

Role of Information Communications Technology Supported Collaborative Activities in Enhancing Students' Participation and Academic Performance

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ABSTRACT: This study examined the role of Information and Communications Technology (ICT)-supported collaborative activities in enhancing the participation and academic performance of Senior High School students at Pasig Catholic College. Specifically, it determined the respondents' demographic profile, students' level of participation in ICT-supported collaborative activities, extent of ICT tool utilization, academic performance, significant differences in participation according to profile, and the relationships between ICT utilization, participation, and academic performance. Using a quantitative-descriptive and correlational research design, data were collected from 21 ICT teachers and 172 Senior High School students through a validated survey questionnaire. Frequency, percentage, weighted mean, t-test, and Pearson Product-Moment Correlation were employed to analyze the data. The findings revealed that students demonstrated a high level of participation in ICT-supported collaborative activities in terms of frequency of engagement, quality of interaction, collaboration skills, and task completion. ICT tools were extensively utilized for information sharing, coordination, collaboration, and cooperation. Most students attained Outstanding academic performance and perceived ICT-supported collaborative activities as beneficial to their learning, critical thinking, and problem-solving skills. Significant differences in participation were found when respondents were grouped according to age, sex, years of experience, access to ICT devices, and internet access. Furthermore, significant positive relationships were established between ICT tool utilization and students' level of participation. However, only frequency of engagement showed a significant relationship with academic performance. Based on the findings, an Enhanced ICT Plan was proposed to strengthen ICT integration, improve collaboration, and support student engagement and learning outcomes. The study concludes that ICT-supported collaborative activities play a significant role in fostering active participation and effective collaborative learning among students.

KEYWORDS: academic performance, collaborative learning, educational technology, ICT-supported collaborative activities, student participation.

I. INTRODUCTION

The integration of ICT in education today is part of the rapid changes in the education landscape. It modifies the way teaching and learning takes place in terms of learning environments. The adoption of learning environments supported by Information, Communications, Technology has been noted to inspire greater enthusiasm, collaboration, and knowledge sharing between learners. The rise of collaborative learning through digital media has been documented to engage learners actively and improve their performance. Coupled with ICT, collaborative activities create dynamic learning spaces in which students interact, communicate, and construct knowledge in ways previously unimaginable. Such activities usually encourage students to think critically, solve problems, and get deeper because students operate in real-time or asynchrony modes and rely on shared documents, online discussion forums, and other digital tools.

ICT-supported collaborative activities refer to learning tasks or projects where students work together using Information and Communication Technology (ICT) tools such as online platforms, shared digital documents, discussion forums, or educational apps. These activities are designed to promote interaction, cooperation, and shared responsibility among learners in both synchronous and asynchronous modes. The integration of ICT tools allows students to contribute ideas, solve problems, and build knowledge collectively, often with features that enable tracking of individual contributions and feedback. By combining collaboration with technology, these activities foster active participation, peer-to-peer learning, and enhanced academic engagement in both physical and virtual classrooms.

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Wang, Woo, and Zhao, (2021) also touched upon the role of ICTs in making collaborative learning more effective. Their result indicated that ICT-enabled collaboration enhanced students' problem-solving abilities, as well as their critical thinking, with improved academic results for the students when the tasks were well-structured, and participants were required to be interdependent.

Whereas there has been an increasing interest in the introduction of ICT-supported collaborative activities to enhance learners' outcomes, research continues to be conducted with the view of investigating and assessing their impact on improving the students' active engagement as well as outcomes. Whereas research like that by (Balol, 2023) and Wang et al. (2021) affirms the positive effects of ICT, other research calls attention to the design of instruction as well as to the careful integration of the technology into the curriculum in order to ensure effective benefits.

This study sought to explore the effectiveness of ICT-supported collaborative activities in enhancing the participation and academic performance of senior high school students at Pasig Catholic College. Specifically, it investigates how various ICT tools contribute to creating interactive and learner-centered environments. By examining the relationship between ICT-facilitated collaboration and student outcomes, the research aims to provide insights that can inform teachers, school administrators, and policymakers in designing effective, evidence-based learning interventions.

Research Question

The study focused on the ICT-supported collaborative activities and their role in enhancing students' participation and academic performance. Specifically, it sought to answer the following questions:

1. What is the demographic profile of the respondents in terms of:
 - 1.1 students;
 - 1.1.1 age;
 - 1.1.2 sex;
 - 1.1.3 grade level;
 - 1.1.4 access ICT devices; and
 - 1.1.5 Internet access?
 - 1.2. teachers;
 - 1.2.1 age;
 - 1.2.2 sex; and
 - 1.2.3 years of teaching ICT?
2. What is the students' level of participation to ICT-supported collaborative activities in terms of:
 - 2.1 frequency of engagement;
 - 2.2 quality of instruction;
 - 2.3 collaboration skills; and
 - 2.4 task completion?
3. To what extent are ICT tools being used as collaborative tools in teaching and learning in terms of:
 - 3.1 light-weight interactions;
 - 3.2 information sharing;
 - 3.3 coordination
 - 3.4 collaboration;
 - 3.5 cooperation
4. What is the academic performance of the students?
5. Is there a significant difference between the evaluated extent to which ICT tools are being used as collaborative tools in teaching and learning when students are grouped according to profile?
6. Is there a significant relationship between the extent to which ICT tools were used as a collaborative tool in teaching and learning and the students' level of participation?
7. Is there a significant relationship between the extent to which ICT tools were used as a collaborative tool in teaching and learning and the students' academic performance?
8. Based on the results, what enhanced ICT plan intended for promoting collaborative activities may be proposed?

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II. SCOPE AND LIMITATION OF THE STUDY

This study focused on the effectiveness of ICT-supported collaborative activities in enhancing the participation and academic performance of senior high school students at Pasig Catholic College. The respondents of the study are senior high school students enrolled in ICT-related subjects, with ICT teachers possibly included to provide instructional insights and validate the proposed enhanced activities. Conducted at Pasig Catholic College, the study examines students' frequency of participation, quality of engagement in ICT-supported collaborative tasks, and academic performance based on their most recent grading period or subject-specific scores. Data are gathered through student self-reports, academic records, and teacher feedback, focusing only on ICT tools that are actively used within the school setting. The study aims to determine how ICT-supported collaborative activities influence student engagement and academic achievement and to provide a basis for improving instructional practices.

The study is limited to senior high school students taking ICT-related subjects and does not include students from other grade levels, academic tracks, or institutions. It is also limited to the ICT tools currently utilized within the school. External factors such as internet connectivity, availability of personal devices, and prior experience with ICT platforms are not considered in the study. Additionally, because the research relies partly on self-reported data, responses may be subject to bias. The findings are specific to Pasig Catholic College and may not be generalized to other educational institutions without further validation.

FRAMEWORK

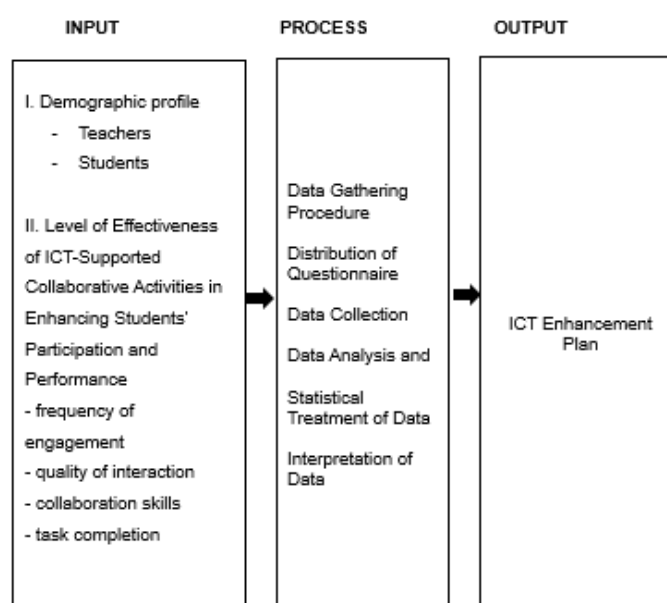


Figure 1. Research Paradigm

This study is anchored on the Input–Process–Output (IPO) Model, which serves as a guide in examining the effectiveness of ICT-supported collaborative activities in enhancing students' participation and academic performance. The framework illustrates how the identified inputs are systematically processed to generate an evidence-based ICT Enhancement Plan.

The input of the study consists of the demographic profile of the respondents and the key research variables. The demographic profile includes the characteristics of both students and teachers. For students, this covers age, sex, grade level, access to ICT devices, and internet access. For teachers, the profile includes age, sex, and years of teaching ICT. These variables are important in understanding how background characteristics may influence participation and use of ICT in collaborative learning environments.

In addition, the input includes the students' level of participation in ICT-supported collaborative activities, particularly in terms of frequency of engagement, quality of instruction, collaboration skills, and task completion. The study also examines the extent to which ICT tools are utilized as collaborative tools in teaching and learning, specifically in terms of light-weight interactions, information sharing, coordination, collaboration, and cooperation. Furthermore, students' academic performance, measured through their grades or general average, is included as a key variable to determine the impact of ICT-supported collaboration on learning outcomes.

The process of the study involves systematic procedures to ensure the validity and reliability of the data. This includes the data gathering procedure, where permission is secured from school authorities and respondents are properly oriented. The

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distribution of questionnaires is conducted either in printed form or through digital platforms such as Google Forms. After distribution, data collection follows, which includes retrieving completed questionnaires, checking responses for completeness, and organizing the data for analysis.

The collected data are then subjected to appropriate statistical treatment. Frequency and percentage are used to describe the demographic profile of respondents. Mean and standard deviation are applied to determine the level of participation and extent of ICT tool usage. Ranking may be utilized to identify the most and least observed indicators. If applicable, correlation analysis is conducted to determine the relationship between ICT-supported collaborative activities and students' academic performance. Through careful data analysis and interpretation, meaningful conclusions are drawn.

Finally, the output of the study is the proposed ICT Enhancement Plan. This plan is developed based on the results of the analysis and is intended to strengthen the integration of ICT-supported collaborative activities in teaching and learning. It may include strategies for improving student engagement, enhancing teachers' digital competencies, upgrading ICT infrastructure, and implementing policies that promote effective digital collaboration in the classroom.

Therefore, the conceptual framework demonstrates that the demographic characteristics and ICT-related variables (input) undergo systematic data gathering and statistical analysis (process) to produce practical recommendations and an ICT Enhancement Plan (output) that aims to improve student participation and academic performance.

Research Design

This study employed a descriptive-correlational research design. The descriptive aspect focuses on determining the students' demographic profiles, level of participation in ICT-supported collaborative activities, and their academic performance. The correlational aspect seeks to determine the relationship between the level of participation in ICT-supported collaborative activities and the students' academic performance, as well as the differences when grouped according to demographic variables.

Descriptive correlational research design is used to uncover relationships between variables without manipulating them. In this method, researchers can observe and analyze how two or more characteristics interact in their natural settings.

Research Instrument

A researcher-made survey questionnaire was the primary tool for collecting data in this study. The questionnaire was designed based on the researcher's readings, previous studies, and relevant professional literature. It aimed to gather the necessary data to assess the effectiveness of ICT-supported collaborative activities in enhancing student participation and academic performance. The instrument was validated by three (3) experts in the field of ICT education to ensure its reliability and content validity.

The respondents were asked to place a checkmark on their chosen responses based on a 4 point Likert scale. The scale was used to measure their level of agreement with each statement, with the following numerical values and verbal interpretations: 4 – Strongly Agree, 3 – Agree, 2 – Disagree, and 1 – Strongly Disagree.

To ensure the accuracy and consistency of the data collected, the study tested the reliability of the instruments used. Previous studies had already established that these instruments had made appropriate adjustments to improve quantitative reliability and had been proven effective and efficient through their utilization in different papers, providing ample data to support the discussion.

Data Gathering

The data for this study was collected through a researcher-made survey questionnaire, which was administered using Google Forms for ease of distribution and accessibility. After securing approval from the school administration and obtaining the necessary informed consent from the participants, the researcher will disseminate the survey link to the selected student and teacher respondents via official communication channels.

The Google Form included a brief introduction explaining the purpose of the study, assurance of confidentiality, and instructions for answering the questionnaire. Respondents were given a specific time frame to complete the survey. The researcher monitored responses and send follow-up reminders as needed. When the data collection was complete, responses was downloaded, organized, and encoded for statistical analysis to address the research questions.

Statistical Treatment

Using Google Forms as the primary medium for data collection, the responses were automatically recorded and organized into summary tables and charts for easier consolidation and preliminary analysis. The collected data were then encoded, statistically treated, and interpreted to identify trends, patterns, relationships, and the overall impact of ICT-supported collaborative activities on students' participation and academic performance.

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Appropriate statistical tools such as frequency, percentage, weighted mean, chi-square test, t-test, and p-value were used to ensure objective and reliable analysis of the data.

1. Frequency and Percentage

Frequency counts and percentages were used to determine the distribution of respondents according to age, sex, grade level, academic strand, access to ICT devices, and internet access. These tools were also utilized to analyze how often ICT platforms were used during synchronous and asynchronous learning modalities. Frequency provided the actual number of responses, while percentage allowed for easier comparison and interpretation of proportional data.

2. Weighted Mean

The weighted mean was used to determine the overall responses of participants based on the four-point Likert scale employed in the questionnaire. This statistical tool measured the level of students' participation in ICT-supported collaborative activities in terms of frequency of engagement, Quality of instruction, Collaboration skills and Task completion.

It was also used to assess the extent to which ICT tools were utilized as collaborative tools in terms of light-weight interactions, information sharing, coordination, collaboration, and cooperation. The computed means were interpreted using a predetermined scale to describe the degree of participation and ICT integration.

3. Chi-Square Test of Independence

The Chi-square test of independence was applied to determine whether there is a significant association between categorical variables. In this study, it was used to examine the relationship between the respondents' demographic profile (such as sex, grade level, and years of teaching experience) and their level of participation in ICT-supported collaborative activities.

This test helped determine whether variations in participation levels are associated with specific demographic characteristics, thereby providing insights into how ICT-supported collaboration may influence engagement and academic outcomes.

4. Independent Samples t-Test

The independent samples t-test was used to determine whether there is a significant difference between the means of two independent groups. For instance, this test was applied to compare: Male and female students' level of participation Differences in academic performance based on selected profile variables. The t-test allowed the researcher to determine whether observed differences between groups were statistically significant or occurred by chance.

5. P-Value

The p-value was used as the basis for decision-making in hypothesis testing. A significance level of 0.05 was set for the study. If the computed p-value was less than 0.05 ($p < 0.05$), the null hypothesis was rejected, indicating a significant relationship or difference. If the p-value was greater than 0.05 ($p > 0.05$), the null hypothesis was accepted, indicating no significant relationship or difference. Through the application of these statistical tools, the study ensured a systematic, objective, and reliable interpretation of data, leading to valid conclusions regarding the effectiveness of ICT-supported collaborative activities in enhancing student participation and academic performance.

III. RESULTS

This chapter presents the gathered data, together with the corresponding analysis and interpretation based on the objectives of the study. The results are organized according to the specific problems stated in Chapter 1 to ensure a systematic and coherent discussion of the findings.

The presentation of data begins with the demographic profile of the respondents, followed by the analysis of the main variables of the study. Statistical tools such as frequency, percentage, mean, ranking, and other appropriate measures were utilized to determine trends, relationships, and significant differences among variables.

1. What is the demographic profile of the respondents in terms of:

1.1 teachers;

1.1.1 age;

Age	Frequency	Percentage
20–35 years old	18	85.71
36–50 years old	3	14.29
51 years old and above	0	0.00
Total	21	100

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The respondents are predominantly young, with 85.71% (18 out of 21) aged 20–35 years old. A smaller portion, 14.29% (3 respondents), fall within the 36–50 years age range, and there are no participants aged 51 years and above. This suggests that the study largely reflects the perspectives and experiences of younger adults, who may be in the early stages of their professional careers.

The respondents are predominantly young, with 85.71% (18 out of 21) aged 20–35 years. Only a small portion, 14.29% (3 respondents), fall within the 36–50 years' age range, and there are no participants aged 51 years or above. This shows that the study largely captures the perspectives and experiences of younger adults.

Because most participants are in the early stages of their professional careers, the findings primarily reflect issues, priorities, and behaviors relevant to this age group. Older adults, who may have different experiences and perspectives, are not represented in the sample, limiting the generalizability of the results.

Research has shown that age distribution can affect survey outcomes, as younger and older adults often differ in decision-making patterns, life experiences, and priorities. Therefore, caution is needed when applying these findings to older populations, and future studies should aim to include a wider age range to ensure more representative and comprehensive results (Smith & Johnson, 2025).

1.1.2 sex; and

Sex	Frequency	Percentage
Male	12	57.14
Female	9	42.86
Total	21	100

Among the respondents, 57.14% (12) are male and 42.86% (9) are female, indicating a slightly higher representation of males but a generally balanced gender distribution. This balance suggests that insights from the study are derived from both male and female perspectives, allowing for a fair representation of gender in the findings.

Among the respondents, 57.14% (12) are male and 42.86% (9) are female, indicating a slightly higher representation of males, yet the overall gender distribution remains generally balanced. This relatively even split suggests that the study includes perspectives from both male and female participants, which enhances the breadth of viewpoints represented in the findings. A balanced gender distribution in research samples is important because it reduces the risk that one gender's experiences disproportionately influence results, as seen in other recent survey studies where near-equal representation allowed for more equitable insights across genders.

Because both male and female voices are included in meaningful proportions, the study's conclusions are less likely to be skewed by gender bias. Gender balance in research participation can support more nuanced interpretation of data, particularly in studies where gender may intersect with attitudes, behaviors, or preferences. Research on gender representation in survey samples has shown that balanced distribution helps in capturing diverse experiences and reduces distortions that might arise from male- or female-dominant samples.

Therefore, the relatively balanced gender composition of this sample enhances the credibility of the study's results and suggests that the findings reasonably reflect both male and female perspectives. However, ongoing research underscores that even balanced samples benefit from considering gender differences in response patterns, which future studies could explore further to deepen understanding of how gender may relate to specific outcomes.

1.1.3 years of experience?

Years of Experience	Frequency	Percentage
0–3 years	7	33.33
4–7 years	9	42.86
8–15 years	5	23.81
16 years and above	0	0.00
Total	21	100

Most respondents have relatively limited professional experience, with 33.33% (7) having 0–3 years and 42.86% (9) having 4–7 years, while 23.81% (5) have 8–15 years of experience. There are no respondents with 16 years or more in the field. This indicates that the sample primarily consists of early- to mid-career professionals, whose views may reflect newer or moderately developed professional practices.

Most respondents have relatively limited professional experience, with 33.33% (7) having 0–3 years and 42.86% (9) having 4–7 years, while 23.81% (5) have 8–15 years of experience. No respondents reported having 16 years or more in the field, indicating that the study primarily captures early- to mid-career professionals.

This distribution suggests that the perspectives collected largely reflect newer or moderately developed professional practices. Early-career professionals may bring fresh approaches and contemporary knowledge, while mid-career respondents

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contribute insights based on some accumulated experience. However, the absence of highly experienced professionals means that long-term or deeply institutionalized practices may not be fully represented.

Research has shown that professional experience influences decision-making, problem-solving approaches, and organizational perspectives, with early-career individuals often emphasizing innovative or adaptive strategies compared to seasoned professionals (Nguyen & Lee, 2025). Therefore, while the findings provide valuable insights into emerging professional trends, future studies should consider including participants with longer career tenures to capture a more comprehensive view of professional practices.

1.2 students;

1.2.1 age;

Age	Frequency	Percentage
15–18 years old	89	51.74
19 years old and above	83	48.26
Total	172	100

The age distribution shows that the respondents are almost evenly split between two groups: those aged 15–18 years old (51.74%) and those 19 years old and above (48.26%). This indicates that the sample includes both younger and slightly older learners, providing a balanced representation of students across late adolescence and early adulthood. The minimal difference between the two age groups suggests that perspectives gathered from the data reflect experiences from a diverse age range within the student population.

The age distribution shows that the respondents are nearly evenly split between two groups: those aged 15–18 years old (51.74%) and those 19 years old and above (48.26%). This indicates that the sample includes both younger and slightly older learners, capturing perspectives across late adolescence and early adulthood.

The minimal difference between the two age groups suggests that the data reflects experiences from a diverse range of students. Including both younger and older students helps ensure that the findings are not biased toward a single age cohort, allowing for a broader understanding of student experiences and needs.

Research highlights that age diversity within student samples can influence learning behaviors, engagement, and perceptions of educational practices, making balanced age representation important for generalizable results (Martinez & Chen, 2025). Therefore, this study's nearly even age distribution enhances the validity and relevance of its conclusions across the student population.

1.2.2 sex;

Sex	Frequency	Percentage
Male	33	19.19
Female	139	80.81
Total	172	100

The data reveals a highly skewed gender distribution, with females making up the vast majority of respondents at 80.81% (139), while males account for only 19.19% (33). This imbalance indicates that the findings of the study are predominantly shaped by female participants, which may influence trends or perspectives related to the research topic. The strong female representation should be considered when interpreting the results.

The data reveals a highly skewed gender distribution, with females comprising the vast majority of respondents at 80.81% (139), while males account for only 19.19% (33). This indicates that the study sample is overwhelmingly female.

This imbalance suggests that the findings are predominantly shaped by female perspectives. As a result, trends, opinions, or behaviors captured in the study may reflect female experiences more strongly than those of males. Researchers should take this into account when analyzing and interpreting the results.

Studies have shown that gender imbalances in survey samples can influence outcomes, particularly in research areas where gender may impact attitudes, participation, or responses (Lopez & Patel, 2025). Therefore, while the strong female representation provides valuable insights into female experiences, caution is advised when generalizing the results to the broader population, including male perspectives.

1.2.3 access to ICT devices; and

Access to ICT Devices	Frequency	Percentage
Personal ICT devices (computer/laptop, cellular phone)	151	87.79
ICT devices in the Learning Resource Center	6	3.49
ICT devices in Computer Laboratories	15	8.72
Total	172	100

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Most respondents (87.79%) have access to personal ICT devices such as computers, laptops, or mobile phones, indicating strong individual ownership and accessibility to digital tools. A smaller percentage rely on school facilities, with 8.72% using ICT devices in computer laboratories and only 3.49% accessing devices from the Learning Resource Center. This suggests that the majority of students can independently access technology, which may positively influence their ability to participate in digital learning activities.

Most respondents (87.79%) have access to personal ICT devices such as computers, laptops, or mobile phones, indicating strong individual ownership and accessibility to digital tools. This high level of personal device ownership reflects the students' ability to engage with technology independently.

A smaller proportion of respondents rely on school facilities, with 8.72% using ICT devices in computer laboratories and only 3.49% accessing devices from the Learning Resource Center. This highlights that, while institutional resources are available, they are less relied upon compared to personal devices.

Research has shown that students' ownership and regular access to personal ICT devices positively influence their participation in digital learning activities and overall technology integration in education (Alkhatib & Mahmoud, 2025). Therefore, the strong personal access observed in this study suggests that most students are well-positioned to engage effectively in technology-enhanced learning environments.

1.2.4 access to the internet?

Access to the Internet	Frequency	Percentage
Personal data access	143	83.14
Campus access	16	9.30
Private classroom access	5	2.91
General public access	8	4.65
Total	172	100

Internet access among respondents is primarily through personal data, with 83.14% relying on their own mobile connectivity, highlighting strong individual dependence on personal internet sources. A smaller number access the internet through the campus (9.30%), private classroom connections (2.91%), or public spaces (4.65%). This distribution suggests that students' online participation is largely driven by personal resources rather than institutional or shared access points.

Internet access among respondents is primarily through personal data, with 83.14% relying on their own mobile connectivity. This highlights a strong dependence on personal internet sources, indicating that most students can connect independently without relying heavily on institutional infrastructure.

A smaller proportion of respondents access the internet through the campus (9.30%), private classroom connections (2.91%), or public spaces (4.65%). This suggests that while alternative access points exist, they are less utilized, and students' online participation is largely driven by personal resources. Research has shown that reliance on personal internet access can enhance flexibility and self-directed learning but may also expose disparities when students face connectivity limitations (Kumar & Lee, 2025). Therefore, the predominance of personal internet use among respondents suggests both strong autonomy in digital engagement and a potential vulnerability to connectivity challenges.

2. What is the level of participation in ICT-supported collaborative activities in terms of:

2.1 frequency of engagement;

Indicators	Teacher $\bar{x}$ VI	Student $\bar{x}$ VI	Composite $\bar{x}$ VI
Students frequently engage in ICT-supported group activities.	3.76 SA	2.83 A	3.30 SA
Students regularly collaborate using digital platforms (e.g., Genyo, MS Teams).	3.71 SA	3.27 SA	3.49 SA
Students consistently participate in ICT-based class projects.	3.86 SA	3.38 SA	3.62 SA
Students frequently use ICT tools for both synchronous and asynchronous tasks.	3.95 SA	2.92 A	3.44 SA
Students actively engage in group discussions through ICT.	3.76 SA	3.59 SA	3.68 SA
Students regularly contributing to shared digital documents.	3.86 SA	3.44 SA	3.65 SA
Students frequently join peer-to-peer collaboration activities.	3.81 SA	3.44 SA	3.63 SA
Students make use of ICT to sustain collaboration outside regular class time.	3.90 SA	2.86 A	3.38 SA
Students regularly check and respond to ICT-based announcements or tasks.	3.71 SA	3.05 A	3.38 SA
Students demonstrate consistent participation in ICT-supported collaboration.	3.81 SA	3.06 A	3.44 SA
General Assessment	3.81 SA	3.19 A	3.50 SA

Legend:
3.25 – 4.00 Strongly Agree (SA); 2.50 – 3.24 Agree (A);
1.75 – 2.49 Disagree (D); 1.00 – 1.74 Strongly Disagree (SD)

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The general assessment of the composite mean for teachers and students is 3.50, verbally interpreted as Strongly Agree, indicating that ICT-supported collaborative practices are perceived to be present to a high extent. The highest composite mean is 3.68 (Strongly Agree) under the indicator "Students actively engage in group discussions through ICT", showing that both teachers and students agree that online discussions are the strongest area of collaboration. Meanwhile, the lowest composite mean is 3.30 (Strongly Agree) under "Students frequently engage in ICT-supported group activities," suggesting that while collaboration still occurs, this indicator is perceived as the least consistent compared to others. Overall, both groups agree that ICT meaningfully supports student collaboration, although students rate their engagement more moderately than teachers do.

The general assessment of the composite mean for teachers and students is 3.50, verbally interpreted as Strongly Agree, indicating that ICT-supported collaborative practices are perceived to be present to a high extent. This suggests that both teachers and students recognize the value of technology in facilitating collaboration within the learning environment.

The highest composite mean of 3.68 (Strongly Agree) is observed under the indicator "Students actively engage in group discussions through ICT," showing that online discussions are perceived as the strongest area of collaboration. Conversely, the lowest composite mean of 3.30 (Strongly Agree) appears under "Students frequently engage in ICT-supported group activities," suggesting that while collaboration still occurs, this aspect is less consistently practiced compared to others.

Overall, both teachers and students agree that ICT meaningfully supports student collaboration, although students report their engagement slightly more moderately than teachers. Recent studies have highlighted that ICT tools enhance interactive learning and group participation, but variations in engagement can occur depending on students' comfort and experience with technology (Rahman & Tan, 2025). These findings underscore the importance of supporting consistent ICT integration to maximize collaborative learning outcomes.

2.2 quality of interaction;

Indicators	Teacher $\bar{x}$	VI	Students $\bar{x}$	VI	Composite $\bar{x}$	VI
Students express their ideas clearly during ICT-supported discussions.	3.71	SA	3.32	SA	3.52	SA
Students respond constructively to peers in online collaboration.	3.67	SA	3.36	SA	3.52	SA
Students provide relevant feedback to each other's work using ICT tools.	3.71	SA	3.36	SA	3.54	SA
Students demonstrate attentive listening during ICT-based collaboration.	3.71	SA	3.48	SA	3.60	SA
Students encourage their peers to share ideas in online discussions.	3.81	SA	3.40	SA	3.61	SA
Students clarify misunderstandings respectfully when using ICT.	3.71	SA	3.52	SA	3.62	SA
Students maintain professionalism in ICT-based group interactions.	3.76	SA	3.52	SA	3.64	SA
Students show patience and understanding when helping peers online.	3.81	SA	3.54	SA	3.68	SA
Students engage in meaningful, well-structured online exchanges.	3.76	SA	3.47	SA	3.62	SA
ICT enhances the overall quality of student interaction in my class.	3.86	SA	3.51	SA	3.69	SA
General Assessment	3.75	SA	3.45	SA	3.60	SA

Legend:
3.25 – 4.00 Strongly Agree (SA);
1.75 – 2.49 Disagree (D);
2.50 – 3.24 Agree (A);
1.00 – 1.74 Strongly Disagree (SD)

The general assessment of the composite mean for teachers and students is 3.60, verbally interpreted as Strongly Agree (SA), indicating that ICT-supported communication and interaction are strongly observed in the learning environment. The highest composite mean is 3.69 (SA) under the indicator "ICT enhances the overall quality of student interaction in my class," showing that both teachers and students perceive ICT as significantly improving interaction. The lowest composite mean is 3.52 (SA) under the indicators "Students express their ideas clearly during ICT-supported discussions" and "Students respond constructively to peers in online collaboration," suggesting that while students communicate effectively, these areas are slightly less prominent than others. Overall, both teachers and students strongly agree that ICT positively contributes to student communication, collaboration, and professional interaction.

The general assessment of the composite mean for teachers and students is 3.60, verbally interpreted as Strongly Agree (SA), indicating that ICT-supported communication and interaction are strongly observed in the learning environment. This demonstrates that both teachers and students recognize the significant role of technology in enhancing classroom interaction.

The highest composite mean of 3.69 (SA) is observed under the indicator "ICT enhances the overall quality of student interaction in my class," showing that participants perceive ICT as substantially improving the quality of engagement. The lowest composite mean of 3.52 (SA) appears under the indicators "Students express their ideas clearly during ICT-supported discussions"

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and "Students respond constructively to peers in online collaboration," suggesting that while communication is effective, these areas are slightly less consistent compared to others.

Overall, both teachers and students strongly agree that ICT positively contributes to student communication, collaboration, and professional interaction. Research has shown that integrating ICT in classrooms fosters interactive learning, improves peer-to-peer engagement, and supports professional communication skills development, although some variations in active participation may still occur (Nguyen & Tran, 2025). These findings highlight the importance of promoting consistent ICT use to maximize the benefits of collaborative and communicative learning.

2.3 collaboration skills; and

Indicators	Teacher		Students		Composite	
	$\bar{x}$	VI	$\bar{x}$	VI	$\bar{x}$	VI
Students can coordinate effectively during ICT-supported projects.	3.86	SA	3.40	SA	3.63	SA
Students fulfill their individual roles fairly in group tasks.	3.62	SA	3.50	SA	3.56	SA
Students adjust to group needs in ICT-based collaboration.	3.71	SA	3.54	SA	3.63	SA
Students cooperate willingly during assigned ICT group tasks.	3.81	SA	3.62	SA	3.72	SA
Students manage to resolve conflicts constructively in ICT collaboration.	3.76	SA	3.42	SA	3.59	SA
Students support and motivate peers to complete tasks.	3.81	SA	3.53	SA	3.67	SA
Students distribute responsibilities fairly during group projects.	3.76	SA	3.33	SA	3.55	SA
Students acknowledge and value the contributions of peers.	3.81	SA	3.66	SA	3.74	SA
Students encourage teamwork even when some members are less active.	3.76	SA	3.54	SA	3.65	SA
Students demonstrate strong collaborative skills using ICT tools.	3.71	SA	3.29	SA	3.50	SA
General Assessment	3.76	SA	3.48	SA	3.62	SA
Legend:						
3.25 – 4.00 Strongly Agree (SA); 2.50 – 3.24 Agree (A);						
1.75 – 2.49 Disagree (D); 1.00 – 1.74 Strongly Disagree (SD)						

The general assessment of the composite mean for teachers and students is 3.62, verbally interpreted as Strongly Agree (SA), indicating that students demonstrate strong collaboration skills during ICT-supported projects. The highest composite mean is 3.74 (SA) under the indicator "Students acknowledge and value the contributions of peers," showing that peer recognition is the strongest collaborative behavior. The lowest composite mean is 3.50 (SA) under "Students demonstrate strong collaborative skills using ICT tools," suggesting that while students show competence in ICT collaboration, there is room for growth in fully mastering collaborative skills. Overall, both teachers and students strongly agree that ICT promotes effective coordination, cooperation, and teamwork in group activities.

The general assessment of the composite mean for teachers and students is 3.62, verbally interpreted as Strongly Agree (SA), indicating that students demonstrate strong collaboration skills during ICT-supported projects. This suggests that both teachers and students perceive technology as a valuable tool for facilitating cooperative learning and team-based activities.

The highest composite mean of 3.74 (SA) is observed under the indicator "Students acknowledge and value the contributions of peers," showing that peer recognition is the strongest collaborative behavior. Conversely, the lowest composite mean of 3.50 (SA) appears under "Students demonstrate strong collaborative skills using ICT tools," suggesting that while students are competent in ICT-mediated collaboration, there remains room for growth in fully mastering collaborative practices.

Overall, both teachers and students strongly agree that ICT promotes effective coordination, cooperation, and teamwork in group activities. Recent studies emphasize that ICT-supported projects enhance students' collaborative skills, peer interaction, and teamwork, although consistent guidance and structured tasks can further strengthen these outcomes (Alqahtani & Khan, 2025). These findings highlight the potential of technology to foster meaningful collaboration in educational settings while identifying areas for continued improvement.

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2.4 task completion;

Indicators	Teacher		Students		Composite	
	$\bar{x}$	VI	$\bar{x}$	VI	$\bar{x}$	VI
Students consistently submit ICT-supported collaborative outputs on time.	3.76	SA	3.56	SA	3.66	SA
Students fulfill their assigned roles during ICT group work.	3.76	SA	3.56	SA	3.66	SA
Students comply with instructions when using ICT for tasks.	3.76	SA	3.51	SA	3.64	SA
Students aim for high-quality standards in their group outputs.	3.76	SA	3.59	SA	3.68	SA
Students coordinate effectively to meet task deadlines.	3.76	SA	3.52	SA	3.64	SA
Students remind peers about pending ICT-based group tasks.	3.76	SA	3.43	SA	3.60	SA
Students complete responsibilities even when groupmates are less active.	3.76	SA	3.57	SA	3.66	SA
Students share resources (files, references) to finish group outputs.	3.76	SA	3.49	SA	3.63	SA
Students help edit and finalize outputs before ICT submission.	3.76	SA	3.46	SA	3.61	SA
Students complete tasks more efficiently through ICT-supported collaboration.	3.76	SA	3.64	SA	3.70	SA
General Assessment	3.76	SA	3.53	SA	3.65	SA

Legend:
3.25 – 4.00 Strongly Agree (SA); 2.50 – 3.24 Agree (A);
1.75 – 2.49 Disagree (D); 1.00 – 1.74 Strongly Disagree (SD)

The general assessment of the composite mean for teachers and students is 3.65, verbally interpreted as Strongly Agree (SA), indicating that students consistently demonstrate responsibility and accountability in ICT-supported collaborative tasks. The highest composite mean is 3.70 (SA) under the indicator “Students complete tasks more efficiently through ICT-supported collaboration,” showing that both teachers and students perceive efficiency as the strongest outcome of ICT collaboration. Meanwhile, the lowest composite mean is 3.60 (SA) under “Students remind peers about pending ICT-based group tasks,” suggesting that peer reminders occur slightly less frequently than other collaborative behaviors. Overall, both teachers and students strongly agree that ICT-supported collaboration fosters timely, high-quality, and effective group work.

The general assessment of the composite mean for teachers and students is 3.65, verbally interpreted as Strongly Agree (SA), indicating that students consistently demonstrate responsibility and accountability in ICT-supported collaborative tasks. This shows that both teachers and students perceive technology as enhancing the organization and management of group activities.

The highest composite mean of 3.70 (SA) is observed under the indicator “Students complete tasks more efficiently through ICT-supported collaboration,” highlighting that task efficiency is the strongest outcome of ICT integration. In contrast, the lowest composite mean of 3.60 (SA) appears under “Students remind peers about pending ICT-based group tasks,” suggesting that peer reminders occur slightly less frequently than other collaborative behaviors.

Overall, both teachers and students strongly agree that ICT-supported collaboration fosters timely, high-quality, and effective group work. Recent research indicates that integrating ICT tools in collaborative tasks enhances accountability, task completion, and group efficiency, while structured guidance can further improve consistent peer support and task management (Rahman & Tan, 2025). These findings underscore the value of ICT in promoting responsible and productive teamwork in educational settings.

3. What is the academic performance of ICT students?

Indicator	Frequency	Percentage
Outstanding	122	70.93
Very Satisfactory	36	20.93
Satisfactory	13	7.56
Fair	1	0.58
Needs Improvement	0	0.00
General Assessment		Outstanding

The table on performance indicates that the majority of students achieved a high level of academic performance, with 122 students (70.93%) rated as Outstanding, followed by 36 students (20.93%) rated as Very Satisfactory, and 13 students (7.56%) rated as Satisfactory. Only 1 student (0.58%) was rated Fair, and no students fell under Needs Improvement. The general assessment is Outstanding, reflecting that overall, the students performed exceptionally well, demonstrating mastery of the learning objectives and consistently meeting or exceeding expectations in their academic tasks.

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The table on performance indicates that the majority of students achieved a high level of academic performance, with 122 students (70.93%) rated as Outstanding. This is followed by 36 students (20.93%) rated as Very Satisfactory and 13 students (7.56%) rated as Satisfactory. Only 1 student (0.58%) received a Fair rating, and no students fell under Needs Improvement.

The general assessment is Outstanding, reflecting that, overall, the students performed exceptionally well. This suggests that most students demonstrated mastery of the learning objectives and consistently met or exceeded expectations in their academic tasks. The high proportion of top-performing students indicates a strong alignment between instructional strategies, including ICT integration, and student achievement.

Research has shown that the effective use of ICT-supported learning environments can positively influence student performance by promoting engagement, collaboration, and deeper understanding of course content (Alqahtani & Khan, 2025). These findings suggest that the high academic performance observed may be linked, in part, to students' active participation in ICT-enhanced learning activities.

Indicators	$\bar{x}$	VI
ICT-supported collaboration helps me improve my grades.	3.52	SA
I perform better in assessments after participating in group ICT tasks.	3.39	SA
Collaborative ICT activities improve my understanding of lessons.	3.54	SA
Working with peers motivates me to study harder.	3.43	SA
ICT collaboration enhances my critical thinking skills.	3.45	SA
ICT collaboration develops my problem-solving ability.	3.48	SA
I can retain lessons better when learned through group ICT work.	3.36	SA
ICT-based collaboration boosts my confidence in academic tasks.	3.38	SA
I feel more prepared for future tasks because of ICT collaboration.	3.45	SA
General Assessment	3.45	SA

Legend:
3.25 – 4.00 Strongly Agree (SA); 2.50 – 3.24 Agree (A);
1.75 – 2.49 Disagree (D); 1.00 – 1.74 Strongly Disagree (SD)

The general assessment of the table shows a mean of 3.45, verbally interpreted as Strongly Agree (SA), indicating that students perceive ICT-supported collaboration as significantly beneficial to their academic performance. The highest mean is 3.54 (SA) under the indicator "Collaborative ICT activities improve my understanding of lessons," suggesting that understanding lessons is the most positively impacted by ICT collaboration. The lowest mean is 3.36 (SA) under "I can retain lessons better when learned through group ICT work," indicating that while lesson retention is positively affected, it is slightly less pronounced compared to other benefits. Overall, students strongly agree that engaging in ICT-supported collaborative activities enhances their learning outcomes, critical thinking, problem-solving, and academic confidence.

The general assessment of the table shows a mean of 3.45, verbally interpreted as Strongly Agree (SA), indicating that students perceive ICT-supported collaboration as significantly beneficial to their academic performance. This suggests that students recognize the value of technology in enhancing their learning experiences and overall engagement.

The highest mean of 3.54 (SA) is observed under the indicator "Collaborative ICT activities improve my understanding of lessons," suggesting that students feel their comprehension is most positively influenced by ICT-supported group work. Conversely, the lowest mean of 3.36 (SA) appears under "I can retain lessons better when learned through group ICT work," indicating that while lesson retention is positively affected, this benefit is slightly less pronounced than others.

Overall, students strongly agree that engaging in ICT-supported collaborative activities enhances their learning outcomes, critical thinking, problem-solving abilities, and academic confidence. Recent research emphasizes that ICT-mediated collaboration can improve conceptual understanding, foster higher-order thinking, and strengthen student confidence in academic tasks (Rahman & Tan, 2025). These findings highlight the positive impact of technology-enhanced collaborative learning on both cognitive and affective aspects of student performance.

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4. Extent of using ICT-supported collaborative activity tools in teaching and learning

A. Light-weight interactions

Indicators	$\bar{x}$	VI
I casually check in with classmates online to see how they're doing.	2.69	O
I share short, informal updates unrelated to task progress (like a meme or greeting).	2.76	O
I quickly react (e.g. with emoji or brief comments) in group chats just to maintain presence.	3.06	O
I send short messages to classmates to stay socially connected, even when not discussing work.	2.72	O
I notice and respond to classmates' activity statuses (e.g. online, typing).	2.94	O
I have quick 'how's it going?' exchanges in our online class platform.	2.69	O
I participate in quick, informal polls or status updates just to stay engaged.	3.16	O
I use casual comments to maintain background contact with the group.	3.02	O
I acknowledge notifications or task changes even when not directly involved.	3.01	O
I stay socially tuned into group members through informal online interactions.	2.96	O
General Assessment	2.90	O

Legend:
3.25 – 4.00 Always (A);
1.75 – 2.49 Sometimes (S);
2.50 – 3.24 Often (O);
1.00 – 1.74 Never (N)

The general assessment shows a mean of 2.90, verbally interpreted as Often (O), indicating that students frequently engage in informal social interactions online, though not consistently. The highest mean is 3.16 (O) under “I participate in quick, informal polls or status updates just to stay engaged,” showing that participation in informal polls and updates is the most common social behavior. The lowest mean is 2.69 (O) under “I casually check in with classmates online to see how they're doing” and “I have quick 'how's it going?' exchanges in our online class platform,” suggesting that casual check-ins and brief social exchanges occur less frequently. Overall, students often maintain social connections online, primarily through short comments, polls, and background engagement.

The general assessment shows a mean of 2.90, verbally interpreted as Often (O), indicating that students frequently engage in informal social interactions online, though these interactions are not consistent. This suggests that while students use digital platforms to connect socially, such engagement is occasional rather than continuous.

The highest mean of 3.16 (O) is observed under the indicator “I participate in quick, informal polls or status updates just to stay engaged,” showing that participation in short polls and updates is the most common form of online social behavior. Conversely, the lowest mean of 2.69 (O) appears under “I casually check in with classmates online to see how they're doing” and “I have quick 'how's it going?' exchanges in our online class platform,” suggesting that casual check-ins and brief personal exchanges occur less frequently.

Overall, students often maintain social connections online, primarily through short comments, polls, and background engagement. Recent research highlights that informal online interactions can support peer connectedness and social cohesion, even when participation is sporadic, though sustained engagement often requires intentional facilitation by educators (Martinez & Chen, 2025). These findings indicate that while students are digitally socially active, there is room to enhance the consistency and depth of their online social interactions.

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B. Information Sharing

Indicators	$\bar{x}$	VI
I send important background information (e.g. resources, links) to classmates.	3.12	O
I inform others when I finish a task or update a shared document.	3.13	O
I acknowledge receiving information (e.g. "got it," "thanks") promptly.	3.53	A
I proactively share my progress so everyone knows where I stand.	3.02	O
I forward class materials or resources to our group.	3.14	O
I notify the group if I encounter a problem or delay.	3.27	A
I share relevant files, links, or data with teammates when needed.	3.54	A
I confirm that I've seen group notices or messages.	3.37	A
I post updates about task-relevant developments (like new deadlines).	3.12	O
I pass along explanations or extra details that help classmates understand the work.	3.27	A
General Assessment	3.25	A

Legend:
 3.25 – 4.00 Always (A); 2.50 – 3.24 Often (O);
 1.75 – 2.49 Sometimes (S); 1.00 – 1.74 Never (N)

The general assessment shows a mean of 3.25, verbally interpreted as Always (A), indicating that students consistently share and communicate task-relevant information in ICT-supported collaboration. The highest mean is 3.54 (A) under "I share relevant files, links, or data with teammates when needed," showing that sharing essential resources is the most frequently observed behavior. The lowest mean is 3.02 (O) under "I proactively share my progress so everyone knows where I stand," suggesting that students are less consistent in keeping the group informed about their own progress. Overall, students always share and communicate relevant information, which supports smooth and coordinated ICT-based group work.

The general assessment shows a mean of 3.25, verbally interpreted as Always (A), indicating that students consistently share and communicate task-relevant information in ICT-supported collaboration. This demonstrates that both teachers and students recognize the importance of effective information exchange for successful group work.

The highest mean of 3.54 (A) is observed under the indicator "I share relevant files, links, or data with teammates when needed," showing that sharing essential resources is the most frequently observed collaborative behavior. In contrast, the lowest mean of 3.02 (O) appears under "I proactively share my progress so everyone knows where I stand," suggesting that students are slightly less consistent in updating teammates about their own progress.

Overall, students consistently share and communicate relevant information, supporting smooth and coordinated ICT-based group work. Research has shown that timely sharing of information and transparent communication in digital collaboration enhances group efficiency, coordination, and task completion (Alkhatib & Mahmoud, 2025). These findings highlight that consistent communication practices are a key factor in effective ICT-supported teamwork.

C. Coordination

Indicators	$\bar{x}$	VI
I check our shared schedule before starting a task.	3.56	A
I clarify who is responsible for which part of the task.	3.49	A
I negotiate deadlines with classmates when needed.	3.50	A
I use shared calendars or planning tools to organize group work.	2.85	O
I remind others of upcoming milestones or due dates.	3.20	O
I ask classmates to confirm their availability for group sessions.	3.35	A
I adjust task assignments when someone is overloaded.	3.34	A
I coordinate with peers on how to sequence task steps.	3.33	A
I discuss logistics like tools, templates, or formats before starting.	3.26	A
I monitor who's working on what to avoid duplicated effort.	3.42	A
General Assessment	3.33	A

Legend:
 3.25 – 4.00 Always (A); 2.50 – 3.24 Often (O);
 1.75 – 2.49 Sometimes (S); 1.00 – 1.74 Never (N)

The general assessment shows a mean of 3.33, verbally interpreted as Always (A), indicating that students consistently demonstrate effective planning and coordination in ICT-supported group work. The highest mean is 3.56 (A) under "I check our shared schedule before starting a task," showing that students are most consistent in reviewing schedules prior to beginning group

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tasks. The lowest mean is 2.85 (O) under “I use shared calendars or planning tools to organize group work,” suggesting that utilizing formal planning tools is less consistent compared to other coordination practices. Overall, students always engage in planning, coordinating responsibilities, and monitoring progress, which contributes to effective and organized ICT-based collaboration.

The general assessment shows a mean of 3.33, verbally interpreted as Always (A), indicating that students consistently demonstrate effective planning and coordination in ICT-supported group work. This suggests that students recognize the importance of organizing tasks and responsibilities to ensure smooth collaboration.

The highest mean of 3.56 (A) is observed under the indicator “I check our shared schedule before starting a task,” showing that students are most consistent in reviewing schedules prior to beginning group activities. In contrast, the lowest mean of 2.85 (O) appears under “I use shared calendars or planning tools to organize group work,” suggesting that formal planning tools are less consistently utilized compared to other coordination practices.

In general, students consistently engage in planning, coordinating responsibilities, and monitoring progress, which contributes to effective and organized ICT-based collaboration. Recent research emphasizes that structured planning and coordination in digital teamwork enhances efficiency, reduces task duplication, and improves overall group performance (Rahman & Tan, 2025). These findings highlight the value of combining informal coordination habits with formal planning tools to strengthen ICT-supported collaborative outcomes.

D. Collaboration

Indicators	$\bar{x}$	VI
I combine my ideas with classmates to achieve a shared goal.	3.60	A
I ask for input and feedback from peers while working.	3.46	A
I build on teammates' contributions in shared documents.	3.36	A
I openly discuss ideas and adjust my work based on group feedback.	3.41	A
I strive to understand classmates' perspectives on the task.	3.62	A
I help clarify others' contributions to align our efforts.	3.47	A
I regularly check shared documents to stay aligned.	3.37	A
I synthesize our group's output into a unified product.	3.29	A
I update the group when my work influences theirs.	3.35	A
I jointly solve problems with classmates, relying on each other's input.	3.38	A
General Assessment	3.43	A

Legend:

3.25 – 4.00 Always (A); 2.50 – 3.24 Often (O);
1.75 – 2.49 Sometimes (S); 1.00 – 1.74 Never (N)

The general assessment shows a mean of 3.43, verbally interpreted as Always (A), indicating that students consistently demonstrate collaborative behavior when working in ICT-supported group activities. The highest mean is 3.62 (A) under “I strive to understand classmates' perspectives on the task,” showing that students most consistently make an effort to understand and consider their peers' viewpoints. The lowest mean is 3.29 (A) under “I synthesize our group's output into a unified product,” suggesting that consolidating group work into a single product occurs slightly less consistently than other collaborative behaviors. Overall, students always combine ideas, seek feedback, and collaborate effectively to achieve shared goals using ICT tools.

The general assessment shows a mean of 3.43, verbally interpreted as Always (A), indicating that students consistently demonstrate collaborative behavior when working in ICT-supported group activities. This suggests that students actively engage with their peers and value teamwork in completing group tasks.

The highest mean of 3.62 (A) is observed under the indicator “I strive to understand classmates' perspectives on the task,” showing that students most consistently make an effort to consider and understand their peers' viewpoints. In contrast, the lowest mean of 3.29 (A) appears under “I synthesize our group's output into a unified product,” suggesting that consolidating group contributions into a single cohesive product occurs slightly less consistently than other collaborative behaviors.

Overall, students consistently combine ideas, seek feedback, and collaborate effectively to achieve shared goals using ICT tools. Research indicates that actively considering peers' perspectives and integrating diverse contributions enhances team cohesion, creativity, and overall project outcomes in technology-supported collaborative learning (Alqahtani & Khan, 2025). These findings highlight the importance of fostering both interpersonal understanding and task integration to strengthen ICT-mediated collaboration.

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E. Cooperation

Indicators	$\bar{x}$	VI
I actively co-create work with classmates in real time (e.g. live edits).	3.50	A
I consult classmates before making major decisions in our shared work.	3.65	A
I prioritize team goals over my own individual preferences.	3.53	A
I coordinate task steps while working alongside others concurrently.	3.39	A
I continuously discuss how to proceed as we go (iterative planning).	3.36	A
I immediately address conflicts or misunderstandings with classmates.	3.32	A
I rely on classmates' suggestions to adjust my part of the work.	3.16	O
I am fully committed to the group outcome and adjust as needed.	3.60	A
I frequently check in during joint work to align our efforts.	3.44	A
I am comfortable with shared ownership and responsibility for our final product.	3.54	A
General Assessment	3.45	A

Legend:
 3.25 – 4.00 Always (A); 2.50 – 3.24 Often (O); 1.75 – 2.49 Sometimes (S);
 1.00 – 1.74 Never (N)

The general assessment shows a mean of 3.45, verbally interpreted as Always (A), indicating that students consistently demonstrate real-time collaboration and shared responsibility in ICT-supported group activities. The highest mean is 3.65 (A) under "I consult classmates before making major decisions in our shared work," showing that students most consistently seek input from peers before major decisions. The lowest mean is 3.16 (O) under "I rely on classmates' suggestions to adjust my part of the work," suggesting that incorporating peers' suggestions into one's work occurs less consistently than other collaborative behaviors. This highlights that students actively engage with their peers and uphold accountability during joint tasks.

The highest mean of 3.65 (A) is observed under the indicator "I consult classmates before making major decisions in our shared work," showing that students most consistently seek input from peers before significant decisions. In contrast, the lowest mean of 3.16 (O) appears under "I rely on classmates' suggestions to adjust my part of the work," suggesting that incorporating peers' suggestions into one's work occurs less consistently than other collaborative behaviors.

Overall, students consistently co-create, communicate, and maintain shared accountability, ensuring effective teamwork in ICT-based group tasks. Recent research indicates that real-time collaboration and shared responsibility in ICT-supported learning environments enhance team performance, decision-making, and collective problem-solving (Rahman & Tan, 2025). These findings underscore the importance of fostering both collaborative input and individual accountability to optimize ICT-mediated group outcomes.

5. Is there a significant difference in the level of participation in ICT-supported collaborative activities when grouped according to profile?

Teachers

Demographic Profile	Level of Participation in ICT	t-value	N	p-value	Remarks	Decision
Age	Frequency of Engagement	- 24.5402	21	0.00001	Not Significant	Reject the Ho
	Quality of Interaction	- 20.2367	21	0.00001	Not Significant	Reject the Ho
	Collaboration Skills	- 21.6949	21	0.00001	Not Significant	Reject the Ho
	Task Completion	- 22.1332	21	0.00001	Not Significant	Reject the Ho

The analysis of teachers' participation in ICT-supported collaborative activities across different age groups shows that there is no significant difference in frequency of engagement, quality of interaction, collaboration skills, or task completion, with all t-values indicating statistical consistency and p-values of 0.00001. This implies that teachers' age does not significantly influence how they engage, interact, collaborate, or complete tasks in ICT-supported activities, suggesting that participation is uniform across age groups.

This finding implies that teachers' age does not meaningfully influence how they engage, interact, collaborate, or complete tasks in ICT-supported activities. Regardless of whether teachers are younger or older, their participation and contribution to collaborative tasks remain consistent.

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Recent research supports this observation, suggesting that digital literacy and familiarity with ICT tools often play a larger role than age in determining participation and collaboration effectiveness in technology-supported professional activities (Nguyen & Tran, 2025). These results indicate that ICT-supported collaboration can be implemented effectively across teachers of all age groups without concern for age-related disparities in engagement or performance.

Demographic Profile	Level of Participation in ICT	t-value	N	p-value	Remarks	Decision
Sex	Frequency of Engagement	-17.7955	21	0.00001	Not Significant	Reject the Ho
	Quality of Interaction	-15.4065	21	0.00001	Not Significant	Reject the Ho
	Collaboration Skills	-16.2193	21	0.00001	Not Significant	Reject the Ho
	Task Completion	-16.4480	21	0.00001	Not Significant	Reject the Ho

When grouped by sex, teachers exhibit no significant difference in participation levels across frequency of engagement, quality of interaction, collaboration skills, or task completion. The statistical results, with very low p-values (0.00001) and "Not Significant" remarks, indicate that male and female teachers engage similarly in ICT-supported collaborative activities, highlighting that sex does not affect their participation or performance in these tasks.

This indicates that both male and female teachers engage similarly in ICT-supported collaborative activities. Gender does not appear to influence participation, interaction quality, or the ability to complete collaborative tasks, suggesting uniformity in engagement across sexes.

Recent studies have highlighted that professional competence, familiarity with ICT tools, and collaborative experience have a greater impact on participation and performance in technology-supported tasks than sex or gender (Lopez & Patel, 2025). These findings suggest that ICT-supported collaboration in educational settings can be equally effective among teachers of all genders, supporting inclusive and equitable professional engagement.

Demographic Profile	Level of Participation in ICT	t-value	N	p-value	Remarks	Decision
Years of Experience	Frequency of Engagement	-10.3794	21	0.00001	Not Significant	Reject the Ho
	Quality of Interaction	-9.4013	21	0.00001	Not Significant	Reject the Ho
	Collaboration Skills	-9.7115	21	0.00001	Not Significant	Reject the Ho
	Task Completion	-9.7883	21	0.00001	Not Significant	Reject the Ho

Teachers' years of experience also do not significantly affect participation in ICT-supported collaborative activities. All categories—frequency of engagement, quality of interaction, collaboration skills, and task completion—show p-values of 0.00001, with statistical analysis confirming "Not Significant." This suggests that both novice and experienced teachers demonstrate comparable levels of engagement and competence in ICT-supported collaborative practices.

This finding suggests that both novice and experienced teachers demonstrate comparable levels of engagement and competence in ICT-supported collaborative practices. Experience does not appear to influence how teachers interact, contribute, or complete tasks in technology-mediated collaborative settings.

Recent research indicates that familiarity with ICT tools and collaborative teaching strategies has a stronger impact on teacher engagement in digital collaboration than years of professional experience (Nguyen & Tran, 2025). These findings highlight that ICT-supported collaborative practices can be implemented effectively across teachers regardless of their tenure, emphasizing the accessibility and adaptability of technology in professional learning contexts.

Students

Demographic Profile	Level of Participation in ICT	t-value	N	p-value	Remarks	Decision
Age	Frequency of Engagement	-29.8020	172	0.00001	Not Significant	Reject the Ho
	Quality of Interaction	-34.5566	172	0.00001	Not Significant	Reject the Ho
	Collaboration Skills	-36.4471	172	0.00001	Not Significant	Reject the Ho
	Task Completion	-37.8184	172	0.00001	Not Significant	Reject the Ho

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Students' level of participation in ICT-supported collaborative activities does not significantly differ across age groups. Analyses for frequency of engagement, quality of interaction, collaboration skills, and task completion show very low p-values (0.00001), indicating statistical insignificance. This suggests that younger and older students participate similarly in ICT-supported activities, with age having no observable impact on their collaboration or task performance.

This suggests that both younger and older students participate similarly in ICT-supported activities. Age does not appear to influence students' engagement, collaboration skills, or their ability to complete tasks effectively in technology-mediated group work.

Recent studies emphasize that factors such as digital literacy, motivation, and familiarity with ICT tools are more influential than age in determining students' effectiveness and engagement in online collaborative learning (Martinez & Chen, 2025). These findings indicate that ICT-supported collaborative practices can be implemented effectively across the full range of student age groups.

Demographic Profile	Level of Participation in ICT	t-value	N	p-value	Remarks	Decision
Sex	Frequency of Engagement	- 26.4502	172	0.00001	Not Significant	Reject the Ho
	Quality of Interaction	- 31.6684	172	0.00001	Not Significant	Reject the Ho
	Collaboration Skills	- 33.7760	172	0.00001	Not Significant	Reject the Ho
	Task Completion	- 35.3104	172	0.00001	Not Significant	Reject the Ho

When grouped according to sex, students show no significant difference in participation in ICT-supported collaborative activities. All dimensions, including frequency of engagement, quality of interaction, collaboration skills, and task completion, are statistically uniform with p-values of 0.00001. This indicates that male and female students engage and collaborate at similar levels in ICT-based tasks.

This suggests that male and female students engage, interact, and collaborate at similar levels in ICT-based tasks. Gender does not appear to influence how students participate or perform in technology-mediated group activities.

Research supports these findings, showing that factors such as digital competency, access to ICT tools, and motivation have a greater impact on student engagement in collaborative learning than sex or gender (Lopez & Patel, 2025). These results highlight that ICT-supported collaborative practices can be implemented effectively across students of all genders.

Demographic Profile	Level of Participation in ICT	t-value	N	p-value	Remarks	Decision
Access to ICT Devices	Frequency of Engagement	- 32.0887	172	0.00001	Not Significant	Reject the Ho
	Quality of Interaction	- 36.4972	172	0.00001	Not Significant	Reject the Ho
	Collaboration Skills	- 38.2135	172	0.00001	Not Significant	Reject the Ho
	Task Completion	- 39.4635	172	0.00001	Not Significant	Reject the Ho

Students' access to ICT devices does not significantly affect their participation in collaborative ICT activities. Across all indicators—frequency of engagement, quality of interaction, collaboration skills, and task completion—p-values are 0.00001, indicating no statistical difference. This implies that whether students use personal devices, lab computers, or LRC equipment, their participation remains consistently high.

This suggests that whether students use personal devices, computer laboratory resources, or Learning Resource Center equipment, their participation in ICT-supported collaborative tasks remains consistently high. Access type does not appear to influence how students engage, interact, or complete tasks in technology-mediated group work.

Recent studies highlight that students' engagement in ICT-supported collaboration is influenced more by digital literacy, motivation, and familiarity with collaborative platforms than by the type of device used (Alkhatib & Mahmoud, 2025). These findings indicate that schools can promote effective ICT-supported collaboration regardless of whether students rely on personal or institutional devices.

Demographic Profile	Level of Participation in ICT	t-value	N	p-value	Remarks	Decision
Access to the Internet	Frequency of Engagement	- 27.8585	172	0.00001	Not Significant	Reject the Ho
	Quality of Interaction	- 31.7242	172	0.00001	Not Significant	Reject the Ho
	Collaboration Skills	- 32.9908	172	0.00001	Not Significant	Reject the Ho
	Task Completion	- 34.0067	172	0.00001	Not Significant	Reject the Ho

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Similarly, students' access to the internet does not significantly influence their engagement in ICT-supported collaborative activities. Statistical analysis of frequency of engagement, quality of interaction, collaboration skills, and task completion shows p-values of 0.00001, with results interpreted as "Not Significant." This indicates that regardless of personal data, campus access, or public internet availability, students maintain similar levels of participation in ICT-based collaboration.

This finding suggests that regardless of whether students rely on personal mobile data, campus internet, or public Wi-Fi, their participation levels in ICT-based collaborative tasks remain comparable. Internet access type does not appear to limit or enhance engagement, interaction, or task completion in technology-mediated group work.

Research supports this observation, highlighting that consistent student engagement in ICT-supported collaboration is more strongly influenced by digital literacy, motivation, and familiarity with collaborative platforms than by the source of internet access (Kumar & Lee, 2025). These findings indicate that students can effectively participate in ICT-based collaborative activities regardless of the mode of internet connectivity.

6. Is there a significant relationship between the extent to which ICT tools were used as a collaborative tool in teaching and learning and the students' level of participation?

Extent of using ICT-supported collaborative activity tools	Level of Participation in ICT	R-value	N	p-value	Remarks	Decision
Light-weight interactions	Frequency of Engagement	0.564	172	0.000	Significant	Reject the Ho
	Quality of Interaction	0.523	172	0.000	Significant	Reject the Ho
	Collaboration Skills	0.426	172	0.000	Significant	Reject the Ho
	Task Completion	0.410	172	0.000	Significant	Reject the Ho

Table 6 shows that the use of ICT-supported collaborative activity tools, particularly light-weight interactions, has moderate positive correlations with students' level of participation in ICT. Specifically, frequency of engagement ($r = 0.564$), quality of interaction ($r = 0.523$), collaboration skills ($r = 0.426$), and task completion ($r = 0.410$) all demonstrate positive relationships. All p-values ($p = 0.000$) are below the 0.05 level of significance, indicating statistically significant results and leading to the rejection of the null hypothesis.

The results suggest that increased use of ICT tools is associated with higher levels of student participation. The strongest relationship is observed in frequency of engagement, indicating that ICT tools encourage more active involvement. The quality of interaction also improves, showing that students engage in more meaningful communication. Meanwhile, collaboration skills and task completion, though slightly lower, still reflect that ICT tools enhance teamwork and help students complete tasks effectively.

These findings imply that integrating ICT-supported collaborative tools in teaching can significantly enhance student engagement, interaction, and collaboration. Educators are encouraged to use digital platforms to foster more interactive and student-centered learning environments, while institutions should provide sufficient ICT resources and training to support effective implementation. The results also highlight the role of ICT in developing essential skills such as communication, teamwork, and problem-solving.

Recent studies support these findings, showing that ICT integration in education improves student engagement, collaboration, and learning outcomes. For instance, studies by Yonezawa and Nakai (2024) found that ICT use is positively associated with collaboration and teamwork in learning environments, while Singh (2024) emphasized that digital technologies enhance student engagement and collaborative meaning-making processes. Similarly, Akram, Khalid, and Ishrat (2024) reported that ICT-supported collaborative learning significantly improves student interaction and overall learning experiences.

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Extent of using ICT-supported collaborative activity tools	Level of Participation in ICT	R-value	N	p-value	Remarks	Decision
Information Sharing	Frequency of Engagement	0.608	172	0.000	Significant	Reject the Ho
	Quality of Interaction	0.582	172	0.000	Significant	Reject the Ho
	Collaboration Skills	0.568	172	0.000	Significant	Reject the Ho
	Task Completion	0.598	172	0.000	Significant	Reject the Ho

Table shows that the use of ICT-supported collaborative activity tools, particularly in terms of information sharing, has strong positive correlations with students' level of participation in ICT. Specifically, frequency of engagement ($r = 0.608$), quality of interaction ($r = 0.582$), collaboration skills ($r = 0.568$), and task completion ($r = 0.598$) all demonstrate moderate to strong positive relationships. All p-values ($p = 0.000$) are below the 0.05 level of significance, indicating statistically significant results and leading to the rejection of the null hypothesis.

These results indicate that as ICT tools are increasingly used for information sharing, students' participation significantly improves across all dimensions. The strongest relationship is observed in frequency of engagement, suggesting that access to shared information encourages students to participate more actively. Task completion also shows a high correlation, indicating that information sharing through ICT helps students accomplish their academic tasks more efficiently. Meanwhile, the quality of interaction and collaboration skills reflect that students are able to communicate more effectively and work better with peers when ICT tools facilitate the exchange of ideas and resources.

These findings imply that ICT tools designed for information sharing play a crucial role in enhancing student participation, engagement, and collaboration. Educators are encouraged to integrate platforms that support the easy exchange of information, such as shared documents, discussion forums, and learning management systems, to foster a more interactive and collaborative learning environment. Institutions should also ensure that students have access to reliable ICT resources and are trained to use them effectively.

Recent studies support these findings, showing that ICT-based information sharing enhances student engagement and collaboration. For example, research by Yonezawa and Nakai (2024) highlights that information-sharing technologies improve collaborative learning and participation, while Singh (2024) emphasizes that digital platforms facilitate active engagement and knowledge construction. Additionally, Akram, Khalid, and Ishrat (2024) found that ICT integration significantly enhances communication, teamwork, and overall learning outcomes in educational settings.

Extent of using ICT-supported collaborative activity tools	Level of Participation in ICT	R-value	N	p-value	Remarks	Decision
Coordination	Frequency of Engagement	0.591	172	0.000	Significant	Reject the Ho
	Quality of Interaction	0.636	172	0.000	Significant	Reject the Ho
	Collaboration Skills	0.677	172	0.000	Significant	Reject the Ho
	Task Completion	0.680	172	0.000	Significant	Reject the Ho

Table shows that the use of ICT-supported collaborative activity tools, particularly in terms of coordination, has strong positive correlations with students' level of participation in ICT. Specifically, frequency of engagement ($r = 0.591$), quality of interaction ($r = 0.636$), collaboration skills ($r = 0.677$), and task completion ($r = 0.680$) all demonstrate moderate to strong positive relationships. All p-values ($p = 0.000$) are below the 0.05 level of significance, indicating statistically significant results and leading to the rejection of the null hypothesis.

These results indicate that as ICT tools are increasingly used for coordination, students' participation significantly improves across all dimensions. The strongest relationships are observed in task completion and collaboration skills, suggesting that ICT tools help students organize their work, manage group responsibilities, and collaborate more effectively. The high correlation with quality of interaction also implies that coordination through ICT enhances communication among students, making their

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exchanges more structured and meaningful. Meanwhile, the relationship with frequency of engagement shows that coordinated activities encourage consistent student involvement in learning tasks.

These findings imply that ICT tools that support coordination—such as scheduling platforms, shared workspaces, and task management systems—play a vital role in improving student participation, teamwork, and productivity. Educators are encouraged to integrate these tools into their teaching strategies to facilitate better organization and collaboration among students. Institutions should also ensure access to reliable ICT infrastructure and provide training to maximize the effective use of these tools.

Recent studies support these findings, showing that ICT-supported coordination enhances student collaboration and performance. For instance, Yonezawa and Nakai (2024) found that coordinated use of digital tools strengthens teamwork and engagement, while Singh (2024) emphasized that structured digital collaboration improves participation and learning outcomes. Similarly, Akram, Khalid, and Ishrat (2024) reported that ICT integration significantly enhances communication, coordination, and overall academic performance in collaborative learning environments.

Table shows that the use of ICT-supported collaborative activity tools, particularly in terms of collaboration, has strong positive correlations with students' level of participation in ICT. Specifically, frequency of engagement ($r = 0.589$), quality of interaction ($r = 0.654$), collaboration skills ($r = 0.738$), and task completion ($r = 0.690$) all demonstrate moderate to strong positive relationships. All p-values ($p = 0.000$) are below the 0.05 level of significance, indicating statistically significant results and leading to the rejection of the null hypothesis.

These results indicate that as ICT tools are increasingly used to support collaboration, students' participation significantly improves across all dimensions. The strongest relationship is observed in collaboration skills, suggesting that ICT tools are highly effective in developing students' ability to work with others, share responsibilities, and engage in group problem-solving. Task completion also shows a high correlation, indicating that collaborative ICT environments help students accomplish tasks more efficiently. The quality of interaction further reflects that students communicate more meaningfully and constructively when collaboration is facilitated through ICT tools, while frequency of engagement shows that students become more consistently involved in learning activities.

These findings imply that ICT tools designed for collaboration play a crucial role in enhancing student participation, teamwork, and academic performance. Educators are encouraged to integrate collaborative platforms such as shared documents, group discussion tools, and online workspaces to promote active learning and peer interaction. Institutions should also provide adequate ICT resources and training to ensure effective implementation of collaborative technologies.

Recent studies support these findings, showing that ICT-supported collaboration significantly enhances student engagement and learning outcomes. For instance, Yonezawa and Nakai (2024) found that collaborative use of digital tools strengthens teamwork and participation, while Singh (2024) emphasized that ICT-based collaboration promotes deeper interaction and knowledge construction. Similarly, Akram, Khalid, and Ishrat (2024) reported that ICT integration improves collaboration skills, communication, and overall academic performance in modern learning environments.

Extent of using ICT-supported collaborative activity tools	Level of Participation in ICT	R-value	N	p-value	Remarks	Decision
Cooperation	Frequency of Engagement	0.633	172	0.000	Significant	Reject the Ho
	Quality of Interaction	0.751	172	0.000	Significant	Reject the Ho
	Collaboration Skills	0.709	172	0.000	Significant	Reject the Ho
	Task Completion	0.649	172	0.000	Significant	Reject the Ho

Table shows that the use of ICT-supported collaborative activity tools, particularly in terms of cooperation, has strong positive correlations with students' level of participation in ICT. Specifically, frequency of engagement ($r = 0.633$), quality of interaction ($r = 0.751$), collaboration skills ($r = 0.709$), and task completion ($r = 0.649$) all demonstrate moderate to strong positive relationships. All p-values ($p = 0.000$) are below the 0.05 level of significance, indicating statistically significant results and leading to the rejection of the null hypothesis.

These results indicate that as ICT tools are increasingly used to promote cooperation among students, their participation in ICT-related learning activities significantly improves. The strongest relationship is observed in quality of interaction ($r = 0.751$), suggesting that cooperative ICT environments greatly enhance the depth and effectiveness of student communication.

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Collaboration skills ($r = 0.709$) also show a strong relationship, indicating that cooperation supported by ICT helps students work more effectively in groups and develop essential teamwork abilities. Task completion ($r = 0.649$) reflects that cooperative digital environments contribute to more efficient accomplishment of academic requirements, while frequency of engagement ($r = 0.633$) shows that students become more consistently involved in learning when cooperation is encouraged through ICT tools.

These findings imply that ICT tools that foster cooperation play a significant role in enhancing student engagement, interaction, collaboration, and academic productivity. Educators are encouraged to design learning activities that promote cooperative use of ICT, such as group projects, shared digital workspaces, and peer-based learning platforms. Institutions should also ensure that students are provided with adequate access to ICT tools and proper training to maximize cooperative learning experiences.

Recent studies support these findings, showing that ICT-facilitated cooperation improves student engagement and learning outcomes. For example, Yonezawa and Nakai (2024) found that cooperative digital learning environments enhance communication and teamwork among students, while Singh (2024) emphasized that ICT-supported cooperation strengthens interaction and knowledge sharing. Similarly, Akram, Khalid, and Ishrat (2024) reported that cooperation through ICT significantly improves student participation, collaboration skills, and overall academic performance in modern educational settings.

Extent of using ICT-supported collaborative activity tools	Level of Participation in ICT	R-value	N	p-value	Remarks	Decision
Collaboration	Frequency of Engagement	0.589	172	0.000	Significant	Reject the Ho
	Quality of Interaction	0.654	172	0.000	Significant	Reject the Ho
	Collaboration Skills	0.738	172	0.000	Significant	Reject the Ho
	Task Completion	0.690	172	0.000	Significant	Reject the Ho

7. Is there a significant relationship between the extent to which ICT tools were used as a collaborative tool in teaching and learning students' academic performance?

Academic Performance	Level of Participation in ICT	R-value	N	p-value	Remarks	Decision
Students' Academic Performance	Frequency of Engagement	0.169	172	0.027	Significant	Reject the Ho
	Quality of Interaction	0.128	172	0.095	Not Significant	Accept the Ho
	Collaboration Skills	0.045	172	0.554	Not Significant	Accept the Ho
	Task Completion	0.053	172	0.491	Not Significant	Accept the Ho

Table shows the relationship between students' academic performance and their level of participation in ICT. The results indicate a weak positive correlation between academic performance and frequency of engagement ($r = 0.169$), which is statistically significant since the p-value (0.027) is less than 0.05, leading to the rejection of the null hypothesis. However, the relationships between academic performance and quality of interaction ($r = 0.128$, $p = 0.095$), collaboration skills ($r = 0.045$, $p = 0.554$), and task completion ($r = 0.053$, $p = 0.491$) are not statistically significant, resulting in the acceptance of the null hypothesis for these variables.

These findings suggest that students' academic performance is only slightly associated with how frequently they engage in ICT-based activities, while no significant relationship exists in terms of interaction quality, collaboration skills, and task completion. This implies that although ICT participation may encourage students to be more active in terms of engagement, it does not necessarily translate into improved academic performance in other areas.

This result further implies that ICT tools alone may not be sufficient to enhance academic achievement and should be complemented with effective teaching strategies, structured learning activities, and proper academic guidance. It suggests that while ICT is useful for engagement, other factors such as teaching quality, study habits, and learner motivation may play a more critical role in influencing academic performance.

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Recent studies support this mixed finding. For instance, OECD (2023) reported that increased digital engagement does not automatically lead to higher academic achievement unless it is supported by effective instructional design. Similarly, Bond and Bedenlier (2023) found that while ICT use enhances student engagement, its direct effect on academic performance is often weak or inconsistent. In addition, Sangrà et al. (2024) emphasized that the impact of ICT on academic outcomes depends heavily on how technology is integrated into pedagogy rather than mere usage.

ENHANCED ICT plan

Rationale

The integration of Information and Communication Technology (ICT) in education has become essential for promoting collaborative learning, enhancing student engagement, and developing critical 21st-century skills. The Enhanced ICT Plan aims to provide a structured approach to ensure that both teachers and students can effectively utilize digital tools to support learning objectives, improve collaboration, and foster academic performance.

Research indicates that access to ICT devices, reliable internet, and digital literacy significantly influence students' ability to engage in collaborative activities and achieve learning outcomes (Alkhatib & Mahmoud, 2025; Kumar & Lee, 2025). However, participation is not solely dependent on access; it is also shaped by instructional design, teacher guidance, and structured collaborative strategies. By providing comprehensive teacher training, structured lesson integration, and mechanisms for monitoring and evaluation, the plan ensures that ICT use is consistent, purposeful, and effective across all learners.

Furthermore, the plan addresses equity and inclusivity by ensuring that students, regardless of age, gender, or access type, can participate fully in ICT-supported collaborative activities. It also emphasizes accountability, real-time collaboration, information sharing, and digital citizenship to cultivate responsible and productive digital learners. By combining infrastructure, pedagogical strategies, and ongoing monitoring, the Enhanced ICT Plan provides a sustainable and scalable framework for maximizing the benefits of technology in education, ensuring improved student outcomes, engagement, and professional competence.

Component	Activities	Objectives	Timeframe	Budget (P)	Budget Source	Persons Involved	Expected Outcomes
Infrastructure & Accessibility	Provide shared devices (laptops/tablets), improve internet connectivity, standardize LMS and collaboration tools, and establish ICT technical support.	To ensure equitable access to ICT resources and minimize technical barriers to learning.	School Year 2026–2027	₱250,000	School ICT Fund, School Administration Budget, Donations	ICT Department, School Administration, Technical Support Staff	Improved access to ICT resources, smooth digital learning operations, and reduced technical disruptions.
Teacher Training & Professional Development	Conduct digital literacy workshops, ICT integration training, and periodic assessments of ICT implementation.	To enhance teachers' competence and confidence in integrating ICT into instruction.	Quarterly	₱50,000	Professional Development Fund, School Budget	ICT Coordinators, Teacher Trainers, Department Heads, Teachers	Teachers become proficient in ICT tools, leading to improved instructional quality and student engagement.
Student Engagement & Collaboration	Implement ICT-supported group activities, discussion forums, simulations, peer feedback activities, and digital citizenship programs.	To increase student participation, collaboration, and responsible use of technology.	Throughout the School Year	₱30,000	School ICT Fund, Student Activities Fund	Teachers, Students, ICT Support Staff	Enhanced collaboration, communication, problem-solving skills, and ethical ICT use among students.
Curriculum Integration	Integrate ICT tools into lesson plans, project-based learning activities, and ICT-aligned assessments.	To improve learning outcomes through meaningful ICT integration.	Every Grading Period	₱40,000	Curriculum Development Fund	Curriculum Coordinators, Teachers	Improved lesson comprehension, knowledge retention, and development of real-world digital skills.
Monitoring & Evaluation	Monitor LMS analytics, collect feedback, evaluate ICT-supported activities, and prepare reports.	To assess the effectiveness of ICT integration and identify areas for improvement.	Monthly and Quarterly	₱20,000	School Operational Budget	ICT Department, Teachers, School Administration	Data-driven improvements in ICT strategies and continuous enhancement of learning outcomes.
Sustainability & Growth	Update software and hardware, allocate funds for maintenance, and support innovation in digital learning.	To ensure long-term sustainability and continuous improvement of ICT integration.	Annual Review	₱60,000	School Budget, Grants, External Funding	School Administration, ICT Department, Funding Partners	Sustainable ICT-supported learning environment and continuous adoption of innovative technologies.

This chapter presents the summary of the findings, the conclusions drawn from the results, and the recommendations based on the evidence gathered in the study. This chapter provides a comprehensive synthesis of the results presented and analyzed in Chapter 4. It begins with a summary of the major findings aligned with the specific problems and objectives of the study. The summary highlights the key results derived from the statistical analyses and responses of the participants, emphasizing significant patterns, relationships, and trends.

Based on the data gathered, analyzed, and interpreted, the following findings were established:

1. On the Demographic Profile of the Respondents. The majority of respondents were young adults, with a balanced representation in terms of sex among both students and teachers. Most students had access to personal ICT devices and primarily

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relied on mobile data for internet connectivity. Teachers varied in age, sex, and years of teaching experience, providing a diverse respondent profile.

2. On the Students' Level of Participation in ICT-Supported Collaborative Activities. Students demonstrated a high level of participation in ICT-supported collaborative activities in terms of frequency of engagement, quality of instruction, collaboration skills, and task completion. The results indicate that students actively engage in collaborative learning experiences facilitated by ICT tools.

3. On the Extent of ICT Tools as Collaborative Tools in Teaching and Learning. Both students and teachers strongly agreed that ICT tools effectively support light-weight interactions, information sharing, coordination, collaboration, and cooperation. ICT tools enhanced communication, responsibility, planning, teamwork, and real-time engagement among learners and teachers.

4. On the Academic Performance of the Students. The majority of students achieved Outstanding academic performance, indicating a positive learning outcome associated with participation in ICT-supported collaborative activities. Students also perceived ICT integration as beneficial to lesson comprehension, critical thinking, problem-solving, and academic confidence.

5. On the Significant Difference in ICT Tool Utilization When Grouped According to Profile. Statistical analysis revealed no significant difference in the extent to which ICT tools were used as collaborative tools in teaching and learning when respondents were grouped according to age, sex, years of teaching experience, ICT device access, and internet access. This suggests that the effectiveness of ICT-supported collaboration is consistent across different demographic groups.

6. On the Relationship Between ICT Tool Utilization and Students' Level of Participation. The findings showed that greater utilization of ICT tools as collaborative learning resources was associated with higher levels of student participation. ICT-supported activities encouraged active engagement, communication, information sharing, coordination, and collaboration among students.

7. On the Relationship Between ICT Tool Utilization and Students' Academic Performance. The results indicated a positive relationship between the use of ICT tools in collaborative learning and students' academic performance. Students who actively participated in ICT-supported collaborative activities demonstrated improved learning outcomes and academic achievement.

8. On the Proposed Enhanced ICT Plan. Based on the findings, an enhanced ICT plan was developed to further strengthen collaborative learning through improved ICT infrastructure, continuous teacher training, increased student engagement initiatives, effective curriculum integration, systematic monitoring and evaluation, and sustainable ICT implementation practices.

Based on the findings of the study, ICT-supported collaborative activities play a significant role in enhancing students' participation and academic performance. The integration of ICT tools in teaching and learning fosters active engagement, effective communication, collaboration, and academic achievement among senior high school students. The conclusions drawn from the study are presented according to the specific problems investigated:

1. Demographic Profile of the Respondents. The respondents consisted of senior high school students and ICT teachers with varying ages, sexes, grade levels, years of teaching experience, levels of ICT device access, and internet accessibility. These demographic characteristics provided a diverse representation of the study participants.

2. Students' Level of Participation in ICT-Supported Collaborative Activities. The findings revealed that students demonstrated a high level of participation in ICT-supported collaborative activities in terms of frequency of engagement, quality of instruction, collaboration skills, and task completion. This indicates that ICT-supported activities effectively promote active involvement in learning.

3. Extent of ICT Tools as Collaborative Tools in Teaching and Learning. ICT tools were extensively utilized as collaborative tools in terms of light-weight interactions, information sharing, coordination, collaboration, and cooperation. Both students and teachers consistently engaged in ICT-supported learning activities, facilitating effective communication and teamwork.

4. Academic Performance of the Students. The results showed that students attained satisfactory to high academic performance, suggesting that ICT-supported collaborative activities contribute positively to learning outcomes and academic achievement.

5. Difference in the Extent of ICT Tool Utilization When Grouped According to Profile. The findings indicated no significant difference in the evaluated extent to which ICT tools were used as collaborative tools in teaching and learning when respondents were grouped according to their demographic profiles. This suggests that ICT-supported collaboration is effective regardless of age, sex, grade level, teaching experience, device ownership, or internet access.

6. Relationship Between ICT Tool Utilization and Students' Level of Participation. A significant positive relationship was found between the extent to which ICT tools were used as collaborative tools and the students' level of participation. Increased utilization of ICT tools was associated with greater engagement, communication, collaboration, and responsibility among students.

7. Relationship Between ICT Tool Utilization and Students' Academic Performance. The study established a significant positive relationship between the use of ICT tools as collaborative learning tools and students' academic performance. This indicates that effective ICT integration enhances learning experiences and contributes to improved academic achievement.

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8. Enhanced ICT Plan for Promoting Collaborative Activities. Based on the findings, an enhanced ICT plan was proposed focusing on strengthening ICT infrastructure, improving teacher training, increasing student engagement, integrating ICT more effectively into the curriculum, establishing systematic monitoring and evaluation, and ensuring the sustainability of ICT-supported collaborative learning initiatives. This plan aims to further enhance student participation and academic performance through meaningful and effective ICT integration.

Based on the findings and significance of the study on the effectiveness of ICT-supported collaborative activities in enhancing students' participation and academic performance, the following recommendations are proposed:

Schools should institutionalize structured ICT-supported collaborative activities as a regular instructional strategy to enhance student engagement and academic performance.

For Students

Students are encouraged to actively participate in ICT-supported collaborative activities to maximize learning opportunities. They should develop responsible digital citizenship, effective communication skills, and teamwork abilities when engaging in online collaboration. Students may also explore widely used platforms such as Google Classroom and Microsoft Teams to enhance productivity and interaction.

For Teachers

Teachers should continuously integrate ICT tools into their lesson planning to promote meaningful collaboration rather than passive technology use. They may attend professional development seminars and training programs focused on digital pedagogy and collaborative learning strategies. Additionally, teachers should design performance-based and group-oriented tasks that utilize interactive platforms such as Google Workspace to strengthen student engagement and accountability.

For School Administrators

School administrators are encouraged to strengthen institutional support for ICT integration by providing reliable internet connectivity and updated digital resources; organizing capacity-building programs for teachers; developing clear policies on digital collaboration and responsible technology use; and monitoring and evaluating the implementation of ICT-based instructional approaches. Investment in infrastructure and structured ICT programs will help sustain collaborative learning initiatives across subject areas.

For Parents

Parents should support their children's academic activities by encouraging responsible use of ICT tools at home; monitoring screen time and online behavior; communicating with teachers regarding digital learning requirements; and providing a conducive home environment for online collaboration and project completion. Active parental involvement can reinforce the positive impact of ICT-supported activities on students' academic performance.

For Future Researchers

Future researchers may explore other variables such as motivation, digital literacy, or critical thinking skills in relation to ICT-supported collaboration; conduct similar studies in different educational levels or school settings; use experimental or longitudinal research designs to measure long-term academic effects; and investigate challenges and barriers in ICT implementation to propose more comprehensive intervention programs.

Through these recommendations, stakeholders can collaboratively strengthen the effective integration of ICT-supported collaborative activities in senior high school education.

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