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Analysis of Social-Emotional Development Through Collaborative Learning of Informatics Subjects for High School Students

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ABSTRACT

This study aims to analyze the implementation of collaborative learning based on crossword puzzles and its relationship to the social-emotional development of class X E5 students. This study uses a qualitative descriptive approach and data collection through observation and documentation during the learning process. This study shows that the implementation of collaborative learning strategies based on crossword puzzles can increase learning interactions actively and optimally. This is seen from the increase in empathy, self-confidence, communication, interactivity, and the ability to work together in groups. This study shows that the integration of collaborative learning with crossword puzzles not only supports the understanding of computer network concepts but also plays a role in the social-emotional development of students. Thus, collaborative learning based on crossword puzzles can be an innovative learning strategy in informatics subjects that is holistically oriented.

Keywords: Collaborative Learning, Social Emotional Development, Informatics.

1. INTRODUCTION

21st-century learning now emphasizes not only cognitive mastery but also demands the development of social-emotional skills to equip students for social life and the workplace. According to Widiastuti, (2022) , the ability to collaborate, communicate, be creative in problem-solving, and manage emotions are essential competencies that must be developed through the learning process to equip students for the workplace. In practice, informatics learning in schools still tends to be oriented toward conceptual understanding and technical skills, while the development of social-emotional skills has not been optimally integrated. This situation indicates a gap between the demands of 21st-century competencies and classroom learning practices.

One learning approach considered effective in bridging this gap is collaborative learning. Collaborative learning can encourage students to collaborate to achieve common goals through the exchange of ideas, discussions, and collective problem-solving. In terms of education, collaborative learning promotes students' emotional development and skills in addition to their cognitive abilities(Pertiwi et al., 2024). Interaction activities in group discussions can require students to manage their emotions, respect the opinions of others, and improve effective communication skills. This is in line with who stated that a lack of social-emotional skills can trigger an inability to accept friends' opinions, interrupt conversations, and lack of self-control in learning. Social-emotional skills include the ability to recognize and manage emotions, solve problems, and build positive relationships with others(Merle et al., 2022). Social-emotional skills are essential in group learning activities, because children will interact with peers, so they must be able to manage their emotions to create a conducive learning environment. Social-emotional development plays a crucial role in helping children develop patience and cooperation skills with both peers and adults(Kogler et al., 2025).

Previous research has shown that collaborative learning can develop students' social-emotional competencies. Research by Nurvitarini & Karkono, (2024) demonstrated that collaborative learning with

multimodal texts effectively enhances students' social-emotional development. Meanwhile, research by (Cuhartati, 2021) demonstrated that collaborative learning based on a Twitter application on hydrocarbons can develop students' social-emotional competencies. However, both studies focused on subjects other than informatics and utilised multimodal and social media-based media. Therefore, specific studies examining the use of educational games such as crossword puzzles in collaborative learning in informatics are still limited.

In the context of informatics subjects, the integration of collaborative learning based on interactive media is important in increasing student involvement while honing their social-emotional skills. Crossword media has the potential to encourage interaction, cooperation between friends, and communication in the process of solving problems together. The more often students are given the opportunity to work together on a task, the faster they will learn to work together (Adl et al., 2024). In addition, collaborative learning allows students to simulate a real work environment, where collaboration and communication are key competencies. Thus, studying the social emotional development of students at school is important because it has a positive impact on the holistic development of students(Majidah & Ahmadi, 2024).

Students' social-emotional development includes the ability to understand and manage emotions, build positive social relationships, and adapt to the learning environment. According to Catala et al., (2023), the achievement of children's social-emotional development is assessed based on the following criteria: empathy, participation, communication, adaptability, self-confidence, a strong sense of curiosity, and displaying emotions appropriate to the situation. According to (Mardiah et al., 2023) emphasized that cooperative and collaborative learning are effective approaches to developing students' social attitudes because they foster cooperation, mutual respect, and a sense of community. Cooperative learning can improve academic achievement and significantly help students develop their interpersonal skills, especially the ability to work together effectively(Lorente et al., 2024). C learning is a method that can be used to optimize social-emotional development, particularly in the areas of cooperation, interaction, responsibility, and honesty.

Based on these theoretical and empirical studies, this study focuses on analyzing students' social-emotional development across five main indicators: (1) empathy; (2) self-confidence; (3) communication; (4) interactive attitudes; and (5) the ability to work together. These indicators are used as a basis for observing and analyzing crossword puzzle-based collaborative learning in computer networking informatics. The purpose of this study is to analyze crossword puzzle-based collaborative learning in computer networking on the social-emotional development of grade X E5 students. This research is expected to address the shortcomings of research related to the integration of educational games in informatics learning and provide practical and conceptual engagement in learning development, balancing students' technical and social-emotional competencies.

2. RESEARCH METHOD

This study employed a qualitative approach with a descriptive design, aiming to provide an in-depth description of the implementation of crossword puzzle-based collaborative learning and its role in students' social-emotional development. This approach was chosen because it allows researchers to understand learning phenomena contextually based on participants' experiences and interactions(Dewanti et al., 2023). The subjects were all 36 students in class X E5, consisting of 16 boys and 20 girls. The subject selection technique used saturated sampling, ensuring that all members of the population were included in the study. Further details about the participants are presented in Table 1.

Table 1. Participants

Participant	Gender	Total
Students	Male	16
	Female	20

Data collection was conducted through observation and documentation during the informatics learning process on computer networks. Observations focused on students' social-emotional behavior during crossword-based collaborative learning, while documentation consisted of learning notes, visual documentation of activities, and student worksheets. To ensure data validity, this study employed data triangulation in the form of technical triangulation and source triangulation. Technical triangulation employed different data collection techniques: observation and documentation. Source triangulation utilized students (observation and documentation). Time triangulation involved data collection during morning and afternoon lessons.

Data preprocessing was carried out through the selection and grouping of data from observations and documentation according to the research focus. After data collection, it was analyzed using qualitative descriptive analysis, which included data reduction, data presentation, and conclusion drawing. This analysis focused on five indicators of social-emotional development: (1) empathy; (2) self-confidence; (3) communication; (4) interactive attitudes; and (5) collaborative skills, compiled based on a review of relevant literature. The analysis results are presented in descriptive form to comprehensively illustrate the students' social-emotional development patterns. The observation sheet was tailored to the focus of this study and was conducted based on aspects of social-emotional development. Observation data were obtained during the learning process. The instruments used in this study are presented in Table 2.

Table 2 Observation Sheet Instrument

No	Aspect	Indicator
1	Empathy	Helping friends who are having difficulties
		Trying to understand other people's perspectives
		Caring about the problems/difficulties experienced by friends
2	Self-confidence	Confident in one's own abilities
		Boldly expressing opinions in front of the class/in group discussions
		Boldly taking initiative in group activities and taking responsibility for assigned tasks
3	Communication	Listening carefully when friends speak
		Expressing opinions/ideas clearly
		Actively asking questions if there is something you don't understand in the lesson
4	Interactivity	Actively participating in group discussions
		Able to adapt to social environments such as friends/group discussions
		Able to interact with friends
5	Cooperation skills	Working collaboratively or actively contributing with friends in the group
		Respecting the opinions of friends in the group
		Willing to share tasks with friends in the group

3. RESULT AND ANALYSIS

This study focuses on the analysis of the contribution of collaborative learning based on crossword puzzle media on computer network material to the development of social emotional competencies of class X E5 students. Based on the results of observations and documentation during the learning process, it was found that collaborative learning based on crossword puzzles was able to arouse active involvement of students and facilitate social emotional development. Based on the analysis data, the review of (1) empathy; (2) self-confidence; (3) communication; (4) interactive; (5) group cooperation skills. which were extracted from the data, are presented in Table 3.

Table 3. Results of observations of social-emotional development of class X E5

No	Aspects	Observation Result
1	Empathy	Students demonstrate concern for their peers' needs and help each other complete assignments.
2	Showing self-confidence	Students are willing to ask questions and express their opinions to both the teacher and their peers.
3	Communication	Open discussions and exchange of ideas are held among students.
4	Interactivity	Students actively ask questions, provide feedback, and participate in discussions.
5	Cooperation skills	Students are able to share tasks and solve problems together.

The results of this study indicate that collaborative learning based on crossword puzzles has a positive impact on students' social-emotional development. In terms of empathy, students demonstrated awareness of their peers' needs and willingness to share learning resources and tools, reflecting their ability to understand and respond to others' feelings. Collaborative learning plays a role in fostering empathy and mutual respect(Lorente et al., 2024). In terms of self-confidence, students demonstrated the courage to ask questions and clarify their understanding with the teacher. This indicates that a collaborative learning environment can create a sense of psychological safety that can encourage active student engagement (Partono et al., 2021). Communication and interactivity also developed through group discussions, the exchange of ideas, and the provision of feedback between students. These results support the opinions of ssPertiwi et al., (2024) that communication and active participation are key to effective collaborative learning. Furthermore, students' cooperative skills were also evident through the division of tasks and responsibilities in solving crossword puzzles. Classroom learning emphasises collaborative problem-solving as a critical skill for students. Integrated collaboration in learning focuses not only on academic understanding but also on developing the interpersonal skills necessary for real-world challenges and 21st-century workplace contexts(Gilbert & Gyöngyvér, 2025).

This study also demonstrates that collaborative learning based on crossword puzzles can create active and meaningful learning interactionsThis aligns with the findings of Godsk & Louise, (2025), that the use of learning technologies—including audience response systems, discussion forums, audio and video media, gamification, and other digital media—can increase interest and engagement in the learning process. Interactions in collaborative learning also provide opportunities for students to develop self-management skills, such as controlling thoughts, emotions, and behaviors, which impact the quality of social relationships and improve decision-making (Oliveira et al., 2021). These emotional and behavioral management skills contribute significantly to academic achievement and adaptive behavior in daily life, including facing challenges, managing emotions, and achieving positive goals (Chance et al., 2023; Niu & Niemi, 2022). Theoretically, the results of this study reinforce the understanding that integrating educational games into collaborative learning can be an effective means of developing social-emotional competencies. Practically, the results of this study provide involvement that informatics teachers can utilise crossword puzzle media as an alternative learning strategy to create interactive learning and be orientated towards developing students' social-emotional competencies.

4. CONCLUSION

This study concludes that the implementation of crossword puzzle–based collaborative learning in computer networking lessons contributes positively to students' social-emotional development. The findings show consistent growth across five key indicators: empathy, self-confidence, communication skills, interactive attitudes, and cooperation skills. The use of educational game media in a collaborative setting created meaningful peer interaction, psychological safety, and shared responsibility, enabling students to engage not only cognitively but also socially and emotionally. Thus, integrating collaborative learning with game-based media can serve as a holistic instructional strategy in informatics education, aligning with 21st-century competency demands that combine technical mastery with interpersonal and emotional skills.

However, several limitations should be acknowledged. The study involved only one class with a relatively small number of participants, limiting the generalizability of the findings. The use of a descriptive qualitative design emphasized behavioral observation without standardized quantitative measures of social-emotional development levels. In addition, the short duration of the intervention restricted the ability to capture long-term developmental changes and sustainability of the observed social-emotional improvements. These constraints suggest that the findings represent contextual insights rather than broad empirical generalizations. Future research is therefore recommended to expand participant diversity across schools, grade levels, and learning contexts to strengthen external validity. Employing mixed-methods designs with validated social-emotional assessment instruments would provide more objective measurement of developmental changes. Longitudinal studies are also needed to examine the sustained impact of collaborative game-based learning on both social-emotional competencies and academic achievement. Furthermore, comparative studies involving different types of educational games or digital collaborative tools could help identify which media most effectively support holistic student development in informatics education.

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