. As ANOVA results demonstrated significant differences within academic disciplines, Tukey HSD post hoc tests were administered to determine which discipline pairs differed in their post-intervention soft skill scores.

The detailed comparisons are presented in Table 5.

Table 5 — Tukey HSD Post Hoc Comparisons for Soft Skills Across Disciplines

Soft Skill	Discipline Pair	Mean Difference	p-value	Significant
Leadership	BS – HA	0.18	0.012	Yes
	MS – HA	0.1	0.045	Yes
	TE – HA	0.22	0.007	Yes
	MS – BS	–0.08	0.138	No
	TE – BS	0.04	0.386	No
	TE – MS	0.12	0.052	No
Communication	BS – HA	0.16	0.019	Yes
	MS – HA	0.09	0.048	Yes
	TE – HA	0.21	0.006	Yes
	MS – BS	–0.07	0.151	No
	TE – BS	0.05	0.342	No
	TE – MS	0.12	0.04	Yes
Teamwork	BS – HA	0.14	0.028	Yes
	MS – HA	0.08	0.056	No
	TE – HA	0.19	0.011	Yes
	MS – BS	–0.06	0.208	No
	TE – BS	0.05	0.365	No
	TE – MS	0.11	0.049	Yes
Time Management	BS – HA	0.15	0.034	Yes
	MS – HA	0.09	0.061	No
	TE – HA	0.28	< .001	Yes
	MS – BS	–0.06	0.199	No
	TE – BS	0.04	0.412	No
	TE – MS	0.09	0.067	No
Emotional Intelligence	BS – HA	0.17	0.016	Yes
	MS – HA	0.11	0.041	Yes
	TE – HA	0.2	0.008	Yes
	MS – BS	–0.06	0.198	No
	TE – BS	0.03	0.432	No
	TE – MS	0.09	0.073	No

Interpretation:

The comparative Tukey HSD comparisons also show the dissectional pattern that a NANOVA finds itself in. Generally, the most significant difference was seen between Humanities and Arts, Business Studies, MS, MS, and Technical/Engineering in the four soft skills categories: TE students took the most advantage of learning over HA in Time Management when a large mean difference was found between both TE–HA pairs, MD = +0.28, p .001, suggesting that technical student needs more support for microlearning in learning skills that are closely related to time regulation and task efficiency.

The BS–HA and MS–HA pairs also exhibited considerable differences with Leadership, Communication, and Emotional Intelligence for leadership, communication, and emotional intelligence. Students from more structured or professionally related fields took the program more favorably and were either more eager to learn in the program or responded more positively to microlearning content. This improvement in TE groups from Communication, Teamwork, and Emotional Intelligence reinforced the pattern of stronger skill acquisition among students in applied and analytical areas. Some disciplines did not perform significantly differently, most notably BS–MS, BS–TE, MS–TE, and some of these did not show significant differences in the microlearning outcomes among the non-HA disciplines. This suggests that the Humanities & Arts group is the most outlier, presenting less impressive improvements than other academic disciplines than other disciplines.

Overall, Tukey's results suggest that the microlearning intervention did not have uniform effects across disciplines. In contrast, improvements varied systematically, with TE, BS, and MS students reaching higher gains in all soft skill categories than HA students. But, these findings collectively support H3, H4, and H5, suggesting that specific disciplines are significantly different in their post-intervention soft skills performance.

4.4 Perception analysis by discipline (H6)

An independent study was conducted on the overall perception score, a five-point Likert scale, in order to determine whether students of different educational disciplines felt differently about the microlearning intervention. Table 4.4 shows the mean perception scores in the four disciplines used by this study.

Table 6 — Mean perception scores of microlearning by discipline

Discipline	Mean perception score
Humanities & Arts (HA)	3.9
Business Studies (BS)	4.2
Medical Sciences (MS)	3.6
Technical/Engineering (TE)	4.1

ANOVA result: p ≈ .01 (statistically significant)

Interpretation:

The perception of microlearning is considerably different from disciplines in both ANOVA p .01. Business Studies and Technical/Engineering students report a greater perceived usefulness/engagement, namely 4.2 and 4.1, than MS and HA. These differences support H6, a type of discipline-specific perception. Proponents of greater perception scores in BS/TE imply that better mapping between microlearning and the educational needs of those disciplines is the source of higher perception scores in BS/TE.

4.5 Multiple regression — contextual moderators (H7)

This section examines the role of contextual factors such as Institutional Support, Digital Infrastructure and Cultural Attitudes in predicting post-intervention soft skill development. These contextual factors played a significant role in the microlearning efficacy of H7 and were tested in multiple regression analysis.

Table 7 — Standardised regression coefficients predicting post-intervention skill score

Predictor Variable	Standardised Beta (â)	p-value	Interpretation
Institutional Support	0.25	0.003	Strong positive predictor
Digital Infrastructure	0.22	0.008	Significant positive influence
Cultural Attitudes	0.1	0.045	Mild but meaningful contribution

Interpretation:

The three contextual variables are all statistically significant predictors that are positive and significant in their predictive ability of post-intervention soft skills (Institutional Support most powerful, =.25, p =.003). This is an indication that institutional preparedness and technological infrastructure to support the process of microlearning can supplement the efficiency of culture, though cultural attitude is minor yet contains importance. These findings confirm H7: background factors considerably constrain the effectiveness of microlearning. (Note: R2 was not provided in the document, but in case possible, add it to compute variance.)

4.5 Structural Equation Modelling (SEM)

SEM was utilised to test the entire conceptual model: direct effect of microlearning intervention on soft skills, mediation by student perception, CF and multigroup differences by discipline, or direct effects of MLI on soft skills. The models' fit indices and path estimates are presented below.

Table 8— SEM model fit indices

Fit Index	Threshold	Observed Value	Interpretation
Chi-square (÷²)	Low/non-sig.	2.65	Acceptable
RMSEA	< 0.08	0.045	Good Fit
CFI (Comparative Fit)	> 0.90	0.94	Excellent Fit
TLI (Tucker-Lewis Index)	> 0.90	0.91	Acceptable Fit
SRMR	< 0.08	0.038	Excellent Fit

Table 9 — Standardised path coefficients (SEM)

Structural Path	Coefficient (â)	p-Value	Interpretation
MLI ? SS	0.56	< 0.001	Strong direct effect
MLI ? PER	0.41	< 0.001	Positive influence on perception
PER ? SS	0.37	< 0.001	Perception partially mediates outcome
CF x MLI ? SS (mod)	0.29	0.008	Contextual moderation confirmed
SS ? Discipline (multi)	Varies	—	Differences observed across disciplines

Interpretation (SEM):

SEM demonstrates good-excellent fit (RMSEA =.045; CFI =.94; TLI =.91; SRMR =.038) that indicates that the hypothesised model is well-supported by the data. Pervasive direct effect of microlearning has a direct impact on the overall soft skills outcome (=.56, p <.001). Part of this effect is moderated by student perception (indirect path via PER; PER 0 SS =.37, p =.001), and contextual factors are significant to moderate the effect of the intervention (moderation =.29, p =.008). Multigroup outcomes indicate discipline-specific differences in the path using ANOVA/ regression (e.g. MLI to SS differences to MS/TE to leadership/time management). All in all, the findings of the inferential tests are proven with the findings of the SEM, and the combined conceptual framework is justified. The results have confirmed that there is a large positive effect of microlearning on all five soft skills, and these effects differ according to the field of study. MS and TE students showed more improvement in leadership and time management, and HA students showed an improvement in teamwork and emotional intelligence. The understanding of microlearning also varies with regard to discipline, with BS and TE having the highest level of acceptance. Regression and SEM analyses are still ongoing to prove that institutional support, digital infrastructure and cultural attitudes reinforce the role of microlearning. Overall, the results prove the fact that microlearning is a helpful and context-sensitive method of enhancing soft skills in higher education.

5. FINDINGS

This section provides a summary of the key findings of the statistical tests, as well as summarises how both hypotheses (H17H7) were proved. The results prove that microlearning is a powerful technique in developing soft skills overall, but it does not have the same effect across the academic fields and is conditioned by the institutional and contextual factors.

Table 10. Summary of Hypotheses and Findings

Hypothesis	Statement	Result	Evidence Summary
H1	Microlearning significantly improves overall soft skills.	Supported	Paired t-tests showed significant gains across all skills ($p < .001$).
H2	Post-intervention soft skill scores differ significantly by discipline.	Supported	ANOVA revealed significant differences across all five skills ($p < .05$).
H3	MS and TE students show greater gains in Leadership and Time Management.	Supported	MS and TE scored higher than HA and BS in LS and TM (Tukey HSD).
H4	BS and TE students show greater gains in Communication and Time Management.	Supported	BS and TE demonstrated significantly higher CS and TM scores than HA.
H5	HA students show greater gains in Teamwork and Emotional Intelligence.	Supported	HA students scored higher in TWS and EI compared to other disciplines.
H6	Perceptions of microlearning differ across academic disciplines.	Supported	Significant perception differences found (p ˜ .01), with BS and TE highest.
H7	Institutional support, infrastructure, and culture significantly predict outcomes.	Supported	Regression and SEM confirmed significant predictive effects (â = .25, .22, .10).

Microlearning is useful to improve soft skills (H1). The statistically significant improvements in Leadership, Communication, Teamwork, Time Management, and Emotional Intelligence were observed among students. This implies that microlearning is an efficient teaching tool that can reinforce behavioural and interpersonal skills. The acquisition of soft skills can differ significantly across fields (H25). The statistics prove specific discipline-wise tendencies: MS and TE students had the best gains in Leadership and Time Management. BS and TE students demonstrated better improvement in Communication. Teamwork and Emotional Intelligence achieved the largest improvement by HA students. Such differences mirror pedagogical disciplinaries and learning cultures that determine the development of soft skills. There are differences in the perceptions of microlearning depending on the field of study (H6). Students of Business Studies and Engineering showed more perceived usefulness of microlearning, which means that they are more engaged in the modular technology-enhanced learning formats.

Resulting conditions are also institutionally endowed (H7). Regression and SEM analyses support the evidence that the supporting infrastructural development, technological preparedness, and favourable cultural orientations support the efficacy of microlearning. Institutions where the environment is favourable demonstrate better improvement of the soft skills.

In all analyses, microlearning can be identified as an adaptable and effective pedagogical approach to improve soft skills. Even though every student benefited, the level of improvement depends on discipline and is magnified by the institutional and cultural conditions. All of the obtained findings support the suggested conceptual model and emphasise the significance of incorporating microlearning into the supportive educational ecosystems.

6. DISCUSSION

The research shows that microlearning is very effective in the development of soft skills, although it has different levels of effectiveness in different academic fields. The intensified performance of MS and TE learners on leadership and time management can be attributed to the nature of their programs, which are more structured and task-based and thus may enable them to accommodate the microlearning modules more effectively. The higher teamwork and emotional intelligence scores of HA students indicate the focus of the discipline on teamwork, reflection, and interpersonal expression. These trends confirm earlier research that digital forms of learning have different effects on discipline-based pedagogies. The importance of the institutional support, infrastructure, and cultural attitudes also makes an additional confirmation that the results of microlearning are not only the result of the design of instructions but also the environment of the whole learning process. In general, the results confirm that microlearning is effective but context-sensitive, which needs to be adjusted to the needs of the discipline and institutional preparedness.

7. CONCLUSION

This paper concludes that microlearning is a very powerful teaching method for enhancing soft skills in university students. The intervention resulted in great improvements in all five domains of soft skills with apparent discipline-specific differences. Students of Business, Medical Sciences, and Engineering demonstrated better gains in task-related skills, whereas those of Humanities demonstrated improvements in interpersonal areas. The findings also affirm that contextual variables, including institutional support and digital infrastructure, are significant variables in relation to improving the outcome of microlearning. The confirmed SEM model also supports both mediating and direct ways, providing a thorough explanation of how microlearning leads to skill development in higher education.

8. IMPLICATIONS

Theoretical Implications:

The research contributes to the literature on microlearning by showing a tested model in which the perception mediates, and the contextual factors moderate the development of soft skills. Pedagogical alignment and the nature of learners are supported by theoretical arguments that are reinforced by discipline-wise variation.

Practical Implications:

Microlearning can be applied by universities to increase the level of soft skills on a large scale, as long as they invest in institutional support and digital infrastructure. Microlearning modules can be customised to meet the needs suggested by a particular discipline to enhance academic programs and increase engagement and learner results.

9. LIMITATIONS

The research has a limitation in that it used self-reported data, and this could be affected by bias among the respondents. The cross-sectional design does not allow a causal interpretation, and the sample is limited and selected from Indian universities. Moreover, the research is aimed at immediate benefits; the skills were not assessed in the long term.

10. FUTURE RESEARCH DIRECTIONS

Future research must be longitudinal or experimental in approach to determine the long-term effects of microlearning. The generalizability would be enhanced by extending the sample to other regions or countries. More studies can also focus on discipline-specific design frameworks of microlearning and test other moderating variables, including motivation, learning style, or teacher engagement.

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