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(IJEPC)**<https://gaexcellence.com/ijepc>**CRITICAL THINKING & PROBLEM SOLVING WITH
GROUP WORK VS PAIR WORK**

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Abstract:

Critical thinking and problem-solving are valued in modern education, but the relative effectiveness of group versus pair work is still uneven, which is why this study on student interaction and cognitive engagement was conducted. This study aims to examine teamwork and critical thinking in different ways of collaboration, from the perspective of 233 college students. The study employed a quantitative survey using a 5-point Likert scale which revealed that the students overall like both arrangements with a mean rating that is typically greater than 4.0. In the group activities, students were very willing to communicate and collaborate towards a common goal, whereas in the pair work, the focus was more on individual responsibility for learning. It's interesting to

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note that those with the lowest scores showed a small preference for working alone as opposed to in pairs. The study suggests teachers customize the structures for collaborative learning with some cognitive objectives, for example, using pair work when the students are doing analytical tasks, and larger groups when they are solving complex problems. These methods are based on the theory of Vygotsky and Tubbs, thus enabling the provision of targeted scaffolding, helping students to move from individual accountability towards generating knowledge from several perspectives. Ultimately, teachers can reduce "social loafing" and enhance peer relationships in the zone of proximal development by creating a "shared mission" and providing clear instructions to support higher-order thinking.

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Critical Thinking, Group Work, Pair Work, Collaborative Approaches, Zone of Proximal Development



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Introduction – Background of Study

The development of critical thinking and problem-solving is increasingly recognized as one of the cornerstones of 21st century education where it is believed that students who are able to interpret, analyze, synthesize and evaluate complex information effectively will be well equipped to deal with the challenges of the 21st century (Xu et al., 2023). This need is attributed to the development of technology, globalization and the complexity of problems that are being faced in society that require adaptive and innovative thinking (Rusmin et al., 2024). Consequently, the educational paradigm has undergone a change in the focus from memorizing, to focusing on higher-order cognitive development and deep learning (Silva et al., 2023).

In this context, collaborative learning is gaining considerable popularity as an effective teaching method to help build these key cognitive skills. Group work and pair work are used to encourage learners to take part, interact with each other and construct their knowledge together (Viado & Department, 2023). The methods used are based on constructivist theory which focuses on how knowledge is actively built by interacting with the environment, inquiring, and reflecting on the environment, thus improving student involvement and understanding (Fadzil & Osman, 2025).

Although collaborative learning is widely used, its effectiveness to improve critical thinking and problem solving has been inconsistent in studies. Some studies show substantial improvements in cognitive outcomes, while others suggest that results vary according to instructional design and contextual factors (Xu et al., 2023; Surin & Damrongpanit, 2024).

These discrepancies make it clear that collaborative learning is not a uniform approach, but a collection of different configurations, which may have different effects.

Another aspect which needs to be addressed is the difference between various types of collaboration such as group work and pair work. The differences among the configurations are how they interact, how they communicate, and how much cognitive load they share. Group work introduces students to various viewpoints on a topic, and pair work enables more intensive and intensive communication. Such differences could impact the depth of critical discourse and problem-solving processes – but have not been well studied (Bobi & Ahiavi, 2023).

Moreover, previous research focuses on general studies of collaborative learning, neglecting to account for the different factors that may moderate the effects of collaborative learning, like intervention length, learning stage and group size. Knowledge of the working of these approaches is also not well understood in various cultural and linguistic settings (Huang et al., 2025). Thus, a more systematic study is needed to identify the effects of the specific collaborative configurations on the development of critical thinking and problem-solving skills in the current educational environment (Yazidi, 2023).

Statement of Problem

Though it is known that cooperative learning is a core component of teaching and learning, there are some gaps in literature regarding the effectiveness of cooperative learning and pair work in fostering critical thinking skills and problem-solving skills (Xu et al., 2023). The research usually regards cooperative learning as a uniform entity, without further differentiation based on the interaction structures, thus making it impossible to specify which one is more effective for the enhancement of higher order cognitive skills.

Moreover, most of the previous studies are task and intervention specific, and results are limited to aspects of the learning environment that are directly related to the specific tasks and activities studied (Moonma & Kaweera, 2021; Song et al., 2024). The results of these studies are sometimes not able to reflect the cumulative and dynamic process of cognition development in long-term periods. Additionally, there are some studies that broaden the definition of thinking skills and fail to specify the elements of critical thinking, which hinders the evaluation of the exact effect of collaborative methods (Al-Kreimeen, 2024).

In addition, the advantages of collaborative learning have been recognized in the past, but there has been a lack of research on the different dynamics of pair work and group work on critical thinking processes. In addition to the specific interactions between the dyad and larger groups, the way in which learners form the knowledge is frequently overlooked, as well as the way they solve complex problems, as discussed by (Bandono et al., 2023; Hadyaoui & Cheniti-Belcadhi, 2023). This lack of focus limits the knowledge of the influence of collaborative structures on cognitive engagement.

Furthermore, the inclusion of 21st century skills like collaboration, digital literacy, and critical thinking is often mentioned with a general focus, but without being specific enough about how the different collaborative settings can increase learning outcomes (KUMAR & PRAJAPATI, 2025; Zha et al., 2025). Likewise, few studies have explored group metacognitive regulation in various collaborative settings, most of which concentrate on the individual processes (Li &

Shukor, 2023). The findings reveal the importance of further research around collaborative configurations and their potential for promoting critical thinking, which should be more focused and structured.

Considering these constraints, it seems evident that the effects of pair work and group work on the development of critical thinking and problem-solving skills need to be explored further (Qiao et al., 2024). Although the studies found that collaborative groupings might differ based on the level of student competency, their influence on collaborative grouping has not been considered in the existing studies (Tram & Quynh, 2019). Moreover, the temporal and sequential aspects of metacognitive interaction in these structures have been overlooked.

Additionally, there is a lack of knowledge about the effect of metacognitive scaffolding on learning in various collaborative configurations. Currently, there is little research that investigates the effects of different kinds of metacognitive prompts on the critical thinking of pairs and groups, especially in an online learning context (Li & Shukor, 2023). This suggests that empirical research systematically comparing these configurations, considering learner characteristics, instructional design and contextual variables should be conducted as noted by (Wei et al. 2024).

The purpose of this study is to fill the identified gaps by making a comparative study between pair work and group work in the development of critical thinking skills and problem-solving skills (Salminen et al., 2024). The study investigates the effect of various collaborative structures on individual and collaborative metacognition, which would help to better understand effective pedagogical techniques for improving higher-order cognitive abilities (Meyers & Feeney, 2016)

Besides, the effects of different group sizes on the effectiveness of metacognitive support in collaborative learning environments will be examined. This study takes a perspective of exploring the relationship between collaborative configuration and metacognitive processes to offer empirical support for design of more effective approaches to instruction. In sum, the results are anticipated to aid teachers in determining the best collaborative methods to employ for a particular learning goal and student group (Qiao et al., 2024).

Objective of the Study and Research Questions

This study is done to explore critical thinking dispositions for group and pair work. Specifically, this study is done to answer the following questions;

- How do learners perceive their critical thinking in group interaction?
- How do learners perceive group work?
- How do learners perceive pair work?
- Is there a relationship between critical thinking across groups and pair work?

H1- There is no relationship between critical thinking across groups and pair work

Literature Review

Theoretical Framework of the Study

Group Work Theory by Tubbs (Tubbs & Dahl, 1991)

In the light of Stewart L. Tubbs's Group Work Theory, research on group work and pair work in contexts of critical thinking and problem solving indicates that group interaction is a dynamic system with the communication as a core element which is crucial in determining the outcome of the activity. Small groups are defined as interdependent systems in which inputs (such as the members' knowledge and skills) are converted by the interaction processes between the members into outputs such as decisions and solutions (Tubbs and Dahl 1991). In this view, the effectiveness of group work is closely related to the communication, role taking, norms setting and decision making that occur within the group. It emphasizes the value of group work in fostering critical thinking and problem-solving skills in educational environments. Students can interact with each other and have ongoing dialogue to question and build on each other's ideas. Differing points of view within a group facilitates intensive cognitive functioning, especially in analyzing, evaluating and synthesizing. This makes it more likely that learners will arrive at well-developed and comprehensive solutions.

Additional research on group communication supports the notion that effective group communication requires several factors, such as maintaining an even participation, establishing clear roles, and having the ability to handle disagreements in an effective way. In such cases, group work may encourage more meaningful discussion and thought than other interaction modes, like pair work. Tubbs' model also acknowledges that there can be problems with groups as well, including social loafing, lack of participation, and coordination problems, all of which can impact the effectiveness of a group if not addressed appropriately. Empirical research on Collaborative Learning also strengthens this view: learning outcomes of groups depend crucially on the quality of the interaction within the group. In general, group activities that are well structured have been shown to improve critical thinking and problem solving; and to promote shared reasoning and joint decision making. This implies that group size is not the only factor, but the quality of the working group. However, when compared to pair work, group work presents a balance between richness of interaction and efficiency. In group situations greater variety of ideas and more complex discussions may be possible, but in pairs, more equal participation and smoother communication might be possible. Thus, the effectiveness of group work, as described by Tubbs, relies on the overall management and organization of the interaction in the learning environment. To summaries, Group Work Theory (Tubbs Tubbs & Dahl, 1991) has proved to be a valuable concept for analyzing the way in which groups communicate determines how their critical thinking and problem-solving skills evolve. It highlights the importance of the group to get students together, but more important, how they will work and interact and collaborate with each other during the learning process.

Sociocultural Theory and Group Interaction (Vygotsky, 1978)

The results of the research conducted to the subject of group work and pair work in the field of critical thinking and problem solving, from the sociocultural theory of Vygotsky point of view, show complex consequences. Each has its own set of mechanisms embedded in the Zone of Proximal Development (ZPD) and neither is clearly superior. Group and pair-based learning can be said to be influenced by Vygotsky's sociocultural framework. Doolittle (1995) correlates

the five elements of cooperative learning with the Zone of Proximal Development ZPD (Vygotsky, 1979): positive interdependence, face-to-face interaction, individual accountability, small group skills, and group self-evaluation. From this view, O'Donnell (2003) further extends the application to peer dyads, highlighting the significant amount of Vygotskian research that focuses on the interactions between two people, one of whom is more knowledgeable and can scaffold the other who is less knowledgeable. Later, Maghfiroh and Muttaqin (2025) confirm that collaborative learning whether in pairs or groups of more than two applies Vygotsky's theories in the way of peer interaction, scaffolding, and the building of knowledge together.

Empirically, one of the most relevant studies is the one conducted by Moonma and Kaweera (2021) which investigated individual, pair and group writing in EFL argumentative writing tasks with 32 students across three language proficiency levels. The results show that group work at all levels of performance (mean $\approx$ 11.2-11.9) outperformed those of pair work (mean $\approx$ 10.2-10.5) and individual work (mean $\approx$ 9.0-9.5). Importantly, qualitative analysis showed that group-based learning enabled multiple aspects of critical thinking such as analysis, evaluation and creation. By contrast, pair work mainly enhanced analytical skills in the exchange of information, and individual work didn't show any signs of critical thinking development. The results of this study align with the highly cited study of Anuradha A. Gokhale (1995), wherein it was found that collaborative learning in small groups would induce higher order thinking skills and would also improve the retention of information longer than that gained in individual learning situations. However, there are specific benefits of pair work when used in the context of collaborative learning. Mowlaie and Azimi Movaghar (2020) conclude that both pair and group configuration showed respective improvements in writing performance, but the pair writing was more efficient due to the dynamism and more well-defined interaction dyadic writing has. Likewise, Lange, Costley, and Han (2016) compared the Think Pair Share strategy to a group-based strategy, Numbered Heads Together, and showed that there was more equity in participation and that substantive responses occurred more frequently per turn with Think Pair Share. This indicates that the procedural system of pair work can make every student more accountable. More recently, (Avci and Durak 2024) noted that, in design tasks, students who had been assigned to pairs tended to concentrate more on the problem definition and solution visualization while the students of groups concentrated more on the overall benefits of cooperative working for complete problem solving

Pair Work vs Group Work

This part brings together previous studies on the pedagogical effects of group or pair work approaches on the learning of critical thinking and problem-solving abilities. The literature indicates that CL learning environments, especially at higher education, can improve students' engagement and critical thinking skills, which involve students' active participation and interaction with different ideas and viewpoints (McCormick et al., 2015; Raju, 2021). However, empirical studies, on the comparative effectiveness of group work versus pair work in developing different types of critical thinking have given varying results, making it necessary to conduct more detailed analysis on the matter (Xu et al., 2023).

Specifically, some studies point to the fact that collaborative learning is based on sociocultural theory, but some issues are related to imbalanced participation and dominant personalities that can influence in the dynamics of interactions G et al., 2026). Therefore, the specific ways in which each collaborative structure supports and/or impedes critical thinking and problem-

solving are an important aspect of instructional design optimization (G et al., 2026). This theoretical framework will thus incorporate the fundamental principles of cognitive, social cognitive and social constructivist viewpoints to explain how group and pair design can influence the development of different types of critical thinking, including evaluative and people-oriented thinking (Hmelo-Silver et al., 2025; Sulaiman et al., 2026). The framework recognizes the importance of cognitive learning theories (which focus on the development of mental models) and constructivist theories (which focus on the construction of knowledge through active learning) in problem-solving in learning environments (Nigussie et al., 2025). Vygotsky's sociocultural theory underlies this, as higher-order cognitive functions such as critical thinking develop through social interaction in the Zone of Proximal Development, which involves interactions with more advanced peers or teachers (Homayouni, 2022; Zhang et al., 2025). In theory, collaborative learning by working in pairs and groups of more than two students in the learning process has the potential to support co-construction of knowledge and internalization of complex problem-solving strategies by providing opportunities for students to interact with each other and engage in mediated learning experiences as suggested by Maghfiroh & Muttaqin (2025) and Steier & Davidsen (2021).

Past Studies

Past Studies on Group Work vs Pair Work

Recent study has emphasized the role and value of collaborative learning particularly in critical thinking, which is emphasized using pair and group work. A questionnaire containing 44 items was used to investigate critical thinking styles of 174 college students (Sulaiman et al. 2026). The study showed that problem-solving and peer evaluation were the most frequently used evaluative and interpersonal thinking strategies. The two methods of learning were pair work, which involved explaining, sharing ideas and shared responsibility, and group work, which involved shared goals, trust, and learning from mistakes. These results imply that both formats promote higher-order thinking and involvement. The study by Fan et al. (2025) explored the effect of the size of collaborative writing groups on 184 EFL (English as a foreign language) learners' critical thinking and writing skills. The larger the group, the more conflict and the less satisfaction was reported; the larger the group, the more collective critical thinking was found, as there were multiple perspectives in the group. Smaller groups, particularly couples, resulted in improved individual writing performance and balanced participation. This implies that there is a compromise between learning outcomes and group size as group learning can benefit in terms of problem solving while a pair working can develop individual skills.

This idea of the importance of group structure is backed up by the theory of Chen and Kuo (2019) which shows that interaction effectiveness and learning outcomes is influenced by the ideal group structure. Likewise, Silva et al. (2022) found that structured cooperative learning activities have a significant effect on the analytical, evaluative and problem-solving abilities of students. The research demonstrates that group size, task design and quality of interaction each influence the effectiveness of pair and group activities in promoting critical thinking. The group work provides greater scope for diverse views, negotiating and collaborative thinking, while pair work facilitates individual reflection and active participation.

The collaborative learning approach is characterized by pair and group work which involves interaction and active participation; hence it is common in second language subjects. The advantages of working in pairs and groups for the learning of a foreign language have been

investigated by numerous studies. Dobao (2012) found that university students that participated in collaborative writing made more accurate writing and had more relations with language debates (LRE) than those that were working in collaborative pairs or individually. However, another useful technique was to use pair work as this enabled the students to assist one another with language difficulties. Lee (2020) found that the pair work method creates an environment where students can ask questions, help each other, and stay engaged. From this result, the pair work technique and group work technique both have a positive effect on language learning. But group work can make people more accurate and pair work can make people more confident and more participative.

By engaging in group activities, students learn languages and can also be socially and cognitively enriched. According to the review of the studies on cooperative learning conducted by Zhou and Colomer (2024), the collaborative approach improves academic achievement, social skills, and cultural sensitivity. This is consistent with the results of Johnson and Johnson (2009), who determined that cooperative learning is more successful and better for interpersonal skills than is individual learning. In this context, working in groups is beneficial for students' social, personal and learning development. Han and Ellis (2021) confirm that students are likely to perform better when they are actively involved in group activities. The studies indicate that pair and group work are effective in cases where students are engaged in activities in which they have some interest. Tanaka (2025) studied the effect of group size on motivation in the research, using the questionnaire responses of 154 Japanese university students participating in project-based learning. Results indicate that group size has a positive effect on group engagement and interpersonal relationships, but a negative effect on idea sharing and interaction. However, based on the study conducted by Lintner et al. (2024), there was no significant difference in student motivation and academic achievement with respect to group size. The study looked at interactions among 145 lower-secondary students, and found that the type of interaction, including reciprocity and communication, had a greater effect on engagement than the number of group members.

Group and pair work are important for developing critical thinking and problem-solving skills. They both have their own benefits. Group participation allows others to think critically, to have multiple viewpoints and to work together to decide. It's especially useful for complicated, multi-part assignments. On the other hand, pair work encourages focused talk, collaborative responsibility and skill development. In collaborative learning, in addition to facilitating learning, the social and emotional development is also improved, such as communication skills, self-confidence, cultural sensitivity, etc. The results underscore the importance of using certain kinds of collaborative forms to achieve specific learning goals in the development of critical thinking and problem-solving skills.

Conceptual Framework of the Study

Interactions during group work and pair work do more than just complete tasks. During interactions, the participants learn from one another. Vygotsky (1978) mentions that there is a member of the group who will be the more knowledgeable other (MKO) and the rest of the team members benefit from this person. In addition to that, Vygotsky (1978) also because of the interactions, participants benefit from the zone of proximal development (ZPD). This refers to the range of tasks that the learners cannot do individually but can accomplish as a group. In addition to that, group conflicts can be beneficial to the participants. Learning to solve problems as a team improves the participants' critical thinking skills (Rahmat, 2025). This

study (Figure 1) shows the conceptual framework of the study. This study compares the influence of critical thinking on group work and pair work. According to Belbin (2013), critical thinking involves tasks that are thought-oriented, action-oriented, and people-oriented. Bateman et.al (2002) states that group work focuses on the members' roles, processes, relationships, intergroup relations, skill and learning, as well as passion and commitment. Pair work, on the other hand, focuses on knowledge construction in the context of social and cultural aspects (Baleghizadeh & Farhesh, 2014). This study explores whether there is a difference in critical thinking dispositions between group and pair work.

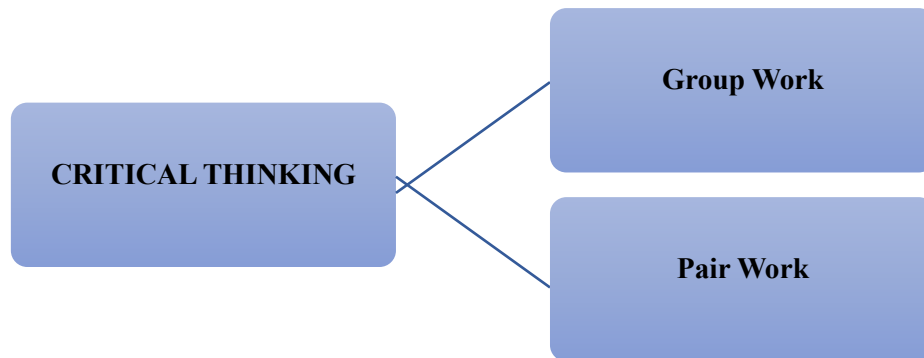


Figure 1- Conceptual Framework of the Study

A Comparison of Critical Thinking for Group Work and Pair Work

Methodology

This quantitative study is done to explore critical thinking dispositions for group and pair work. A convenient sample of 233 participants responded to the survey. The instrument used is a 5 Likert-scale survey and is rooted from who Belbin (2013), Bateman, et.al. (2002) and Baleghizadeh & Farhesh (2014) to reveal the variables in table 3 below. Table 1 below shows the categories used for the Likert scale; 1 is for Strongly Disagree, 2 is for Disagree, 3 is for Undecided, 4 is for Agree and 5 is for Strongly Agree.

Table 1- Likert Scale Use

1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

Table 2- Distribution of Items in the Survey

SECTION	VARIABLE	CONSTRUCT	ITEM		
A	CRITICAL THINKING & PROBLEM SOLVING	Thought-Oriented	4	10	.843
		Action-Oriented	3		
		People-Oriented	3		

	Belbin (2013)				
B	GROUP WORK Bateman, et.al. (2002)	Purpose and Goals (PG)	3	22	.963
		Roles (R)	3		
		Team Processes (TP)	3		
		Team Relationships (TR)	4		
		Intergroup Relations (IR)	3		
		Passion and Commitment (PC)	3		
		Skills and Learning (SL)	3		
C	PAIR WORK Baleghizadeh & Farhesh (2014)	Social Interactions	4	12	.923
		Knowledge Construction	4		
		Social and Cultural Context	4		
				44	.969

The distribution of the survey used to gauge three main variables, critical thinking and problem solving, group work, and pair work is shown in Table 2. There are 44 items in all, divided up into three separate parts. Section A focuses on how people approach problem solving in various settings and is based on the work of Belbin (2013). It consists of 10 items altogether, divided into three constructs: thought-oriented (four items), action-oriented (three items), and people-oriented (three items). The survey's largest section, Section B, cites Bateman et al. (2002). Through seven distinct constructs totalling 22 items purpose and goals (PG) (three items), roles (R) (three items), team processes (TP) (three items), team relationship (TR) (four items), intergroup relations (IR) (three items), passion and commitment (PC) (three items), and skill and learning (SL) (three items), it assesses the dynamics of working in a group. In the meantime, the dynamics of working in pairs are based on Baleghizadeh & Farhesh (2014) for section C. It contains 12 items in total, divided into three categories: social interactions (four items), knowledge construction (four items), and social and cultural background (four items)

Table 3- Reliability Levels, Cronbach's Alpha Ranges, and Their Interpretations

Reliability Level	Cronbach's Alpha range	Interpretation
Excellent	0.9 and above	Indicates very high internal consistency
Good	0.80-0.89	Reflects strong internal consistency
Acceptable	0.70-0.79	Indicates acceptable internal consistency
Questionable	0.60-0.69	Reflects questionable internal consistency
Poor	Below 0.6	Indicates poor internal consistency

A reliability analysis was performed to assess the internal reliability of the instrument. Table 3 above shows the distribution and interpretation of Cronbach Alpha range. According to Ahmad,et.al. (2024), Cronbach Alpha scores between 0.7 to 0.9 is considered acceptable to excellent.

This is interesting when Table 2 also shows the reliability of the survey showing a Cronbach alpha of .843 for Critical Thinking, .963 for Group work, and .923 for Pair Work. The overall Cronbach's alpha for all 44 items is .969, revealing excellent reliability of the chosen

instrument Further analysis using SPSS was conducted to address the research questions for this study.

Findings

Demographic Analysis

According to Zienefuss, et.al (2021), researchers report demographic data in percentages to establish sample representatives and allow for generalizability to a larger population. The report also provides an overview of participants' characteristics. Percentages offer a clear and understandable picture of the sample makeup.

Table 4- Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	35%
		Female	65%
2	Cluster	Science & Technology	40%
		Social Sciences & Humanities	60%

According to the data shown in Table 4, the demographic profile of the respondents shows a higher representation of females, who make up 65 percent of the group, compared to males, who account for 35 percent. In terms of academic or professional clusters, most participants (60%) are in the Social Sciences & Humanities category, with the remaining 40% in the Science & Technology cluster. Overall, the sample is largely female and comes from the social sciences.

Descriptive Statistics

Why is there a need to report the mean and standard deviation? According to Vetter (2017), Mean (M) represents the average, or center of a data set. Standard deviation (SD) indicates the typical distance of individual observations from the mean which shows the data's variability or spread. A low SD means the data points are clustered close to the mean while high SD indicates they are more spread out. It is good to have a high SD.

Findings for Critical Thinking

This section presents data to answer research question 1- How do learners perceive their critical thinking in group interaction? In the context of this study, this is measured by (i) thought-oriented, (ii) action-oriented, and (iii) people-oriented.

(i) Table 5- Mean and Standard Deviation for Thought-Oriented (TO)

ITEM	Mean	SD
TOQ1 When suddenly asked to consider a new project, I can take an independent and innovative look at most situations.	3.94	0.76

TOQ2 In seeking satisfaction through my work, I like to make critical discrimination between alternatives.	3.74	0.911
TOQ3 When trying to solve a complex problem, I like to weigh up and evaluate a range of suggestions thoroughly before choosing.	4.22	0.77
TOQ4 When suddenly asked to consider a new project, I approach the problem in a carefully analytical way	4.11	0.71

Table 5 above presents the mean and standard deviation for thought oriented. Item TOQ3 has the highest mean of 4.22 (SD= 0.77). This is followed by item TOQ4 with a mean of 4.11 (SD=0.71). The lowest mean is item TOQ2 IS 3.74 (SD=0.911).

(ii) Table 6- Mean and Standard Deviation for Action-Oriented (AO)

ITEM	Mean	SD
AOQ1 In seeking satisfaction through my work, I tend to have a creative approach to solve problem solving.	3.93	0.77
AOQ2 In carrying out my day-to-day work, I tend to see pattern in solving problems where others would see items as unconnected.	3.86	0.79
AOQ3 I take considerable amount of time to make judgement but most often, the judgement made is accurate.	3.97	0.75

Table 6 above presents the mean and standard deviation for action oriented. Item AOQ3 has the highest mean of 3.97 (SD= 0.75). This is followed by item AOQ1 with a mean of 3.93 (SD=0.77). The lowest mean is item AOQ2 IS 3.86 (SD=0.79).

(iii) Table 7- Mean and Standard Deviation for People-Oriented (PO)

ITEM	Mean	SD
POQ1 I can see how ideas and techniques can be used in perceiving new relationships.	4.03	0.80
POQ2 I analyse other people's ideas objectively, by evaluating both advantages and disadvantages	4.27	0.77
POQ3 If I am suddenly given a difficult task with limited time and unfamiliar people, my feelings seldom interfere with my judgement.	3.55	0.93

Table 7 above presents the mean and standard deviation for people oriented. Item POQ2 has the highest mean of 4.27 (SD= 0.77). This is followed by item POQ1 with a mean of 4.03 (SD=0.80). The lowest mean is item POQ3 IS 3.55 (SD=0.93).

Findings for Group Work

This section presents data to answer research question 2- How do learners perceive group work? In the context of this study, this is measured by (i) purpose and goals, (ii) roles, (iii) team processes, (iv) intergroup relations, (v) passion and commitment, and skills and learning.

(i) Table 8- Mean and Standard Deviation for Purpose and Goals (PG)

ITEM	Mean	SD
PGQ1 Our team has a meaningful, shared purpose.	4.17	0.77
PGQ2 We are strongly committed to a shared mission.	4.29	0.74
PGQ3 We set and meet challenging goals.	4.22	0.77

Table 8 above presents the findings for purpose and goals. Item 2 has the highest mean ($M=4.29$, $SD=0.74$). This is followed by item 3 with a mean of 4.22 ($SD=0.77$). The lowest mean is item 1 ($M=4.17$, $SD=0.77$).

(ii) Table 9- Mean and Standard Deviation for Roles (R)

ITEM	Mean	SD
RQ1 Team members clearly understand their roles.	4.14	0.80
RQ2 When an individual's role changes, an intentional effort is made to clarify it for everyone on the team.	4.04	0.78
RQ3 Everyone values what each member contributes to the team	4.27	0.75

Table 9 above presents the findings for roles. Item 3 has the highest mean ($M=4.27$, $SD=0.75$). This is followed by item 1 with a mean of 4.14 ($SD=0.80$). The lowest mean is item 2 ($M=4.04$, $SD=0.78$).

(iii) Table 10- Mean and Standard Deviation for Team Processes (TP)

ITEM	Mean	SD
TPQ1 We address and resolve issues quickly.	3.94	0.83
TPQ2 Our team works with a great deal of flexibility so that we can adapt to changing needs.	4.10	0.84
TPQ3 When we choose consensus decision-making, we do it effectively.	4.14	0.75

Table 10 above presents the findings for team processes. Item 3 has the highest mean ($M=4.14$, $SD=0.75$). This is followed by item 2 with a mean of 4.10 ($SD=0.84$). The lowest mean is item 1 ($M=3.94$, $SD=0.83$).

(iv) Table 11- Mean and Standard Deviation for Team Relationships (TR)

ITEM	Mean	SD
TRQ1 Team members appreciate one another's unique capabilities.	4.25	0.74
TRQ2 Team members are effective listeners.	4.11	0.84
TRQ3 Communication in our group is open and honest.	4.26	0.84
TRQ4 Members of our team trust each other.	4.22	0.82

Table 11 above presents the findings for team relationships. Item 3 has the highest mean ($M=4.26$, $SD=0.84$). This is followed by item 1 with a mean of 4.25 ($SD=0.74$) and item 4 with a mean of 4.22 ($SD=0.82$). The lowest mean is item 2 ($M=4.11$, $SD=0.84$).

(v) **Table 12- Mean and Standard Deviation for Intergroup Relations (IR)**
(vi)

ITEM	Mean	SD
IRQ1 We are able to resolve conflicts with other teams collaboratively.	4.15	0.78
IRQ2 We communicate effectively with other groups.	4.16	0.78
IRQ3 Our collaborations with other teams are productive, worthwhile, and yield good results.	4.15	0.74

Table 12 above presents the findings for Intergroup Relations. Item 2 has the highest mean ($M=4.16$, $SD=0.78$). This is followed by item 1 and item 3 with a mean of 4.15 ($SD=0.78$ and $SD=0.74$).

(vii) **Table 13- Mean and Standard Deviation for Passion and Commitment (PC)**

ITEM	Mean	SD
PCQ1 Working on our team inspires people to do their best.	4.13	0.78
PCQ2 People are proud to be part of our team.	4.08	0.77
PCQ3 My team is proud of its accomplishments and optimistic about our work.	4.25	0.74

Table 13 above presents the findings for Passion and Commitment. Item 3 has the highest mean ($M=4.25$, $SD=0.74$). This is followed by item 1 with a mean of 4.13 ($SD=0.78$). The lowest mean is item 2 ($M=4.08$, $SD=0.77$).

(viii) **Table 14- Mean and Standard Deviation for Skills and Learning (SL)**

ITEM	Mean	SD
SLQ1 We have the skills we need to do our jobs effectively.	4.12	0.74
SLQ2 We view everything, even mistakes, as opportunities for learning and growth	4.25	0.75
SLQ3 Team members embrace continuous improvement as a way of life.	4.23	0.78

Table 14 above presents the findings for skills and learning. Item 2 has the highest mean ($M=4.25$, $SD=0.75$). This is followed by item 3 with a mean of 4.23 ($SD=0.78$). The lowest mean is item 1 ($M=4.12$, $SD=0.74$).

Findings for Pair Work

This section presents data to answer research question 3- How do learners perceive pair work? In the context of this study, this is measured by (i) social interactions, (ii) knowledge construction, and (iii) social and cultural context

(i) **Table 15- Mean and Standard Deviation for Social Interaction (SI)**

ITEM	Mean	SD
SIQ1I like learning activities in which students work together in pairs	4.08	0.93
SIQ2 Pair work create a relaxing learning environment.	4.15	0.84
SIQ3 Students give more help to each other during pair work	4.16	0.82
SIQ4 I prefer to work within a pair rather than work alone.	3.8	1.0

Table 15 above presents the mean and standard deviation for Social Interactions. Item 3 has the highest mean ($M = 4.16$, $SD = 0.82$). This is followed by item 2 with a mean of 4.15 ($SD = 0.84$). The lowest mean is item 4 ($M = 3.8$, $SD = 1.0$).

(ii) **Table 16- Mean and Standard Deviation for Knowledge Construction (KC)**

ITEM	Mean	SD
KCQ1 Pair work help students solve tasks better and faster.	4.06	0.85
KCQ2 Pair work help students more chances to exchange ideas with each other.	4.18	0.81
KCQ3 Pair work help students understand information better after explaining it to others.	4.14	0.86
KCQ4 When pairs are well organized, the work gets done fast.	4.30	0.78

Table 16 above presents the mean and standard deviation for Knowledge Construction. Item 4 has the highest mean ($M = 4.30$, $SD = 0.78$). This is followed by item 2 with a mean of 4.18 ($SD = 0.81$). The lowest mean is item 1 ($M = 4.06$, $SD = 0.85$).

(iii) **Table 17- Mean and Standard Deviation for Social and cultural context (SCC)**

ITEM	Mean	SD
SCCQ1 Students learn more about how to share the responsibilities when working in pairs	4.18	0.84
SCCQ2 I feel more accepted by others after working within a pair	3.92	0.90
SCCQ3 It is important that each person takes responsibility for learning as well.	4.34	0.63
SCCQ4 I never felt let down when I work in pairs.	3.95	0.95

Table 17 above presents the mean and standard deviation for Social and Cultural Context. Item 3 has the highest mean ($M = 4.34$, $SD = 0.63$). This is followed by item 1 with a mean of 4.18 ($SD = 0.84$). The lowest mean is item 2 ($M = 3.92$, $SD = 0.90$).

Correlational Analysis

According to He (2024), correlation is a statistical technique that shows how strongly two variables are related to each other or the degree of association between the two. It's a common tool for describing simple relationships without making a statement about cause and effect. This section presents data to answer the research question on correlation.

Findings for the relationship between critical thinking across groups and pair work

This section presents data to answer research question 4- Is there a relationship between critical thinking across groups and pair work?

H1- There is no relationship between critical thinking across groups and pair work

To determine if there is a significant association in the mean scores between critical thinking across groups and pair work, data is analyzed using SPSS for correlations. Results are presented separately in Table 18 below.

Table 18- Correlation Between Critical Thinking Across Groups And Pair Work

		Critical Thinking	Group Work	Pair Work
Critical Thinking	Pearson (Correlation)	1	.819**	.682**
	Sig (2-tailed)		<.001	<.001
	N	233	233	233

**Correlation is significant at the 0.01 level (2-tailed)

Table 18 shows there is an association between critical thinking and group work. Correlation analysis shows that there is a highly significant association between critical thinking and group work ($r=.819^{**}$) and ($p=.000$). According to He (2024), coefficient is significant at the .05 level and positive correlation is measured on a 0.1 to 1.0 scale. Weak positive correlation would be in the range of 0.1 to 0.3, moderate positive correlation from 0.3 to 0.5, and strong positive correlation from 0.5 to 1.0. This means that there is also a strong positive relationship between critical thinking and group work.

Table 18 shows there is an association between critical thinking and pair work. Correlation analysis shows that there is a highly significant association between critical thinking and pair work ($r=.682^{**}$) and ($p=.000$). At the .05 level, coefficient is significant and positive correlation is indicated by values ranging from 0.1 to 1.0 (He 2024). Weak positive correlation 0.1 to 0.3, Moderate positive correlation 0.3 to 0.5 and Strong positive correlation 0.5 to 1.0. This means that there is also a strong positive relationship between critical thinking and pair work.

In comparison, the correlation for critical thinking and group work ($r=.819^{**}$) is higher than for pair work ($r=.682^{**}$). Null hypothesis is rejected for H1. This result also reveals that statistically, in the context of this study, there is a higher tendency for the development of critical thinking skills in group than pair work. According to Vygotsky's Socio-Cultural Theory, group work creates an interaction area with more "More Knowledgeable Individuals" (MKO) than the pair work. This is a diversified MKO which provides greater cognitive support or scaffolding, and elicits deep socio-cognitive discussions, allowing students to explore a topic from a variety of perspectives and develop critical thinking skills. Tubbs' Model says that group-work "encourages dynamic communication, multiple personality inputs, and constructive cognitive conflict.

Intellectual debate is often restricted by resource limits and a need to look after the partner's feelings in comparison to pair work. This means that the synergy, argument and advanced group process (throughput) significantly boosts cognitive output. This is part of the reason why group work is better associated with Critical thinking than pair work.

Conclusion

Summary of Findings and Discussions

A mean score analysis of the Thought-Oriented (TO) critical thinking items showed high mean scores among all the respondents, which indicated that the collaborative group work and pair work activities in Vygotsky's sociocultural approach helped develop strong critical thinking cognitive dispositions. More specifically, TOQ1 showed a high mean endorsement of independent innovation under pressure, which aligned with flexible creativity supported by Zone of Proximal Development (ZPD) interactions; TOQ2 (with a higher standard deviation) endorsed critical discrimination among alternatives for work satisfaction, in line with Vygotsky's emphasis on negotiation and deliberation as mediated problem-solving; TOQ3 also pointed to a thorough evaluation of suggestions with a high mean and low standard deviation, indicating broad consensus underlying methodical analytical approaches to novel problems, and thus structured thinking enhanced by negotiation in social settings; and TOQ4 affirmed a general tendency toward thorough evaluation of suggestions, with a low mean and standard deviation indicating structured thinking that is enhanced by negotiation in social settings. The averages are grouped on the higher side of the 3.7 (moderately high) and SDs are low (<0.92) indicating uniform thought-oriented skills among respondents. This applies to sociocultural dimensions: group work enhances diversity evaluation (such as TOQ3), and pairs sharpen innovation (TOQ1) – as Vygotsky (1978) noted.

The results for the Action-Oriented (AO) critical thinking items showed a consistent high mean and were generally supported in terms of fostering proactive behavioral dispositions developed during collaborative interactions in a Vygotsky sociocultural context. Specifically, the strongest mean was achieved by AOQ1, which highlighted a creative approach to problem solving for work satisfaction that is consistent with the Vygotskian (1978) conception of innovative mediation that emerges in Zone of Proximal Development (ZPD) collaborative work sessions, while AOQ2 showed good agreement in a capacity to recognize interconnected patterns in seemingly disparate daily tasks and thus emphasized peer negotiation for holistic systems thinking; and AOQ3 exhibited the highest mean, indicating a preference for deliberate, time consuming, but accurate judgements, which are consistent with the Vygotskian conception of mediation in pair or group work sessions, in which the precise nature of the judgements is refined.

The analysis of items related to People Oriented (PO) critical thinking showed that the mean score for the items belonged mostly to the high-range indicating well-developed interpersonal skills which have been developed through cooperative interactions, consistent with Vygotsky's (1978) sociocultural theory. Specifically, POQ1 showed a high mean, indicating good internalization of cultural tools through Zone of Proximal Development (ZPD) interactions; POQ2 exhibited a very high mean, indicating that it was proficient in objective analysis of others' ideas (balanced advantage/disadvantage judging); POQ3 had a moderately lower mean reflecting moderate levels of emotional detachment in judging under time constrained

conditions with unfamiliar group tasks, with greater variation suggesting divergent effects of pair intimacy versus group interaction on emotional interference.

The results in table 8 indicate that the team members are highly committed towards achieving a common objective, and the mean score for Item 2 ("commitment to a shared mission") is the highest. The outcomes illustrate high "inputs" (the individual skills and commitment needed for the group to function as a living system), according to Tubbs' Group Work Theory. This shared sense of purpose enables pupils to engage in "co-construction of knowledge" and in group problem-solving, as suggested by Vygotskian theory. Table 9 shows that team members value each other's contributions but the assignment of roles when they change is rated slightly lower. The literature review shows that balanced and clear involvement and responsibilities are essential for successful group projects. We can see that for the lower score in role clarification, there may be a "challenge in coordination" that if not managed well, can have a negative impact on the overall effectiveness of the group, as indicated by Tubbs' (2018) framework, and that for the high score given for contributions, there may be a "supportive environment", as described by Lee (2020). Results for team procedures indicate that the group is best at coming to a consensus when it is making decisions (Table 10), but longer to solve problems quickly. This confirms the findings of the literature review that "collective decision making" and "shared reasoning" are enhanced through group work. Lower mean on problem-solving may be indicative of "increased conflict" that sometimes happens in bigger groups. Regardless of this, the success of reaching consensus gives some weight to the idea that critical thinking is being enhanced through group activity because students are encouraged to develop their ideas in groups. The mean scores were very high for all the items, indicating that there was strong internal cohesion between the individuals, with open communication and mutual trust. Specifically, the highest mean for Item 3 suggests that these groups perceive communication as open, and honest. It is in line with Tubbs' Group Work Theory which states that the outcome of most groups is determined by communication and the efficacy of the group is linked to how they communicate and establish norms.

The high level is also in accord with the results obtained by Sulaiman et al. (2026), who described group work as having a shared goal and trust between group members. From the results presented in Table 12 it can be concluded that the participants have great ability to communicate and solve conflicts cooperatively even when interacting with external groups. The "successful group work" elements noted in the literature, such as the capacity to resolve conflicts in a constructive manner, are reflected in this capacity to resolve conflicts and sustain fruitful partnerships. These results show the "co-construction of knowledge" and "mediated learning experiences" that are described by sociocultural theory, in which problem-solving and developing an integrated solution are supported by social interaction. The result from table 13 indicates that the high ratings for pride in achievements show that the collaborative setting significantly promotes participants' social and emotional development. The results align with those of Johnson and Johnson (2009) and Zhou and Colomer (2024), who found that collaborative learning enhances social skills, self-esteem, and self-growth. Also, the notion of group environments fostering greater engagement and enhanced interpersonal relationships is reinforced by the sense of pride and motivation to perform to the best of his or her ability, especially when students believe that they are part of a supportive group. The results in table 14 indicate that the teams have a high level of competency and continuous improvement; the respondents are confident that they can function well. This confidence in individual ability is consistent with Tubbs' Group Work Theory which suggests that a group's decisions and solutions are their "outputs" and that it is the group's interaction that transforms the individual's

knowledge and skills into these results. Further, the perception of mistakes as learning opportunities was rated as the highest mean score strongly supporting the notion that effective group work involves shared accountability and learning from mistakes. This commitment to continuous development indicates that the collaborative setting is effective in supporting co-construction and promoting student development in their Zone of Proximal Development (ZPD), through peer interaction and scaffolding. This type of co-operative learning, therefore, extends beyond the classroom to provide valuable social and personal growth experiences, including self-confidence, communication, and other forms of interaction. The results of Social Interaction (SI) indicate that students' attitude towards the mutual assistance that takes place between students in the process of pair work is very positive, and the participants who help each other get the highest mean score.

Lee's research (2020) found that pair work creates an atmosphere of mutual support and encouragement, where students are at ease in asking questions and giving each other support. The evidence shows that pair work is effective in creating a collaborative learning environment. High ratings for calm learning environment corroborate the idea that smaller group sizes, such as dyads, foster greater engagement and interpersonal relationships between participants than larger groups. In terms of Knowledge Construction (KC), students feel that working in pairs is very effective to complete the assignment particularly when there is a good organization of the pair. This apparent efficiency and the opportunity to co-construct knowledge through social interaction is evidence for the implementation of Vygotsky's (1978) sociocultural theory that suggests that social interactions within the Zone of Proximal Development co-construct knowledge. Mowlaie and Azimi Movaghar's results which indicate more effective performance using pair work rather than larger group sizes due to the more dynamic and closely structured interaction of pair work are also in agreement with the much high level of task performance that students reported. The Social and Cultural Context (SCC) data shows a high level of accountability students feel, with the highest mean in the study signifying how important each student is to take responsibility for their own learning. This is consistent with the findings of Lange, Costley, and Han (2016) who argued that pair-based methods such as "Think-Pair-Share" result in higher individual accountability and more balanced participation, which means that pair work is well-suited to achieve personal and shared accountability. The result of this study also corroborates with Sulaiman et al. (2026) who concluded that pair work helps to develop higher order thinking and involvement as it focuses on explaining and mutual responsibility.

Implications and Suggestions for Future Research

Implications

The findings of the study reflect the outcomes of the structured interactions which facilitate collaborative learning, and they are consistent with the sociocultural approach of Vygotsky's theory and Group Work Theory of Tubbs. Regarding group work, Tubbs' concept that interdependent systems in which members perform unique roles and work productively together is the fundamental basis of group performance is evidenced by the degree of commitment to a group objective and strong emphasis on member contributions. Results from pair work also support Vygotskian concepts of scaffolding and individual responsibility in the Zone of Proximal Development, as do concepts of mutual assistance and the need for individual responsibility for learning. Further, studies have shown that dyadic involvement is often more efficient, more focused in interaction than the more complex talks in larger groups, in line with

the notion of the efficiency of organized pair labor. In the end, our findings support the theory that both modalities operationalize learning through knowledge co-construction and peer interaction.

Pedagogical Implications

Teaching should adapt by carefully choosing the collaborative structure according to the desired cognitive outcome, using group work for complicated problem-solving and pair work for effective analytical tasks. Since students have shown strong commitment to group objectives, educators should focus on developing a "shared mission" to increase participation. Students, however, had trouble in quickly solving problems, so it is also necessary to give them direct teaching on how to manage the operation of the team. Also, in keeping with Vygotsky's theories of the Zone of Proximal Development, in which the more adept peers help to advance, teachers should build on the high sense of personal responsibility demonstrated in pair work and leverage it as a scaffold for more complex group dynamics. By moving away from a generic way of working with groups, teachers can better support the transition from simple information sharing in pairs to richer, multi-perspectival conversations for the co-construction of knowledge and higher order thinking.

Suggestions for Future Research

In order to solve the coordination concerns and "social loafing" mentioned in Tubbs' Group Work Theory, future study should investigate the precise variables causing the lower perceptions of "resolving issues fast and the lack of clarity during "role shifts") inside group settings. Further qualitative research is required to comprehend the social and psychological obstacles to dyadic engagement because students place a high priority on "taking responsibility for learning" in pairs but show a comparatively lesser preference for working in pairs versus working alone. Future research should also look at how pair versus group arrangements specifically support different types of critical thinking, such as "evaluative" versus "analytical" thinking, given the conflicting findings in the literature now available addressing the relative effectiveness of collaborative structures.

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