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Praveen Shinde
Associate Professor, Government First Grade College, Dharwad, Karnataka, India

Rajeshwari N
Professor & Head, Department of Extension and Communication Management, College of Community Science, UAS, Dharwad, Karnataka, India

Nagaratna C Kurbetta
Research Assistant, Department of Extension and Communication Management, College of Community Science, UAS, Dharwad, Karnataka, India

Vijaya U Patil
Principal & Associate Professor, Department Home Science, Government First Grade College, Ankola, Uttara Kannada, Karnataka, India

Girijamma Mulimani
Associate Professor, Department of Home Science, Government First Grade Women's College, Dharwad, Karnataka, India

Corresponding Author:
Praveen Shinde
Associate Professor, Government First Grade College, Dharwad, Karnataka, India

ICT-based learning among college students: An attitudinal survey

Praveen Shinde, Rajeshwari N, Nagaratna C Kurbetta, Vijaya U Patil and Girijamma Mulimani

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Abstract
The study examined the attitudes, challenges and suggestions towards ICT-based learning among college students with a sample of 100 students selected through simple random sampling. Results revealed that 68.00 percent were female and 32.00 percent were male and almost all students (97.00%) owned smartphones used for academic purposes. Students exhibited a highly positive attitude towards ICT-based learning, particularly in critical thinking and lifelong learning (Mean = 3.93) followed by skill development and self-learning (Mean = 3.88). Major challenges included poor internet connectivity (60.00%), device access issues (11.00%), and time management (9.00%). The most frequently suggested improvement was better internet connectivity, mentioned by 41.00 percent of students, emphasising the need for stable and high-speed networks for uninterrupted access to digital learning resources. The findings highlight that while learners recognise ICT's potential to improve engagement and learning outcomes, inadequate digital infrastructure and skills remain barriers. Strengthening institutional ICT facilities and providing continuous training can enhance effective digital learning among students.

Keywords: ICT-based learning, attitude, challenges, college students, higher education

Introduction
The integration of Information and Communication Technology (ICT) in education has revolutionised the teaching and learning environment by making knowledge acquisition more accessible, interactive and learner-centred. Digital tools have transformed conventional classrooms into dynamic spaces that foster creativity, collaboration and critical thinking. ICT facilitates flexible learning through online resources, virtual classrooms and multimedia platforms, allowing students to learn at their own pace and convenience. In India, the National Education Policy (NEP) 2020 strongly advocates for the integration of technology in higher education to promote inclusive and equitable access to quality learning opportunities. Despite these advancements, disparities in infrastructure, digital literacy and internet connectivity persist, particularly in rural and semi-urban regions, limiting the optimal use of ICT in education.

Understanding students' attitudes toward ICT-based learning is essential to ensure that technological initiatives are meaningful and effective. A positive attitude can significantly enhance students' engagement, motivation and overall learning outcomes, while a negative or indifferent perception may hinder the adoption of digital tools. Hence, there is a pressing need to assess how college students perceive ICT in terms of its usefulness, accessibility and relevance to their academic pursuits. This study seeks to explore the attitude, challenges and suggestions of college students toward ICT-based learning. The findings will help identify key areas that require attention such as digital skill development, infrastructure enhancement and pedagogical innovation to strengthen the integration of ICT in higher education and promote a more inclusive and technology-driven learning environment.

Methodology
The study was conducted among 100 college students selected through simple random sampling. A structured questionnaire was designed and administered using google forms to collect data on demographic profile, ownership of devices, purpose of ICT usage, attitude towards ICT-based learning and challenges and suggestions related to ICT adoption.

The attitude scale included 29 statements under six components Learning Motivation and Interest, Learning Process and Participation, Skill Development and Self-Learning, Access and Independent Learning, Critical Thinking and Lifelong Learning and Creativity and Innovation measured on a five-point Likert scale. The responses were subsequently categorized using the interval method into three groups as positive, neutral, and negative attitudes to interpret the overall perception trend. Data were analysed using frequency, percentage, mean and standard deviation.

Results and Discussion

Table 1 presents the demographic profile of the students. The data reveal that a majority (63.00%) of students were in the 20-22 years age group, followed by 19% in the 23-25 years category, 12.00 percent between 17-19 years and 6.00 percent aged 26 years and above. This indicates that most students belong to the typical college-going age, representing a young and digitally active generation familiar with technology use. With respect to gender, the sample consisted of 68.00 percent female and 32.00 percent male students, showing greater participation of female students in the study. This may reflect the increasing involvement of women in higher education and their growing interest in technology-based learning.

Regarding the year of study, 35.00 percent of students were in their second year, 29.00 percent in the first year, 21.00 percent in the third year and 15.00 percent were pursuing fourth year and above. This distribution demonstrates that all academic levels were fairly represented, ensuring a comprehensive understanding of ICT attitudes across different years of study. In terms of the course of study, 47.00 percent of students were pursuing B. Com, while 43.00 percent were enrolled in B. Sc programs. This balance suggests that the findings represent students from both commerce and science streams, providing a holistic view of ICT awareness and use among college students.

Table 1: Demographic profile of the students, (n=100)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	17-19 years	12	12.00
	20-22 years	63	63.00
	23-25 years	19	19.00
	26 years and above	06	06.00
Gender	Female	68	68.00
	Male	32	32.00
Year of Study	First Year	29	29.00
	Second Year	35	35.00
	Third Year	21	21.00
	Fourth Year and above	15	15.00
Course of study	B. Com	47	20.00
	B.Sc	43	43.00

Table 2: Ownership of device by the students, (n=100)

Device owned	Yes		No	
	(F)	(%)	(F)	(%)
Mobile Phones: Basic Set/ Android	97	97.00	03	3.00
Messages	100	100.00	00	0.00
Whatsapp	100	100.00	00	0.00
Facebook	27	27.00	73	73.00
Tablet	16	16.00	84	84.00
Laptop	21	21.00	79	79.00
Desktop	16	16.00	84	84.00

Table 2 depicts the ownership pattern of ICT devices among the students. The data clearly show that 97.00 percent of students owned mobile phones, which were the most widely used digital devices for accessing online content and communication. A vast majority of students reported using messaging (100.00%) and WhatsApp (100.00%) applications, signifying that smartphones are the primary medium of digital interaction and information exchange among students.

In contrast, only 27.00 percent of students had Facebook accounts, indicating a shift from traditional social media platforms to more convenient and mobile-based applications. Ownership of other devices was comparatively low i.e., 16.00 percent had tablets, 21.00 percent had laptops and 16.00 percent owned desktop computers. This suggests that although mobile access is nearly universal, access to advanced devices suitable for academic and creative work remains limited. The overall pattern highlights the growing dependence on smartphones for academic purposes due to their portability and affordability. However, the limited ownership of laptops and desktops indicates a need for institutional ICT facilities to ensure equitable access to technology for all students.

Table 3: Purpose of using tools by the students, (n=100)

Purpose of ICT Usage	Regularly f (%)	Occasionally f (%)	Never f (%)	Weighted Mean Score	Rank
Use social media like Whatsapp	80 (80.00)	14 (14.00)	2 (2.00)	2.81	I
Watch educational programmes	57 (57.00)	29 (29.00)	2 (2.00)	2.62	II
Download information	54 (54.00)	34 (34.00)	0 (0.00)	2.61	III
Chat in WhatsApp groups	53 (53.00)	20 (20.00)	8 (8.00)	2.56	IV
Watch videos and movies	42 (42.00)	27 (27.00)	3 (3.00)	2.54	V
Get doubts cleared	54 (54.00)	29 (29.00)	7 (7.00)	2.52	VI
Carry out online transactions	37 (37.00)	21 (21.00)	9 (9.00)	2.42	VII
Collect agricultural information	24 (24.00)	29 (29.00)	3 (3.00)	2.38	VIII
Prepare presentations	25 (25.00)	40 (40.00)	6 (6.00)	2.27	IX

The data presented in Table 3 indicate that a significant proportion of students actively utilize ICT tools for communication, information retrieval and academic support. Among the various purposes, the use of social media like WhatsApp recorded the highest weighted mean score (2.81), signifying that WhatsApp is the most frequently used ICT platform among students. Its widespread popularity can be attributed to its convenience, user-friendly interface and effectiveness in facilitating communication and social interaction.

The second most common purpose of ICT usage was to watch educational programmes (WMS = 2.62). This highlights the growing preference among students for digital learning through platforms such as YouTube, online lectures and educational portals. Such engagement reflects that students consider ICT an essential supplement to classroom learning, helping them strengthen their conceptual understanding and broaden their knowledge base.

The third-ranked purpose was to download information (WMS = 2.61), emphasizing the importance of ICT in enabling quick and convenient access to study materials, lecture notes and reference resources. This demonstrates that students rely on ICT tools to enhance learning efficiency, save time and support self-directed study.

Moderate levels of usage were recorded for purposes such as chatting in WhatsApp groups (2.56) and watching videos and movies (2.54). These indicate that students not only use ICT for academic collaboration and group discussions but also for recreation and relaxation. Such activities, while seemingly informal, can contribute indirectly to peer learning, communication skills and stress management.

Lower mean scores were noted for the purposes of getting doubts cleared (2.52) and carrying out online transactions (2.42). These relatively moderate levels may be due to limited online teacher-student interaction or a lack of confidence in using digital financial platforms.

The least utilized ICT purposes were collecting agricultural information (2.38) and preparing presentations (2.27). The low frequency of collecting agricultural information may be attributed to the general academic background of students, who are not from agriculture-related disciplines. Similarly, the limited use of ICT for preparing presentations could be due to a lack of familiarity with advanced presentation software or insufficient digital skill training.

Overall, the findings suggest that students predominantly use ICT for communication and information access rather than for advanced academic or professional purposes. Hence, there is a strong need to integrate ICT-based learning and digital literacy programs into academic curricula to encourage students to make more meaningful use of ICT for research, creativity and professional skill enhancement.

Table 4: Attitude of students towards ICT-based Learning, (n=100)

Sl. No.	Statement	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	Mean	SD
I	**Learning Motivation and Interest**							
1	There is a significant increase in students' desire to use ICT to learn online	4 (4.00)	7 (7.00)	14 (14.00)	59 (59.00)	16 (16.00)	3.76	1.02
2	There is a possibility to increase the desire and motivation for education using modern technologies	7 (7.00)	0 (0.00)	8 (8.00)	61 (61.00)	24 (24.00)	3.95	0.98
3	The use of ICT helps stimulate learner motivation and form new trends	6 (6.00)	10 (10.00)	26 (26.00)	47 (47.00)	11 (11.00)	3.47	0.97
4	The use of ICT helps gain experiences and increase active participation	2 (2.00)	2 (2.00)	17 (17.00)	63 (63.00)	16 (16.00)	3.89	0.76
	Mean Score	3.74						
II	**Learning Process and Participation**							
5	The use of ICT helps engage the learner's senses, leading to better understanding	2 (2.00)	17 (17.00)	29 (29.00)	35 (35.00)	17 (17.00)	3.48	1.03
6	ICT helps confront verbal errors and form sound concepts	5 (5.00)	5 (5.00)	22 (22.00)	58 (58.00)	10 (10.00)	3.63	0.92
7	ICT helps confront individual differences and modify learner behavior	2 (2.00)	4 (4.00)	26 (26.00)	52 (52.00)	16 (16.00)	3.76	0.84
8	ICT helps organize and continue ideas formed by the learner	3 (3.00)	3 (3.00)	21 (21.00)	61 (61.00)	12 (12.00)	3.76	0.81
9	ICT makes learning materials more understandable and resistant to forgetting	3 (3.00)	6 (6.00)	25 (25.00)	54 (54.00)	12 (12.00)	3.66	0.88
	Mean Score	3.80						
III	**Skill Development and Self-Learning**							
10	ICT has helped in individual learning	5 (5.00)	5 (5.00)	27 (27.00)	51 (51.00)	12 (12.00)	3.60	0.94
11	ICT provides immediate feedback on performance	3 (3.00)	6 (6.00)	23 (23.00)	55 (55.00)	13 (13.00)	3.69	0.88
12	ICT promotes student-centered learning	4 (4.00)	5 (5.00)	23 (23.00)	55 (55.00)	13 (13.00)	3.68	0.89
13	ICT encourages collaborative learning	4 (4.00)	5 (5.00)	21 (21.00)	56 (56.00)	14 (14.00)	3.71	0.90
14	ICT helps enhance problem-solving skills	5 (5.00)	7 (7.00)	24 (24.00)	50 (50.00)	14 (14.00)	3.61	0.96
	Mean Score	3.88						
IV	**Access and Independent Learning**							
15	ICT improves decision-making and analytical skills	4	7	26	50	13 (13.00)	3.61	0.92

		(4.00)	(7.00)	(26.00)	(50.00)			
16	ICT increases access to educational resources	2 (2.00)	4 (4.00)	21 (21.00)	56 (56.00)	17 (17.00)	3.82	0.82
17	ICT promotes independent learning	3 (3.00)	6 (6.00)	20 (20.00)	54 (54.00)	17 (17.00)	3.76	0.89
18	ICT helps develop communication skills	4 (4.00)	5 (5.00)	25 (25.00)	52 (52.00)	14 (14.00)	3.67	0.91
19	ICT helps in planning and organizing study activities	3 (3.00)	6 (6.00)	24 (24.00)	52 (52.00)	15 (15.00)	3.70	0.88
	Mean Score	3.76						
V	**Critical Thinking and Lifelong Learning**							
20	ICT facilitates access to online academic communities	5 (5.00)	5 (5.00)	23 (23.00)	52 (52.00)	15 (15.00)	3.67	0.93
21	ICT provides access to diverse perspectives and information	2 (2.00)	6 (6.00)	22 (22.00)	55 (55.00)	15 (15.00)	3.75	0.85
22	ICT helps in developing critical thinking	4 (4.00)	5 (5.00)	27 (27.00)	50 (50.00)	14 (14.00)	3.66	0.92
23	ICT helps in self-evaluation and monitoring progress	4 (4.00)	6 (6.00)	26 (26.00)	51 (51.00)	13 (13.00)	3.63	0.90
24	ICT promotes continuous learning beyond the classroom	3 (3.00)	5 (5.00)	25 (25.00)	54 (54.00)	13 (13.00)	3.69	0.87
	Mean Score	3.93						
VI	**Creativity and Innovation**							
25	ICT encourages lifelong learning attitude	2 (2.00)	6 (6.00)	24 (24.00)	53 (53.00)	15 (15.00)	3.73	0.86
26	ICT contributes to the development of creative skills	7 (7.00)	5 (5.00)	17 (17.00)	57 (57.00)	14 (14.00)	3.66	0.98
27	ICT provides opportunities to develop new ideas and solutions	7 (7.00)	6 (6.00)	19 (19.00)	55 (55.00)	13 (13.00)	3.61	0.99
28	ICT helps in organizing study time	5 (5.00)	6 (6.00)	18 (18.00)	55 (55.00)	16 (16.00)	3.71	0.95
29	ICT helps develop creative skills by providing new tools and resources	6 (6.00)	7 (7.00)	20 (20.00)	54 (54.00)	13 (13.00)	3.61	0.98
	Mean Score	3.70						

Table 4 presents the students' attitude towards ICT-based learning across six components: Learning Motivation and Interest, Learning Process and Participation, Skill Development and Self-Learning, Access and Independent Learning, Critical Thinking and Lifelong Learning and Creativity and Innovation.

The overall results revealed a highly positive attitude among students toward the use of ICT in education. The highest mean score (3.93) was observed under the component Critical Thinking and Lifelong Learning, indicating that students strongly agreed that ICT enhances analytical skills, access to diverse perspectives and promotes continuous learning beyond the classroom. The component Skill Development and Self-Learning (Mean = 3.88) ranked second, suggesting that students recognized ICT as an effective tool for independent learning, problem-solving and collaborative study.

The mean scores for Learning Process and Participation (3.80) and Access and Independent Learning (3.76) were also high, signifying that ICT tools encourage active participation and provide flexibility in accessing learning resources. Similarly, Learning Motivation and Interest (3.74) showed that ICT creates enthusiasm and interest among learners by making education interactive and engaging. The component Creativity and Innovation (Mean = 3.70, approx.) demonstrated that students value ICT for its potential to stimulate creative thinking and time management.

These findings indicate that the students hold a favourable attitude of ICT as a medium for effective learning. The use of technology not only improves motivation and communication but also supports students in developing higher-order thinking and problem-solving skills essential in modern education.

The data presented in Fig.1 show that a large majority of students (78.00%) demonstrated a positive attitude toward ICT-based learning, indicating their strong acceptance and enthusiasm for integrating digital tools in education. About 18.00 percent of students expressed a neutral attitude, suggesting moderate engagement and partial confidence in using ICT resources. Only 4.00 percent of students displayed a negative attitude, reflecting limited digital literacy or lack of access to technological facilities. Overall, the findings highlight that students view ICT as a beneficial medium for enhancing communication, accessing information and supporting academic learning, though targeted training and institutional support could further strengthen its effective utilization.

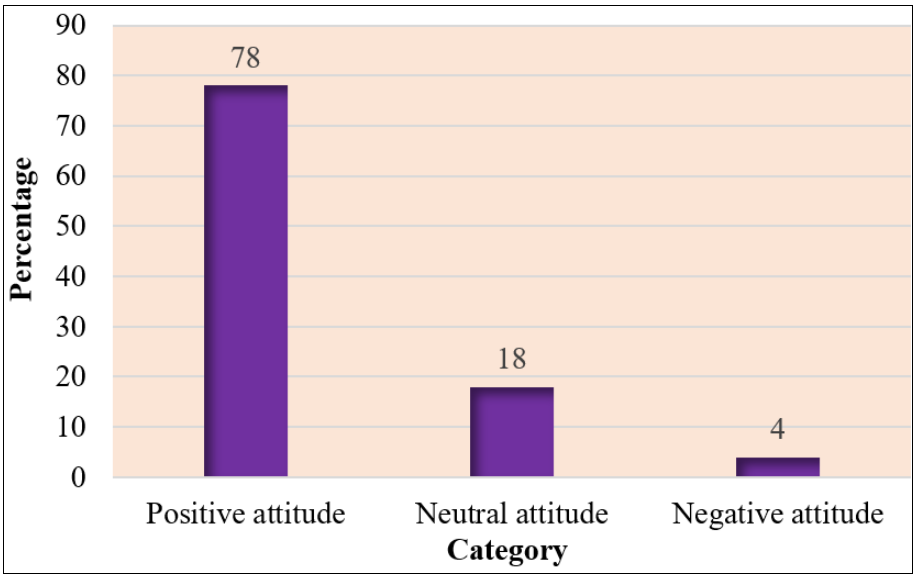

Fig 1: Categorization of Attitude toward ICT-Based Learning among Students

Table 5: Challenges and Difficulties in usage of ICT tools by the students, (n = 100)

Theme	Frequency	Percentage (%)
Connectivity issues	60	60.00
Device access issues	11	11.00
Technical knowledge gap	5	5.00
Power supply issues	1	1.00
Time management	9	9.00

Table 5 highlights the major challenges and difficulties experienced by students while using ICT tools. The most prominent issue reported by 60.00 percent of students was poor internet connectivity, which remains a critical barrier to consistent online learning, particularly in rural or semi-urban areas. This reflects the infrastructural limitations that hinder effective implementation of digital education.

Device access issues were faced by 11.00 percent of students, indicating that a portion of learners lacked personal devices such as laptops or tablets, leading to dependency on mobile phones. Limited technical knowledge (5.00%) also emerged as a concern, suggesting that some students still struggle with the operational aspects of ICT tools and require hands-on training. A smaller proportion (1.00%) cited power supply interruptions as a hindrance, while 9.00 percent mentioned time management difficulties, reflecting the challenge of balancing online and offline academic responsibilities.

Overall, the findings emphasize that while students are willing to adopt ICT, infrastructural and skill-related gaps continue to affect its optimal use. Addressing these issues through institutional support and technical training can help enhance the efficiency of ICT-based learning.

Table 6: Suggestions and Improvements in the usage of ICT tools, (n = 100)

Theme	Frequency	Percentage (%)
Better infrastructure	23	23.00
Improved connectivity	41	41.00
More training	13	13.00
Device availability	8	8.00
Digital content development	7	7.00

Table 6 summarizes the suggestions and recommendations provided by the students to enhance the use of ICT in education. The most frequently suggested improvement was better internet connectivity, mentioned by 41.00 percent of students, emphasizing the need for stable and high-speed networks for uninterrupted access to digital learning resources. Improved infrastructure, suggested by 23.00 percent, reflects the demand for well-equipped computer labs, smart classrooms and upgraded hardware to facilitate technology-integrated education.

More ICT training programs were suggested by 13.00 percent of students, highlighting the importance of building digital literacy and confidence in using technology effectively. Additionally, 8.00 percent of students called for increased availability of devices through college initiatives and 7.00 percent recommended the development of digital content in the form of e-resources, video lectures and localized learning materials.

The results clearly indicate that students recognize ICT as a transformative tool for education but seek institutional measures to improve access, reliability and capacity-building opportunities. Enhancing infrastructure, providing adequate training and ensuring inclusive access to digital devices can significantly improve the learning experience and contribute to the overall quality of higher education.

Conclusion

The study concludes that college students exhibit a positive attitude towards ICT-based learning and recognize its role in enhancing participation, critical thinking and creativity. However, poor connectivity and inadequate facilities hinder effective utilization. Strengthening infrastructure, ensuring access to reliable internet and conducting regular ICT literacy programs are essential to bridge the digital divide. Policy support and institutional initiatives can further encourage inclusive and sustainable ICT integration in education.

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