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Assessment of determinants affecting communication skill gap in higher agricultural education in India

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Abstract

This study presents a comprehensive assessment of the determinants affecting the communication skill gap among postgraduate students in higher agricultural education (HAE) in India. Empirical data from three high-performing agricultural universities confirm a substantial and systemic overall skill deficit of 31.38 per cent. Dimensional analysis identified Writing skills and speaking skills as the most critical training needs, reflecting a failure to prepare graduates for professional roles like research publication and public advocacy. A highly significant regression model (Adjusted R²=0.75) was employed to analyse the influencing factors. The analysis established that psychological variables are the central determinants of competency, with factors like Achievement Motivation, Academic Motivation, Self-Confidence, and Self-Esteem exhibiting a robust negative correlation with training needs. Conversely, Communication Apprehension emerged as the crucial internal barrier, significantly increasing perceived training needs and driving avoidance behaviours. The study revealed a widespread "Institutional Irony": despite significant socio-personal disparities among students, the provision of structured soft-skill training was uniformly low and non-significant across all institutions. The findings necessitate a policy mandate that reframes communication from a peripheral "soft skill" to a core professional competency, demanding a multi-pronged intervention strategy that prioritizes psychological preparedness, self-efficacy enhancement, and the mandating of Experiential Learning to bridge the academic-professional divide.

Keywords: Achievement motivation, communication apprehension, communication skill gap, higher agricultural education, psychological determinants, training need index (TNI)

Introduction

In the rapidly evolving landscape of modern agriculture, effective communication has become a core professional competency rather than a peripheral soft skill. Agricultural professionals are increasingly required to communicate complex scientific knowledge to diverse stakeholders, including farmers, policymakers, researchers, extension personnel, and industry actors. In this context, communication competence is essential not only for academic success but also for effective knowledge dissemination, policy advocacy, and collaborative problem-solving within agricultural innovation systems. However, a persistent gap exists between the communication skills required in professional agricultural careers and those possessed by many graduates of higher agricultural education institutions.

This mismatch often limits graduates' employability, research dissemination capacity, and effectiveness in extension and development roles (Andrews & Higson, 2008; Jackson, 2014 ^[2, 22]). The current pedagogical approaches

frequently emphasize theoretical knowledge and technical specialization while giving relatively limited attention to communication competencies, thereby contributing to a growing disparity between academic preparation and professional expectations (Sharma & Gupta, 2019; Singh & Yadav, 2020) ^[36, 38].

The communication skill gap in higher agricultural education arises from a complex interaction of socio-personal, psychological, and institutional determinants. At the socio-personal level, students' educational background, family environment, and academic exposure can influence their communication readiness. In India, many students entering higher agricultural education come from rural or regional-language schooling systems and often face difficulties adapting to English-dominated academic environments. Such linguistic transitions can affect students' participation in academic discussions, presentations, and professional communication contexts (Kumar & Arora, 2012) ^[24].

Similarly, parental education and family background may

shape students' aspirations, learning opportunities, and self-confidence, thereby indirectly influencing their communication competence (Eccles, 2005; Dubow *et al.*, 2009) ^[10, 11]. Although many students demonstrate strong academic performance, limited exposure to structured soft-skill training programs further restricts opportunities to systematically develop communication abilities.

Beyond socio-personal influences, psychological determinants play a critical role in shaping students' communication competence. According to Social Cognitive Theory, individuals' beliefs about their capabilities significantly influence their learning behavior, persistence, and performance outcomes (Bandura, 1997) ^[3]. Psychological constructs such as self-confidence, self-esteem, empathy, and motivation affect students' willingness to participate in communication-intensive academic activities such as seminars, presentations, and group discussions. Students with stronger self-beliefs and socio-emotional competencies are more likely to actively engage in communication tasks and develop professional interaction skills.

In contrast, low self-confidence or weak self-perception may reduce students' participation in communication opportunities and limit their skill development.

Motivational orientation further influences communication competence through its role in learning engagement and persistence. Self-Determination Theory emphasizes that intrinsic motivation and internalized learning goals enhance students' engagement in skill development and academic participation (Deci & Ryan, 2000) ^[9]. Students with higher academic and achievement motivation tend to invest greater effort in communication activities such as writing research papers, presenting seminars, and participating in academic discussions. Conversely, lower motivation may discourage students from actively engaging in such activities, thereby widening communication skill gaps.

Another important psychological determinant influencing communication competence is communication apprehension, defined as the level of anxiety or fear associated with real or anticipated communication situations (McCroskey, 1977) ^[26]. High levels of communication apprehension can lead to avoidance of speaking opportunities, reduced classroom participation, and limited engagement in professional communication settings. Over time, such avoidance behavior restricts opportunities for skill practice and reinforces communication deficiencies.

Socio-emotional attributes such as empathy also contribute to effective communication, particularly in agricultural extension contexts where professionals interact closely with farmers and rural communities and must understand diverse perspectives and needs (Rogers, 2003; Malakçioğlu, 2022) ^[25, 32].

Institutional factors further influence communication skill development in higher agricultural education. Agricultural curricula traditionally emphasize disciplinary knowledge and technical expertise, while communication competencies are often treated as supplementary soft skills rather than core professional capabilities (Flowerdew, 2015; Hyland, 2019 ^[14, 21]). Opportunities for experiential learning such as extension fieldwork, student seminars, internships, and communication training programs are frequently limited or inadequately integrated into academic programs.

As a result, many graduates enter professional environments with strong technical knowledge but insufficient communication competence to effectively convey research findings, engage stakeholders, or participate in collaborative knowledge systems.

Drawing on these perspectives, the present study adopts a multidimensional framework to explain communication skill gaps among postgraduate students in higher agricultural education. The framework integrates socio-personal characteristics, psychological attributes, and institutional factors as potential determinants influencing communication training needs. Psychological constructs such as motivation, self-confidence, self-esteem, and empathy are expected to enhance students' communication competence, while communication apprehension may act as a critical internal barrier limiting effective communication engagement. Institutional learning environments and exposure to training opportunities further shape the development of communication competencies.

Despite growing recognition of the importance of communication competence in higher education, empirical research examining the determinants influencing communication skill gaps in agricultural education remains limited. Most existing studies focus either on identifying communication skill deficiencies or assessing employability skills among agricultural graduates (Andrews & Higson, 2008) ^[2]. While these studies highlight the presence of communication gaps, they rarely examine the combined influence of socio-personal, psychological, and institutional determinants on communication competence.

Moreover, empirical studies specifically focusing on postgraduate students in higher agricultural education in India remain relatively scarce, despite the critical role that agricultural graduates play in research dissemination, extension services, and knowledge transfer within the agricultural innovation system.

Furthermore, many studies assess communication competencies through general skill evaluations rather than employing structured quantitative measures such as the Training Need Index (TNI) to estimate communication skill gaps across multiple communication dimensions. A systematic assessment of communication training needs, combined with an analysis of the determinants influencing these gaps, can provide deeper insights into the factors shaping communication competence among agricultural students.

Therefore, the present study aims to assess communication skill gaps among postgraduate students in higher agricultural education and to examine the socio-personal and psychological determinants influencing these gaps. By integrating multidimensional determinants with a Training Need Index-based assessment of communication competencies, the study seeks to provide empirical evidence that can inform targeted communication training programs and educational reforms aimed at strengthening the professional preparedness of agricultural graduates.

Methodology: An exploratory and descriptive research design was employed for the study. Three prominent agricultural institutions were purposively selected based on their ranking and reputation in the National Institutional Ranking Framework (NIRF) 2024. Selection criteria

included key indicators weighted under NIRF parameters: Research and Professional Practice, Graduation Outcomes, Outreach and Inclusivity, and Perception. The chosen institutions represent a diverse institutional landscape: a Deemed University (Indian Agricultural Research Institute, IARI), a State Agricultural University (G.B. Pant University of Agriculture and Technology, GBPUAT), and a Central University with an agricultural faculty (Banaras Hindu University, BHU).

All three institutions were ranked within the top ten, ensuring that the study reflects insights from high-performing universities that significantly shape agricultural education in India. The study targeted postgraduate students enrolled in agricultural programs at these institutions. Inclusion criteria required that participants be currently registered in master's or doctoral programs and have exposure to coursework, seminars, and academic writing, ensuring familiarity with communication-related tasks. To ensure representation across different institutional contexts, seventy students were selected from each university using stratified sampling, resulting in a total sample of 210 students.

Care was taken to include participants from various agricultural disciplines, enhancing the generalizability of the findings within the

In the present study, a comprehensive set of socio-personal and psychological variables identified through literature review and expert consultation and incorporated based on based on their established relevance in explaining communication competence, learning engagement, and professional skill development in higher education contexts. Socio-personal variables included medium of school education, residence, parental education, academic performance, and exposure to soft-skill training programs. These variables were considered because students' educational and socio-cultural backgrounds often shape their access to communication opportunities, language proficiency, and academic participation (Eccles, 2005; Dubow *et al.*, 2009^[10, 11]).

Academic performance was included as an indicator of overall learning engagement and academic preparedness, which may indirectly influence communication competence. Psychological determinants were measured using standardized and validated instruments to ensure reliability and comparability. Academic motivation was assessed using the Motivation Measurement Scale (MMS) developed by Smith (2017), which captures students' goal orientation and persistence in academic activities. Achievement motivation was measured using the Achievement Motivation Scale (AMS) developed by Reddy (1979), widely applied in Indian educational research to assess students' aspiration for success and performance orientation. Students' self-perception was evaluated through Rosenberg's Self-Esteem Scale (RSES) (Rosenberg, 1965)^[33] and the Self-Confidence Scale (SCS) developed by Sanders and Sanders (2003).

These instruments measure individuals' perceptions of self-worth and confidence in handling academic and professional tasks. Empathy was assessed using the Empathy Assessment Scale developed by Malakçioğlu (2022)^[25], which evaluates individuals' ability to understand and respond to others' perspectives an essential attribute for agricultural extension and participatory communication contexts. Communication-related anxiety was measured using the Personal Report of Communication Apprehension (PRCA-24) developed by McCroskey (1982)^[41], which assesses individuals' predisposition to experience anxiety across common communication contexts such as group discussions, meetings, interpersonal interactions, and public speaking.

This instrument is widely used in communication research and provides a comprehensive assessment of communication apprehension across different communication situations.

Communication skill gaps were assessed using the Training Need Index (TNI) approach (Patil & Kokate, 2011). Required communication competencies were first identified using the Delphi technique, covering five major communication dimensions: speaking, writing, reading, listening, and non-verbal communication skills. Students' perceived competency levels in these dimensions were then measured using a five-point rating scale. The Training Need Index was calculated by comparing the total obtained score with the maximum obtainable score, and the communication skill gap was derived as the difference between the maximum competency level and the observed competency score. This method allowed a systematic quantification of training needs across multiple communication skill domains.

$$TNI = \frac{\text{Total obtained score}}{\text{Maximum obtainable score}} \times 100 \quad (1)$$

$$\text{Skill gap} = \text{Training need} = 100 - TNI \quad (2)$$

This rigorous operationalization, supported by established scales and reliability testing, provided a robust framework to analyse how socio-personal, psychological, and institutional determinants shape communication skill requirements in the context of higher agricultural education.

Major findings

The socio-personal characteristics of postgraduate agricultural students across the three institutions are presented in Table 1. The results indicate that a majority of students (70.95%) had studied in English-medium schools, while 11.42 per cent and 17.61 per cent had Hindi and regional-medium schooling respectively. Despite the dominance of English-medium education, nearly one-third of students came from non-English backgrounds, which may create adjustment challenges in academic communication environments.

Table 1: Distribution of Socio-Personal Variables among Students

S.N.	Socio-Personal Variables	IARI (n=70)		GBPUAT (n=70)		BHU (n=70)			Total Students (n=210)	
1.	Medium	f	%	f		%	f	%	f	%

	English	45	64.28	61	87.14	43	61.42	149	70.95
	Hindi	7	10	6	8.57	11	15.71	24	11.42
	Regional	18	25.71	3	4.28	16	22.85	37	17.61
2.	Background	IARI		GBPUAT	BHU			Total Students	
	Urban	22	31.42	48	68.57	24	34.28	94	44.76
	Rural	48	68.57	22	31.42	46	65.71	116	55.23
3.	Father education	IARI		GBPUAT	BHU			Total Students	
	Not formally educated	11	15.71	3	4.28	12	17.14	26	12.38
	Primary	5	7.14	4	5.71	6	8.57	15	7.14
	High school	18	25.71	4	5.71	14	20	36	17.14
	Intermediate	12	17.14	13	18.57	16	22.85	41	19.52
	Diploma	2	2.85	1	1.42	2	2.85	5	2.38
	Graduation	18	25.71	28	40	16	22.85	62	29.52
	Post Graduation	4	5.71	17	24.28	4	5.71	25	11.90
4.	Mother education	IARI		GBPUAT	BHU			Total Students	
	Not formally educated	20	28.57	6	8.57	22	31.42	48	22.85
	Primary	9	12.85	6	8.57	7	10	22	10.47
	High school	16	22.85	8	11.42	15	21.42	39	18.57
	Intermediate	14	20	13	18.57	14	20	41	19.52
	Diploma	1	1.42	5	7.14	1	1.42	7	3.33
	Graduation	9	12.85	17	24.28	10	14.28	36	17.14
	Post Graduation	1	1.42	15	21.42	1	1.42	17	8.09
5.	Academic performance O.P.G.A.	IARI		GBPUAT	BHU			Total Students	
	5-6	1	1.42	2	2.85	1	1.42	4	1.9
	6-7	1	1.42	2	2.85	1	1.42	4	1.9
	7-8	9	12.85	32	45.71	10	14.28	51	24.29
	8-9	55	78.57	33	47.14	53	75.71	141	67.14
	>9	4	5.71	1	1.42	5	7.14	10	4.76
6.	No. of Soft-skill training attended	IARI		GBPUAT	BHU			Total Students	
	1-3	45	64.28	46	65.71	44	62.85	135	64.29
	4-5	21	30	18	25.71	18	25.71	57	27.14
	6-9	3	4.28	2	2.85	5	7.14	10	4.76
	>9	1	1.42	4	5.71	3	4.28	8	3.81

With respect to residential background, 55.23 per cent of respondents belonged to rural areas, while 44.76 per cent were from urban backgrounds. This reflects the agrarian roots of agricultural education in India but may also indicate differences in exposure to formal communication environments. Parental education levels varied considerably. Approximately 29.52 per cent of fathers had graduate-level education, while 11.90 per cent had postgraduate education. In contrast, a relatively higher proportion of mothers had limited formal education, with 22.85 per cent reporting no formal schooling. Family educational background can influence students' academic aspirations and communication exposure. Academic performance among respondents was generally strong, with 67.14 per cent of students scoring between 8 and 9 OGPA, indicating high

academic achievement among postgraduate agricultural students. However, exposure to soft-skill training programs was relatively limited, as 64.29 per cent of respondents reported attending only one to three training programs. This suggests that structured communication skill development opportunities remain limited within agricultural education systems.

The Friedman test results (Table 2) revealed statistically significant differences across institutions in most socio-personal variables, including medium of schooling, family background, parental education, and academic performance ($p < 0.01$). These results indicate that students across the three universities differ in their socio-educational backgrounds and learning environments.

Table 2: Freidman test for each indicator of Social-Personal dimension

Indicators	Universities	Mean rank	Chi-square	Sig.
Medium of School Education	GBPUAT	1.75	15.28	<0.001**
	IARI	2.11		
	BHU	2.14		
Family background -RESIDENCE	GBPUAT	1.64	28.54	<0.001**
	IARI	2.20		
	BHU	2.16		
Father's Education	GBPUAT	2.45	27.74	<0.001**

	IARI	1.76		
	BHU	1.79		
Mother's Education	GBPUAT	2.41	20.93	<0.001**
	IARI	1.81		
	BHU	1.79	35.10	<0.001**
	GBPUAT	1.60		
Academic performance	IARI	2.2	0.25	0.879
	BHU	2.2		
No. of soft skill training attended	GBPUAT	1.97		
	IARI	2		
	BHU	2.03		

Significance level at 1 percent, * significance level at 5 percent.

GBPUAT students were more likely to have English-medium schooling and urban backgrounds, while IARI and BHU had higher rural representation, reflecting disparities in linguistic and social exposure (Kumar & Arora, 2012; Narain, 2019) ^[24, 29]. Parental education was also higher at GBPUAT, supporting earlier findings that family background influences academic aspirations and communication competence (Eccles, 2005; Dubow *et al.*, 2009) ^[10, 11]. Academic performance varied significantly, with GBPUAT students ranking higher, consistent with institutional reputation effects (Altbach & Forest, 2007) ^[1].

However, no significant difference emerged in soft-skill training exposure, indicating a common weakness across institutions where structured communication training is often undervalued (Andrews & Higson, 2008; Hyland, 2019) ^[2].

The Friedman test indicated significant differences in socio-personal characteristics of postgraduate agricultural students across the three universities, but it does not specify which groups differ. Therefore, the Wilcoxon signed-rank test was applied to all possible university pairs to identify the specific group differences (Field, 2024; Siegel, 1956) ^[12, 37],

Table 3: Wilcoxon signed rank test for each indicator of Social-Personal dimension

Indicators		IARI - GBPUAT	GBPUAT - BHU	BHU - IARI
Medium of School Education	Z	-3.403b	-3.376b	-0.186c
	Sig(2-tailed)	0.001**	0.001**	0.852
Family background (RESIDENCE)	Z	-4.333b	-4.116b	-0.471c
	Sig(2-tailed)	<0.001**	<0.001**	0.637
Father's Education	Z	-4.201 ^b	-4.308 ^b	-0.356 ^b
	Sig(2-tailed)	<0.001**	<0.001**	0.722
Mother's Education	Z	-4.342 ^b	-4.374 ^b	-0.171 ^c
	Sig(2-tailed)	<0.001**	<0.001**	0.864
Academic performance	Z	-3.988 ^b	-3.722 ^b	0.000 ^c
	Sig(2-tailed)	<0.001**	<0.001**	1.000
No. Of soft skill Training attended	Z	-0.367 ^b	-0.257 ^c	-0.987 ^c
	Sig(2-tailed)	0.713	0.797	0.323

Significance level at 1 percent, significance level at 5 percent,

The Wilcoxon signed-rank test revealed significant pairwise differences in socio-personal characteristics such as school medium, residence, parental education, and academic performance between IARI-GBPUAT and GBPUAT-BHU, while no significant differences were observed between BHU and IARI. Soft skill training attendance showed no variation across universities, reflecting uniformly limited exposure. These results suggest that socio-personal background strongly influences students' academic and communicative capacities, while the lack of training

opportunities is consistent with earlier reports of insufficient soft-skill programs in agricultural education (Andrews & Higson, 2008) ^[2]. The Wilcoxon test thus supplements the Friedman test by pinpointing specific institutional disparities (Siegel & Castellan, 1988; Field, 2013).

The psychological profile of respondents is presented in Table 4. The results indicate that 61.90 per cent of students expressed occupational aspirations toward service-oriented careers, reflecting a preference for stable employment in research, academia, or government sectors.

Table 4: Distribution of students' according to psychological characteristics

Psychological Variables	IARI		GBPUAT		BHU		Total Students	
	(n=70)		(n=70)		(n=70)		(n=210)	
1. Occupational Aspiration	f	%	f	%	f	%	f	%
Services	48	68.57	38	54.28	44	62.85	130	61.90
Business	5	7.14	11	15.71	8	11.42	24	11.42
Not decided	16	22.85	20	28.57	17	24.28	53	25.23
Any other	1	1.42	1	1.42	1	1.42	3	1.42
2. Achievement Motivation	IARI		GBPUAT		BHU		Total Students	
Low (<21.23)	24	34.29	26	37.14	27	38.57	77	36.67
Medium(21.23-27.08)	27	38.57	27	38.57	21	30.00	75	35.71

High (>27.08)	19	27.14	17	24.29	22	31.43	58	27.62
3. Academic Motivation	IARI		GBPUAT		BHU		Total Students	
Low (<105.30)	16	22.85	14	20	15	21.42	45	21.42
Medium (105.30-149.95)	26	37.14	32	45.71	28	40	86	40.95
High (>149.95)	28	40	24	34.28	27	38.57	79	37.61
4. Self- esteem	IARI		GBPUAT		BHU		Total Students	
Low <25.57	16	22.85	22	31.42	18	25.71	56	26.66
Medium 25.57-30.52	30	42.85	37	52.85	32	45.71	99	47.14
High >30.52	24	34.28	11	15.71	20	28.57	55	26.19
5. Self- confidence	IARI		GBPUAT		BHU		Total Students	
Low <83.2	17	24.28	22	31.42	14	20	53	25.23
Medium 83.2-94.2	23	32.85	21	30	23	32.85	67	31.90
High >94.2	30	42.85	27	38.57	33	47.14	90	42.85
6. Empathy	IARI		GBPUAT		BHU		Total Students	
Low <38.36	11	15.71	15	21.42	13	18.57	39	18.57
Medium 38.36-50.03	30	42.85	36	51.42	34	48.57	100	47.61
High >50.03	29	41.42	19	27.14	23	32.85	71	33.80
7. Communication apprehension	IARI		GBPUAT		BHU		Total Students	
Low <51	0	0	1	1.43	2	2.86	3	1.43
Medium 51-80	47	70	49	74.29	45	72.86	141	72.38
High >80	21	30	17	24.29	17	24.29	55	26.19

Table 4 presents the psychological characteristics of postgraduate agricultural students across IARI, GBPUAT, and BHU. Most students (61.90%) aspired for careers in services, indicating a preference for secure employment over entrepreneurship, consistent with earlier studies on agricultural graduates' job orientation (Mishra & Kumar, 2018) [28]. More than half of the students exhibited medium to low levels of achievement and academic motivation, as well as medium to low self-perception through self-esteem and self-confidence, highlighting a pressing need to strengthen their orientation toward these aspects. Motivation plays a central role in driving persistence, learning outcomes, and professional aspirations (Deci & Ryan, 2000; Schunk *et al.*, 2014) [9, 35]. Self-perception significantly influences academic engagement, communication effectiveness, and professional performance, (Rosenberg,

1965; Schunk & DiBenedetto, 2020) [33, 34], making it a critical factor in preparing students professional roles in agriculture. Similarly, inadequate achievement and academic motivation can restrict students' engagement with communication and leadership opportunities, thereby limiting their preparedness for extension and research roles (Andrews & Higson, 2008) [2]. Empathy was largely medium (47.61%), crucial for extension roles (Rogers, 2003) [32]. However, communication apprehension remained a concern, with most students in the medium (72.38%) range, reflecting persistent communication skill gaps highlighted in earlier research (Andrews & Higson, 2008) [2]. Overall, while motivation and confidence appear encouraging, targeted efforts are needed to strengthen self-esteem and communication competence.

Table 5: Freidman test for each indicator of Psychological dimension

Indicators	Universities	Mean rank	Chi-square	Sig.
Occupational Aspiration	GBPUAT	2.10	1.793	0.408
	IARI	1.93		
	BHU	1.97		
Academic Motivation	GBPUAT	1.90	1.229	0.451
	IARI	2.01		
	BHU	2.09		
Achievement Motivation	GBPUAT	1.94	0.792	0.693
	IARI	2.08		
	BHU	1.99		
Self Confidence	GBPUAT	1.91	8.035	0.019*
	IARI	1.94		
	BHU	2.12		
Empathy	GBPUAT	1.92	6.098	0.036*
	IARI	2.07		
	BHU	2.01		
Self Esteem	GBPUAT	1.82	8.002	0.021*
	IARI	2.09		
	BHU	2.01		
Communication Apprehension	GBPUAT	2.04	11.409	0.015*
	IARI	1.86		
	BHU	2.10		

Significance level at 1 percent, significance level at 5 percent

The Friedman test showed significant differences across universities in self-confidence, empathy, self-esteem, and communication apprehension, while occupational aspiration, academic motivation, and achievement motivation did not differ. This indicates that motivational factors remain consistent, but self-perception and communication traits are shaped more by institutional environments. The significant variation in self-confidence and self-esteem suggests that institutional climate, mentoring, and exposure to academic opportunities may play an important role in shaping students' self-perceptions (Rosenberg, 1965; Schunk *et al.*, 2014) [33, 35]. Differences in empathy point to the role of curriculum and experiential learning in developing socio-emotional competencies, which are critical for extension and participatory approaches in agriculture (Davis, 1980; Narayanasamy, 2020) [8, 30]. Variation in communication apprehension underscores

earlier findings that agricultural students often face difficulties in oral communication, particularly in professional and extension settings, where institutional training and peer interactions strongly influence skill development (Mc Croskey, 1977) [26]. The absence of significant differences in academic and achievement motivation suggests that students across the three universities share similar motivational orientations, possibly due to shared socio-cultural and educational contexts (Deci & Ryan, 2000) [9]. However, the significant findings in other psychological dimensions highlight the need for institution-specific interventions such as confidence-building programs, empathy training, and communication workshops to strengthen the socio-psychological preparedness of students for academic and professional success in agricultural sciences.

Table 6: Wilcoxon signed rank test for indicator of Psychological dimension

Indicators		IARI - GBPUAT	GBPUAT - BHU	BHU - IARI
Self Confidence	Z	-1.701 ^b	-3.041 ^b	-2.814 ^b
	Sig(2-tailed)	0.089	0.021*	0.018*
Empathy	Z	-2.722 ^b	-2.667 ^b	-0.277 ^c
	Sig(2-tailed)	0.038*	0.028*	0.782
Self Esteem	Z	-4.017 ^b	-4.016 ^b	0-.041 ^c
	Sig(2-tailed)	0.019*	0.023*	0.967
Communication Apprehension	Z	-3.403 ^b	-0.186 ^b	-0.186 ^c
	Sig(2-tailed)	0.014*	0.852	0.018*

Significance level at 1 percent, significance level at 5 percent

The Wilcoxon signed-rank test revealed significant differences in psychological traits across universities. Self-confidence of BHU differed with both GBPUAT and IARI, while empathy, and self-esteem of GBPUAT varied notably with both IARI and BHU, similarly communication apprehension of IARI differed with GBPUAT and BHU.

These variations indicate institutional influences on students' psychological development (Field, 2024; Siegel & Castellan, 1988) [12].

Communication skills dimensions Results of TNI

Indicators	Score	GBPUATNI%	IARI TNI%	BHU TNI%	Over All TNI%	Skill gap/ Training need	Rank
Speaking skills	7860 (11 skills)	63.12	72.55	72.31	68.05	31.95	2
Writing skills	11299 (16 skills)	63.09	71.51	72.60	67.26	32.74	1
Listening skills	13102 (18 skills)	63.25	68.95	69.57	69.32	30.68	4
Reading skills	7159 (10 skills)	66.40	69.19	72.38	68.18	31.82	3
Non-verbal skills	8735 (12 skills)	63.46	69.57	71.51	69.33	30.67	5
Overall communication skills	48272 (67 skills)				68.62	31.38	

The Training Need analysis of communication skills among postgraduate agricultural students across the three universities highlights writing skills (32.74%) as the most critical training need, followed by speaking skills (31.95%), reading skills (31.82%), listening skills (30.68%), and non-verbal skills (30.67%). The overall TNI for communication skills stood at 31.38%, indicating a substantial skill gap requiring structured interventions.

The higher training need in writing and speaking reflects persistent challenges faced by students in academic and professional communication, which directly impacts research publication, extension work, and career readiness (Andrews & Higson, 2008; Flowerdew, 2015; Hyland, 2019) [2]. Weakness in reading and listening suggests gaps in comprehension and critical processing of information,

which are essential for effective learning and knowledge transfer (Brownell, 2012). Similarly, the moderate gap in non-verbal skills highlights the importance of body language, eye contact, and other behavioural cues in teaching, extension, and professional interactions (Guerrero & Floyd, 2006) [17].

These findings are consistent with earlier studies that emphasize the centrality of communication competence in agricultural education and its role in employability, leadership, and stakeholder engagement (Jackson, 2014; Finch *et al.*, 2013) [13, 22]. Therefore, targeted training programs focusing on academic writing, public speaking, active listening, and non-verbal communication are urgently needed to bridge the identified gaps and enhance students' professional competencies.

Table 7: Relationship between the selected socio-personal and psychological variables with training needs of communication skills

Determinants	Correlation Coefficient (r)	P value
Medium of school education	-0.130	0.061
Residence	0.051	0.460
Educational status of Father	-0.075	0.276
Educational status of Mother	-0.130	0.061
Academic Performance	-0.251**	<0.001
No. Of training attended	-0.094	0.173
Occupational aspiration	0.037	0.599
Academic motivation	-0.213**	0.002
Achievement motivation	-0.264**	<0.001
Self-confidence	-0.137*	0.034
Empathy	-0.232**	0.001
Self esteem	-0.200**	0.004
Communication apprehension	0.105*	0.016

Significance level at 1 percent, significance level at 5 percent

The analysis indicates that psychological variables exert a stronger influence than socio-personal factors on postgraduate students' perceived training needs for communication skills. Academic performance ($r = -0.251$), academic motivation ($r = -0.213$), achievement motivation ($r = -0.264$), self-confidence ($r = -0.137$), self-esteem ($r = -0.200$), and empathy ($r = -0.232$) were negatively correlated with training needs, suggesting that students with higher competence, motivation, or socio-emotional skills perceive lower requirements for communication training (Andrews & Higson, 2008; Ryan & Deci, 2000; Burleson, 2003; Brackett *et al.*, 2011; Goleman, 1995) [2, 6, 16, 42, 43]. Conversely, communication apprehension ($r = 0.105$) showed a small positive correlation, indicating that students with higher apprehension perceive greater training needs, consistent with McCroskey's (1977) [26] findings on the impact of communication anxiety. Socio-personal variables such as residence, parental education, and occupational aspiration were largely non-significant, emphasizing that intrinsic

psychological factors including motivation, self-confidence, empathy, and emotional intelligence are more critical in determining training needs (Robbins & Judge 2005; Bandura, 1997; Kline, 2008) [3, 23, 31]. These results underscore the importance of designing communication skill development programs that enhance motivation, self-efficacy, empathy, and reduce communication apprehension to effectively meet students' training needs.

Correlation indicates the strength and direction of a relationship between variables but does not quantify predictive influence or account for other factors. Regression analysis, in contrast, allows to estimate how much one variable predicts another while controlling for multiple variables and confounding effects (Field, 2018; Cohen *et al.*, 2013; Tabachnick & Fidell, 2019) [7, 39]. Thus, even after observing significant correlations, regression is performed to determine the unique contribution of each factor and to inform targeted interventions (Hair *et al.*, 2010; Gujarati & Porter, 2009) [18, 19].

Table 8: Regression analysis of independent variables with Training needs of communication skills

Model	Standard error	Coefficient β	t	Sig.
Constant	-0.153	0.454	4.53	0.000**
Medium of education (X ₁)	-0.035	-0.723	5.23	0.002**
Residence(X ₂)	0.042	0.083	-0.594	0.553
Achievement motivation(X ₃)	-0.204	-0.565	-2.77	0.007**
Academic Performance (X ₄)	-0.045	-0.671	4.912	0.08*
Father's education(X ₅)	-0.025	-0.413	-2.13	0.097
Mother's education(X ₆)	-0.031	-0.635	4.236	0.013*
Academic motivation (X ₇)	-0.031	-0.352	2.93	0.008**
Occupational aspiration(X ₈)	0.023	0.06	0.076	0.38
Empathy(X ₉)	-0.027	-0.395	-2.994	0.022*
Self-esteem(X ₁₀)	-0.011	-0.417	3.101	0.012*
Self-confidence(X ₁₁)	-0.027	-0.395	-2.994	0.022*
Communication apprehension(X ₁₂)	0.031	0.635	4.236	0.013*
R ² = 0.78 adjusted R ² =0.75 F Ratio=28.67				

Significance level at 1 percent, significance level at 5 percent

The regression analysis showed that the model is highly significant and explains 75% of the variance in training needs ($R^2 = 0.78$, adjusted $R^2 = 0.75$) (Cohen *et al.*, 2013; Hair *et al.*, 2010) [7, 19]. Among the socio-personal variables, medium of education (X_1 , $\beta = -0.035$), mother's education (X_6 , $\beta = -0.031$), and to a lesser extent, father's education (X_5 , $\beta = -0.025$) showed negative coefficients, suggesting that students from more educated backgrounds or certain

educational mediums perceive lower training needs, consistent with Andrews and Higson (2008) [2], who reported that academic exposure influences communication competence. Residence (X_2) and occupational aspiration (X_8) were non-significant, indicating limited influence on training needs, which aligns with previous studies emphasizing psychological over demographic factors in skill development (Ryan & Deci, 2000) [43]. Psychological

variables demonstrated stronger predictive power. Achievement motivation (X3, $\beta = -0.204$), academic motivation (X7, $\beta = -0.031$), empathy (X9, $\beta = -0.027$), self-esteem (X10, $\beta = -0.011$), and self-confidence (X11, $\beta = -0.027$) were all negatively associated with training needs. These findings indicate that students with higher motivation, socio-emotional skills, and perceived support perceive less need for communication training, consistent with Mc Croskey (1997), Burleson (2003), and Brackett *et al.* (2011) [6, 26, 42]. Communication apprehension (X12, $\beta = 0.031$) had a positive coefficient, confirming that higher apprehension increases perceived training needs, reflecting prior research

on anxiety as a barrier to communication skill development (Mc Croskey, 1997) [26].

Overall, the results suggest that while socio-personal factors contribute modestly, psychological and emotional factors play a central role in determining training needs for communication skills. This underscores the importance of integrating motivation enhancement, self-confidence building, empathy development, and apprehension-reduction strategies into communication training programs (Goleman, 1995; Bandura, 1997; Zimmerman, 2000) [3, 16, 40].

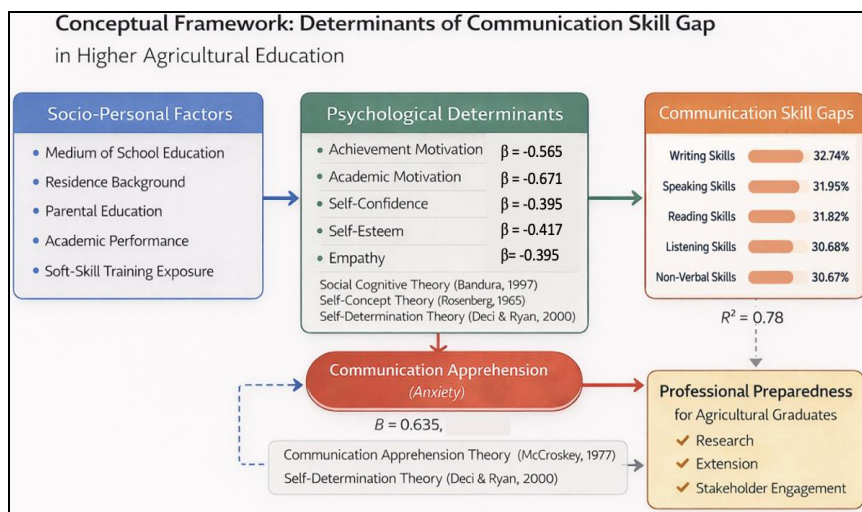


Fig 1: Conceptual framework

Discussion

The present study examined the determinants influencing communication skill gaps among postgraduate students in higher agricultural education. The findings indicate that communication deficiencies persist even among students enrolled in high-performing agricultural universities. The overall communication skill gap of 31.38 per cent suggests that although students possess strong academic knowledge, their communication competencies remain insufficient for professional roles such as research dissemination, extension communication, and stakeholder engagement. The dimensional analysis revealed that writing and speaking skills represent the most critical training needs among postgraduate agricultural students. These findings are consistent with previous research highlighting that agricultural graduates often struggle with academic writing, presentation skills, and professional communication tasks (Andrews & Higson, 2008; Hyland, 2019) [2]. Writing skills are particularly important in agricultural research for preparing scientific papers, reports, and project proposals, while speaking skills are essential for extension communication, seminars, and stakeholder interactions. Weaknesses in these competencies may limit graduates' ability to effectively disseminate research findings and participate in knowledge-sharing processes within the agricultural innovation system.

The correlation analysis further demonstrated that psychological variables exert stronger influence than socio-personal characteristics on communication training needs. Academic motivation, achievement motivation, empathy,

self-esteem, and self-confidence were all negatively associated with communication skill gaps, suggesting that students with stronger psychological attributes tend to perceive fewer communication deficiencies. These findings support Social Cognitive Theory, which emphasizes that individuals' beliefs about their capabilities strongly influence learning behavior and performance outcomes (Bandura, 1997) [3]. Students with higher levels of self-confidence and self-esteem are more likely to actively participate in communication tasks such as presentations and discussions, thereby strengthening their communication competence. Similarly, the negative relationship between motivation and communication skill gaps aligns with Self-Determination Theory, which proposes that motivated learners are more likely to engage in learning activities and persist in skill development (Deci & Ryan, 2000) [9]. Students with stronger academic and achievement motivation may actively seek opportunities to practice communication through seminars, collaborative learning, and research activities, thereby reducing their perceived communication training needs. Empathy also emerged as a significant factor influencing communication competence. Empathy enables individuals to understand others' perspectives and respond effectively in interpersonal interactions. In agricultural education, this competency is particularly important for extension professionals who must communicate with farmers, rural communities, and diverse stakeholders (Rogers, 2003) [32]. The significant negative association between empathy and communication skill gaps suggests that socio-emotional competencies contribute to

effective communication behavior. In contrast, communication apprehension demonstrated a positive relationship with communication training needs, indicating that students with higher levels of communication anxiety tend to experience greater communication skill gaps. This finding supports earlier studies emphasizing that communication apprehension acts as a major psychological barrier to effective communication (McCroskey, 1977; McCroskey, 1984) ^[26, 27]. Students with high communication apprehension often avoid speaking opportunities, group discussions, and professional interactions, which limits opportunities for skill practice and reinforcement. Over time, such avoidance behaviors may contribute to persistent communication deficiencies.

The regression analysis further confirmed that psychological variables are central determinants of communication competence. Achievement motivation, academic motivation, empathy, self-confidence, and self-esteem significantly reduced communication training needs, while communication apprehension significantly increased them. These findings suggest that communication skill development is not solely a technical training issue but also a psychological and motivational challenge. Strengthening students' psychological preparedness may therefore play a critical role in improving communication competence. Although socio-personal characteristics such as educational background and parental education showed some influence, their impact was comparatively weaker than psychological determinants. This indicates that communication competence in higher education is more strongly shaped by students' motivational orientation, emotional readiness, and confidence rather than demographic background alone.

Another important finding of the study is the institutional similarity in soft-skill training exposure across the three universities. Despite differences in socio-personal characteristics and academic environments, the availability of structured communication training programs appeared uniformly limited. This finding reflects a broader structural issue within higher agricultural education, where communication competencies are often treated as secondary soft skills rather than core professional capabilities (Hyland, 2019; Jackson, 2014) ^[22]. Overall, the findings highlight that improving communication competence among postgraduate agricultural students requires a multidimensional approach that simultaneously addresses technical skill development, psychological readiness, and institutional support mechanisms. Communication training programs that integrate experiential learning, confidence-building activities, and opportunities for real-world communication practice may play a crucial role in bridging the existing communication skill gap in higher agricultural education.

Practical Implications for Agricultural Education

The findings highlight the need to strengthen communication training within postgraduate agricultural education. Since writing and speaking skills emerged as the most critical training needs, universities should prioritize structured opportunities such as scientific writing workshops, research presentation seminars, and communication-focused coursework. The results also indicate that psychological determinants significantly influence communication competence. Variables such as

motivation, self-confidence, self-esteem, and empathy reduce communication skill gaps, whereas communication apprehension increases them. Therefore, communication training programs should be complemented with confidence-building and motivation-enhancing strategies, including mentoring, goal-setting, peer learning, and constructive feedback. Experiential learning approaches such as student-led seminars, extension simulations, and group discussions can further strengthen communication competence by providing real-world practice opportunities. Integrating such activities into postgraduate curricula can help agricultural universities better prepare graduates for research dissemination, extension communication, and stakeholder engagement.

Limitations and Future Research

This study relied primarily on self-reported assessments of communication competency, which may reflect perceived rather than objective skill levels. Future research may incorporate objective evaluation methods such as assessment of presentations, writing samples, or communication simulations. The study was conducted among postgraduate students from three major agricultural universities, which may limit the generalizability of findings to other institutions. Expanding research across a broader range of universities could provide deeper insights into communication skill development in agricultural education. Longitudinal studies may also help examine how communication competence and psychological determinants evolve during postgraduate training and how educational interventions influence this process.

Conclusion

This comprehensive assessment established that effective communication is a core professional competency for graduates in higher agricultural education in India, essential for successfully engaging with diverse stakeholders, from farmers to policymakers. Empirical data confirmed a substantial and systemic disparity between the skills required by the profession and those possessed by postgraduate agricultural students, revealing an urgent overall communication skill gap of 31.38 per cent. A deeper dimensional analysis quantified the greatest deficiencies in skills demanding high academic and professional output i.e., Writing and Speaking skills indicating a fundamental failure to adequately prepare graduates for high-stakes professional roles such as research publication, proposal drafting, and public advocacy. The regression model employed to assess the influence of various factors proved highly significant and predictive, explaining 75 per cent of the variance in communication training needs. This powerful analysis established the psychological capital of the student as the central determinant of competency. Internal psychological variables including high Achievement Motivation, Academic Motivation, Self-Confidence, Self-Esteem, and Empathy demonstrated a robust and consistently significant negative association with training needs, suggesting that mastery of communication skills is fundamentally an emotional and motivational challenge before it is a technical one. Conversely, Communication Apprehension stood out as the crucial internal barrier, registering a significant positive correlation that directly increases the perceived

need for training, as high apprehension leads to avoidance behaviors that arrest skill development. In addition to psychological factors, the study revealed a shared, systemic weakness across the high-performing higher agricultural education sector the Institutional Irony. While the institutions exhibited significant disparities across socio-personal characteristics such as urban/rural residence and parental education, the Friedman test confirmed a statistically insignificant difference in the uniformly low provision of structured soft-skill training exposure across all three universities. This shared structural oversight highlights a paradox in higher agricultural education strategy: prioritizing theoretical excellence while neglecting core professional skills. The empirical findings necessitate a policy mandate that reframes communication from a peripheral "soft skill" to an integral and formally assessed professional competency. The powerful predictive influence of psychological variables demands a theoretical shift toward a socio-cognitive and emotional intelligence framework, where instructional design must move beyond merely providing technical rules. Effective pedagogical reform must now prioritize psychological preparedness and the enhancement of self-efficacy by directly addressing the motivational and emotional barriers that impede practice and performance mastery. Strategic interventions must therefore be multi-pronged, including: Mandating Experiential Learning through credit-bearing modules focused on scientific rhetoric, grant proposal drafting, and high-fidelity professional speaking simulations; simultaneously, institutions must implement Psychological Resilience Programs utilizing techniques like systematic desensitization to directly reduce Communication Apprehension and employing mentorship to link skill mastery to professional outcomes, leveraging achievement motivation; and finally, tailored Institutional Capacity Building is mandatory, requiring faculty professional development, dedicated resource allocation for specialized Communication Resource Centres, and specialized linguistic proficiency programs for students from regional-medium backgrounds to mitigate initial linguistic capital disadvantages.

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