Problem based learning supported by flipped classroom approach to enhance collaborative skills of grade X-7 students at SMAN 1 Kasihan

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Abstract

Collaboration skills, which are one of the cores 21st-century competencies, have not been optimally observed in class X-7 of SMA Negeri 1 Kasihan. Therefore, the implementation of problem-based learning supported by the Flipped Classroom approach is necessary. The objective of this research is to analyze the improvement of collaboration skills after the implementation of problem-based learning supported by the Flipped Classroom approach in class X-7 of SMA Negeri 1 Kasihan. This research is conducted in two cycles as classroom action research. Data collection is carried out through direct observation during learning activities and distribution of questionnaires to the students to obtain their perspectives on the learning experience. The collected data is then analyzed using descriptive quantitative analysis. In the first cycle, the research results showed that the average collaboration skills of the students were 67.04 with a classical completeness level of 67.04%. This indicates that the implementation of problem-based learning with the Flipped Classroom approach in the first cycle has led to an improvement in students' collaboration skills. However, there is still room for improvement. Furthermore, in the second cycle, there was a significant increase in students' collaboration skills. The average score for collaboration skills increased to 75.46 with a classical completeness level of 75.46%. It can be observed that there was an improvement of 8.42 in the average collaboration skills and a similar increase in the classical completeness level between the first and second cycles. Based on the results of this research, it can be concluded that the implementation of problem-based learning supported by the Flipped Classroom approach is effective in improving students' collaboration skills.

Introduction

In the past few years, the field of education has undergone a paradigm shift, where the focus was once on mechanical learning without critical thinking, with an emphasis on rote memorization and storage of information found in books (Boser, 2018; Seel, 2012; Waks, 2006). The ability to memorize, known as rote memorization, was considered the lowest level of cognitive ability (Anderson et al., 2001). Anderson et al. explained that this ability encompassed recognition, which involves placing knowledge into long-term memory consistent with the presented material, and recall, which involves retrieving relevant knowledge from long-term memory (Anderson et al., 2001). An example of this ability would be recognizing and recalling important historical dates (Anderson et al., 2001). Consequently, students

in the past were primarily focused on memorizing information without truly understanding its meaning or significance (Ferlazzo, 2020; J. Lau, 2023; Orlin, 2013; Shapiro & Stolz, 2019). This approach could hinder students' ability to apply memorized information in different situations or to solve problems collaboratively (Hoque, 2018; Lodge et al., 2018; Tambychik & Meerah, 2010). As a result, the reliance on memorization as a learning method is no longer prioritized or mandatory, as times have changed. Current educational practices have shifted towards developing more crucial skills that enable students to apply their knowledge in social contexts and collaborative settings (Hoque, 2018).

Teaching and training on teamwork have become imperative to prevent students from becoming individuals who are arrogant and prioritize their own ego. Often, students with strong cognitive abilities tend to judge and belittle those with lower cognitive abilities (Schiano, 2021). Observations indicate that some high-achieving students struggle with teamwork skills, finding it difficult to engage in discussions and reach a consensus when faced with differing opinions during group activities. However, teamwork skills have been listed as one of the top skills for the future by UNICEF, following creativity (Watson, 2017). Similarly, Bernard Marr identifies teamwork skills as one of the twenty future skills required by everyone (Marr, 2022). Unfortunately, effective teamwork skills have not been demonstrated by students in class X-7 at SMA Negeri 1 Kasihan, Bantul, DIY.

The initial data was obtained through observations and discussions with the sociology subject teacher. It was found that during group activities involving both male and female students, male members tended to remain silent and did not actively contribute, leaving the female students to work alone. Additionally, during the discussion process, some groups struggled to reach a consensus, with certain members insisting on maintaining their opinions even when they had been rejected by others.

Based on the indicators of collaborative skills, approximately 45% of the students demonstrated good collaborative abilities, while 55% showed indifference in group activities. Among the indicators, the aspect of coordination, which involves respecting and listening to peers' opinions or answers, not dominating group tasks, providing opportunities for others to express their thoughts or speak, and refraining from acting bossy or commanding towards fellow students, showed promising results. Similarly, the aspect of willingness to accept input and share information also showed positive values. However, the remaining aspects, particularly communication and cooperation, still need improvement.

Therefore, it is essential to focus on enhancing communication and cooperation skills among the students to foster effective collaboration within group activities. Targeted interventions and teaching methods should be implemented to familiarize the students with these skills and improve their ability to work together in a cooperative manner. By doing so, the students' collaborative skills can be

significantly enhanced, leading to a more productive and harmonious learning environment.

Literature reviews indicate that collaboration or teamwork is a core skill of the 21st century (Graesser et al., 2020; Koehorst et al., 2021; Mcewan et al., 2017; Piniuta, 2019). This skill is also among the top five skills for the future according to UNICEF (Watson, 2017). Bernard Marr further explains that collaboration and teamwork are among the top ten skills most sought after for the next ten years (Marr, 2022b). He highlights that the changing nature of team collaboration, especially during the pandemic, which has led to the evolution of hybrid work, demands workers who can effectively collaborate and communicate with diverse colleagues and co-workers (Marr, 2022b). Numerous studies have demonstrated that collaborating in group tasks and projects, rather than working independently, leads to deeper information processing and more meaningful psychological relationships among participants (Smith & McGregor, 1992 Piniuta, 2019; Piniuta & Meyerzon, 2018).

Collaboration skills are of utmost importance to teach, as they provide numerous benefits to individuals and society (Conaway, 2021; Ilgen, 2006). Firstly, collaboration skills help individuals work more effectively and efficiently together towards common goals. This can lead to faster task completion and reduce the likelihood of conflicts or dissatisfaction. Secondly, collaboration skills are crucial for enhancing individuals' social and emotional abilities. Through working together with others, actively listening to their perspectives, and solving problems collectively, individuals can develop social and emotional competencies essential for building healthy relationships and managing emotions effectively. Thirdly, collaboration skills can contribute to the development of professional abilities and increase job opportunities. In an increasingly competitive job market, the ability to work collaboratively can enhance an individual's productivity. Lastly, collaboration skills are pivotal for creating a better society. Through effective collaboration, it is hoped that a stronger community can be formed to achieve broader common goals.

The objective of this article is to emphasize the importance of collaboration skills in education and identify the challenges faced by students in developing these skills. Through this research, we aim to discover effective approaches or teaching methods to impart and cultivate cooperation skills in students. By doing so, this article intends to make a valuable contribution to the advancement of holistic education and prepare students to tackle the demands of an increasingly complex and interconnected world.

Based on the above explanation, it can be concluded that an action is needed to improve the ability of collaboration. The author chooses to use problem-based learning as an effort to enhance the students' collaboration skills. This learning model is chosen because: Firstly, Problem-Based Learning (PBL) is a learning model that is based on problems or cases that must be solved by students, so that this learning

activity will focus on the problem-solving process that involves the application of knowledge and skills possessed by students. Secondly, Problem-Based Learning (PBL) presents students with problems that do not have definite answers, so it will challenge students to think critically and seek solutions to the problem. Thirdly, Problem-Based Learning (PBL) requires students to work independently as well as in groups, thus training critical and collaborative thinking skills. Fourthly, Problem-Based Learning (PBL) will mentor students to actively engage in the learning process, so that students will be accustomed to reflecting and asking questions about the existing problem and will develop their critical thinking skills. Fifthly, Problem-Based Learning (PBL) trains students to find and use valid sources of information in the problem-solving process, so that students will be accustomed to thinking critically and evaluatively about the information obtained (Baloche & Brody, 2017; Checchi, 2022; Le et al., 2018; Rachmad Syarifuddin Hidayatullah et al., 2020; Yew & Goh, 2016). This is also supported by previous research that Problem-Based Learning can improve students' cooperative attitudes (Almulla, 2020; Ayunda et al., 2023; Rahayu & Yulistiani, 2016; Wulandari et al., 2015).

The problem-based learning (PBL) approach, supported by the flipped classroom method, follows a systematic process to foster students' active engagement and problem-solving skills. The learning steps are as follows:

Cycle I:

a. Preparing Content: Several days before the class session, the teacher provides the necessary learning materials through YouTube videos, enabling students to access and review the content at their own pace.

b. Group Formation: At the beginning of the class session, the students are divided into six groups to promote collaborative learning.

c. Problem Orientation: The teacher introduces the problem that each group needs to solve collaboratively. The groups then observe and comprehend the presented problem.

d. Organizing for Learning: The teacher ensures that every group member understands their assigned task. Students engage in discussions and delegate responsibilities to gather data, materials, or tools required to address the problem.

e. Guided Investigation: The teacher supervises and guides both individual and group investigations, monitoring students' data collection progress. Students conduct research, seek references, and gather relevant information to support their group discussions.

f. Developing and Presenting Solutions: The teacher oversees the group discussions and assists in creating infographics, ensuring that each group's work is ready for presentation. The groups engage in constructive discussions

to generate problem-solving solutions, which are presented in the form of infographics.

g. Analyzing and Evaluating Problem-Solving Process: The teacher guides the presentation and encourages groups to provide feedback and constructive criticism to one another. The teacher, together with the students, summarizes the material. Each group presents their solutions, and other groups provide appreciation and feedback. The activity concludes with a summary and conclusions based on the feedback received from other groups.

Cycle II:

The second cycle follows a similar syntax of learning, with the main difference being the use of written materials instead of video content. The teacher distributes reading materials to students several days before the class session, along with the assigned problem for discussion. This modification is based on reflections from Cycle I to ensure students' readiness. Furthermore, in Cycle II, the teacher introduces the idea of rewarding the group that exhibits the best teamwork, fostering improved collaboration among the students.

By employing the problem-based learning approach with the support of the flipped classroom method, students are actively engaged in the learning process. They develop critical thinking skills, teamwork, and problem-solving abilities through hands-on experiences, discussions, and presentations. The systematic approach of the PBL cycle, coupled with the flipped classroom strategy, enhances the effectiveness of teaching and learning, creating a dynamic and meaningful learning environment for students.

Based on the background of the problem above, this study uses the Problem Based Learning (PBL) model to improve collaboration skills, supported by the flipped classroom approach. This is based on research results that show high motivation and self-efficacy in students because of flipped classroom (Davies et al, 2013; DeGrazia et al, 2012 in Tawfik & Lilly, 2015). Self-efficacy, or an individual's confidence in their ability to perform a task, is increased through flipped classroom because students can revisit or review the material provided before learning in school, so they are well-prepared and able to understand the material before class (Campillo-Ferrer & Miralles-Martínez, 2021; Tawfik & Lilly, 2015; Van Alten et al., 2021; Zhang, 2020). Therefore, this classroom action research is entitled "Problem Based Learning Supported by Flipped Classroom Approach to Enhance Collaborative Skills of Grade X-7 Students at SMAN 1 Kasihan".

Research Method

This study was conducted at SMA Negeri 1 Kasihan, Bantul, DIY in January 2023. The participants in this study were 36 students, consisting of 11 male students and 25 female students.

The research uses the classroom action research model developed by Kemmis and McTaggart. The cycle stages developed by Kemmis and McTaggart are Planning, Acting, Observing, and Reflecting (McTaggart & Kemmis, 1988). This research model is appropriate for the purpose of assessing students' collaboration skills in the learning process, so the implementation and observation stages are carried out at the same time. Observation and questionnaire filling methods were used to collect data in this study. The observation method was used to assess students' collaboration skills, as well as questionnaire filling. Observation was conducted by an observing teacher, while questionnaire filling was conducted by peers or group members who were collaborating. The collaboration skills indicators used are communication, coordination, cooperation, and exchanging information (West, 2002).

The application of analytical methods was utilized to address the research problem and facilitate problem-solving in this study. This involved a comprehensive explanation of the methods employed in problem-solving research. The research process involved the following detailed steps:

1. Planning Stage: In this stage, the research objectives, research questions, and hypotheses were formulated. The specific indicators of collaboration skills (communication, coordination, cooperation, and exchanging information) were defined based on relevant literature (West, 2002). The CAR cycle was planned and designed, including the determination of intervention strategies to improve collaboration skills.

2. Acting Stage: During this stage, the planned intervention was implemented in the classroom. The teacher provided learning materials in the form of YouTube videos and written materials, presenting the problem for students to solve collaboratively. Group formation took place, and students were assigned roles and responsibilities to encourage effective teamwork.

3. Observing Stage: In this stage, the teacher conducted observations to assess students' collaboration skills during the group activities. The teacher focused on observing communication patterns, coordination efforts, cooperation levels, and information exchange among the group members.

4. Reflecting Stage: Following the implementation and observation, data collection through questionnaires was carried out. Peers or group members assessed and provided feedback on each other's collaboration skills. Meanwhile, the teacher reflected on the effectiveness of the intervention strategies and the progress of students' collaboration skills based on the observation and questionnaire data.

By utilizing the CAR model of McTaggart & Kemmis in conjunction with analytical methods, this study aimed to obtain a comprehensive understanding of the students' collaboration skills and the impact of the intervention strategies. The application of each step of the CAR model was carefully described, providing a clear depiction of the researcher's actions and data collection approaches. This allowed for a more detailed and systematic analysis of the research process and findings.

In the process of data analysis and conclusion drawing, this research uses a quantitative descriptive statistical analysis method. This method is used to process data on students' collaboration skills in the sociology subject. The success criteria of this study are when the average result of the class collaboration skills is greater than or equal to 75% (Sutoyo, 2020). The success criteria of this study are when the average result of the class collaboration skills reaches 75% or higher. Classroom Action Research (CAR) is a type of research conducted by teachers in the classroom to improve specific conditions as impact variables. The success of CAR is not only assessed based on the methodology used and the level of confidence in the research results but also the effectiveness of the actions taken to improve the specific conditions as impact variables.

To assess the effectiveness of the intervention used in CAR and its impact on other variables, it is necessary to establish a standard or benchmark to determine the success of the intervention. Although there is no absolute limitation in measuring the success of CAR, the general benchmark is usually set at a minimum of 60% in terms of the scores achieved or the number of respondents as research subjects.

The determination of the standard or benchmark for success in CAR is adjusted by the researcher, taking into consideration the conditions and abilities of the research subjects. If the research subjects have sufficient capabilities, then the standard of success can be set higher than 60%. However, if otherwise, the benchmark for success is set at 60%.

Result and Discussion

In this study, the focus of the discussion is on improving students' collaboration skills through the implementation of Problem-Based Learning (PBL) supported by the Flipped Classroom approach in the subject of Sociology. Collaboration skills refer to students' ability to work together, communicate effectively, and coordinate well within a group to achieve common goals. The objective of this research is to enhance students' collaboration skills and determine whether the implementation of PBL with the Flipped Classroom approach can improve the quality of social interaction and cooperation among students during the learning process.

The study employed the PBL method, which centers on addressing social issues related to social interactions in society. As a preliminary step, students were provided with learning materials on the concept of social interactions in the form of videos or written materials before the classroom sessions. This was done to prepare students before engaging in collaborative activities in the class.

During the problem-based learning, students were encouraged to identify social issues related to social interactions in society. Each group of students was then tasked with analyzing the identified problem and seeking solutions collectively. This process promoted discussions, communication, and coordination among students within the groups to gain deeper understanding of the issue and come up with innovative solutions.

Throughout the implementation of PBL with the Flipped Classroom approach, students were empowered to be more active in their learning. They became not only recipients of information from the teacher but also seekers and processors of information independently. By watching pre-class materials, students had the opportunity to understand the subject matter at their own pace, and when they gathered in the classroom, more time was available for collaborative activities and discussions on problem-solving.

First, let's discuss Cycle I. The average formula was used to compare the average scores with the criteria of PAP on a four-point scale, resulting in the conclusion that the collaborative skills were categorized as very good, good, fair, or poor. Each indicator had a maximum score of 4 based on observations by the observer and questionnaire responses from students as a comparison conducted during the implementation of Problem Based Learning supported by the flipped classroom approach in the subject of Sociology. As a result, based on the observation data, the collaborative skills had an ideal maximum score of 100. The obtained data were then analyzed to produce an average score of 67.04. This average was converted into a four-point PAP scale, resulting in 67.04%. The average collaborative skills were compared with the four PAP criteria. The average percentage fell between 51.01% and 75.00%. This indicates that the students' collaborative skills were categorized as good. However, improvement is still needed. In Cycle II, improvements were made based on the reflection of the action research in Cycle I, by providing learning materials or topics based on students' choices and delivering them before the classroom meetings. This ensured that students had sufficient knowledge of the learning materials and were better prepared for the collaborative work when they formed groups and produced outcomes.

Based on the analysis of the data on collaborative skills on a scale of 100, with observation scores ranging from 50 to 83, the average collaborative skills of the students were 67.04, which placed them in the good category. This research was considered successful if the average score of students' collaborative skills was greater than or equal to 75, and the achievement rate reached 75%, according to the competency criteria for collaborative skills. However, based on the data of collaborative skills in Cycle I, this research did not meet the targeted criteria for achievement. At the end of Cycle I, a reflection was conducted using observation sheets and a questionnaire on collaborative skills at the end of the cycle as a guide. In Cycle I, the students' collaborative skills met the criteria of good and improved from the initial reflection before the action was taken. However, due to several constraints faced during Cycle I, the collaborative skills did not meet the targeted criteria. The constraints encountered in Cycle I included: (1) students were still not accustomed to working in groups, resulting in a lack of enthusiasm in collaborating with their group members; (2) Grade X students were not accustomed to working in groups as they had previously been accustomed to independent learning due to the online learning environment; (3) students had a tendency to interact with the same individuals, making it difficult for them to adapt well when they were grouped with other students; (4) the topics chosen for group work were too diverse, causing students to often stick to their own arguments and struggle to reach agreements due to limited class time.

Based on the difficulties encountered in Cycle I, the researcher and the teacher agreed to find alternative solutions to the challenges faced in Cycle I, which were then refined in Cycle II. The improvements made included: (1) motivating students to always work collaboratively

in their respective groups and appreciating or reinforcing students who expressed their opinions and accepted others' opinions well; (2) providing personalized approaches to students who were indifferent or reluctant to work in groups to change their attitudes; (3) providing appreciation or rewards to students with the best collaborative skills and to groups that demonstrated excellent collaboration.

Moving on to the results of Cycle II. Each indicator had a maximum score of four based on observations conducted during the implementation of Problem Based Learning supported by the flipped classroom approach in the subject of Sociology. As a result, the data on collaborative skills had an ideal maximum score of 100. The obtained data were then analyzed to produce an average score of 75.46. This average was converted into a four-point PAP scale, resulting in 75.46%. The average collaborative skills were compared with the four PAP criteria. The average percentage fell between 75.01% and 100.00%. This indicates that the students' collaborative skills in Sociology in Cycle II were excellent. Based on the analysis of the data on collaborative skills on a scale of 100, with scores ranging from 48 to 90, the average score obtained was 75.46, which falls within the criteria for excellent collaborative skills with a classical completeness of 75.46%. This research is considered successful if the average score of students' collaborative skills is greater than or equal to 75 and the classical completeness reaches 75%, according to the success criteria. This research meets the success criteria based on the observation data of collaborative skills in Sociology in Cycle II.

Table 1.
Comparison of Students' Collaborative Skills in Cycle I and II (by observer)

No	Collaborative Skills	Average	Classical Mastery	Succes Criteria
1	Cycle I	67,04	67,04%	Not yet succes
2	Cycle II	75,46	75,46%	Succes

Table 2.
Comparison of Students' Collaborative Skills in Cycle I and II (by students)

No	Collaborative Skills	Average	Classical Mastery	Succes Criteria
1	Cycle I	88,60	88,60%	Succes
2	Cycle II	91,41	91,41%	Succes

The tables above illustrate the distribution of students' collaborative skills during sociology lessons in Cycle I and after the intervention in Cycle II. Table 1 presents the average collaborative skills based on observations conducted by the teacher. On the other hand, Table 2 displays the results of questionnaires filled out by the students to assess the collaborative skills of their groupmates. The completion of questionnaires by the students aims to provide a comparison with the observation results by the teacher, in order to minimize subjectivity. Although the average collaborative skills assessed by the students indicate excellent

performance, with a score of 88.60 in Cycle I, the determination of Cycle II was based on the teacher's observation results, which did not demonstrate success yet.

The learning activities conducted to assess students' collaborative skills involved providing learning materials for students to study at home before class meetings. During the class, students were divided into groups, and each group was assigned a specific problem related to social interactions in society. The indicators used to assess students' collaborative skills included communication, coordination, cooperation, and information exchange.

In the classroom, students gathered in their respective groups and engaged in discussions and brainstorming sessions to analyze the assigned problem. They communicated their ideas, shared perspectives, and coordinated their efforts to come up with potential solutions. This phase allowed the teacher to observe how well students communicated with each other, how effectively they coordinated their actions, and how willing they were to cooperate within the group.

Furthermore, the groups worked collaboratively to create presentation media that would showcase their findings and proposed solutions. This involved dividing tasks, assigning roles, and exchanging information among group members to ensure the successful completion of the assignment. The ability of each group member to cooperate, contribute to the group's efforts, and exchange relevant information was closely monitored.

Throughout the collaborative work, the teacher assessed the students' communication skills, such as their ability to actively listen, ask questions, and express their ideas clearly. The teacher also observed how well the students coordinated their actions, whether they shared responsibilities, and how they managed conflicts or differences of opinion within the group.

In terms of cooperation, the teacher paid attention to the level of engagement and commitment shown by each student in the group work. Cooperation was assessed based on the willingness of students to help and support each other, their willingness to take on different roles, and their overall contribution to the group's progress.

Additionally, the teacher observed the information exchange process within the groups. This involved evaluating how well students shared relevant information, whether they were open to considering diverse perspectives, and whether they effectively integrated new information into their discussions and proposed solutions.

Based on the initial assessment, it was observed that the students' collaborative skills in terms of cooperation and information exchange were particularly visible and evident. The groups demonstrated a good level of teamwork and shared relevant information to collectively work towards finding solutions to the assigned problems.

However, there were areas that still needed improvement. The assessment revealed that some groups faced challenges in effective communication, and there were instances of limited coordination among members. These areas were identified as opportunities for further development to enhance students' collaborative skills.

Overall, the learning activities and assessments allowed the teacher to gain valuable insights into the students' collaborative skills, with a focus on communication, coordination, cooperation, and information exchange. By identifying both the visible strengths and areas for improvement, the teacher could tailor interventions and support to foster better collaboration among the students and promote their overall social interaction and teamwork abilities.

Collaboration is a process of working together with others to achieve desired goals (Woolfolk, 2007). In collaborative activities, it is important to build and develop communication among team members to clearly define their roles in the working relationship. Additionally, the process involves dividing the work among group members during the activity (Rusman, 2010). Collaboration is also defined as an interdependent performance component required to effectively coordinate the performance of multiple individuals, encompassing a set of interrelated cognitions, attitudes, and behaviors that contribute to dynamic performance processes (Salas et al., 2008).

There are five key characteristics of high-performing teams: first, the team's goals must be clear and shared by all individual members; second, the responsibilities and roles of all members must be clearly defined, with each member contributing according to their strengths and styles; third, each member must actively participate, take responsibility, and exhibit enthusiasm that leads to synergy; fourth, effective communication among team members should be based on trust, respect, and an understanding of group diversity; fifth, effective teamwork processes, such as meetings and decision-making, should be in place to facilitate team members' dedication to the team's goals (P. Lau et al., 2013).

The ability to collaborate can be observed when working on group tasks during learning activities. Some aspects of students' collaboration that can be observed include: consensus building, task completion and task sharing, participation in group activities, inviting others, completing tasks on time, questioning skills, respecting group members, summarizing and checking the work of group members (Yuni, 2012 Hilalliati, 2019). In addition, Michael West outlined aspects of group collaboration, such as communication, coordination, cooperation, and information exchange (West, 2002). These aspects were further elaborated in Nurnawati's study as the examined skills, namely oral communication skills, which include asking questions, answering questions, presenting, and commenting on opinions; coordination skills, which involve appreciating and listening to opinions or answers from peers, not dominating group work, giving opportunities to express opinions or speak up, and not acting bossy or commanding towards other students; cooperation skills, which involve interaction between pairs of students, responsibility for tasks, giving and receiving feedback, and having confidence in expressing opinions; information exchange skills, which include providing explanations of material or answers to peers, understanding opinions, and sharing information or knowledge (Nurnawati et al., 2012).

The flipped classroom approach can be defined as "what is traditionally done in school is done at home, and homework is done in school" (Bergmann & Sams, 2014). In this approach, before the lesson begins, students watch the theoretical part of the lesson through various tools such as online videos, presentations, learning management systems, and take notes, while also preparing questions about the parts they don't understand (Kim et al., 2014). During the lesson, they engage in supporting activities such as collectively finding answers to the questions they prepared before the lesson, working in groups, problem-solving, discussing, and making inferences (Formica et al., 2010). Flipped classroom is an approach that shifts the responsibility of learning from the teacher to the students (Bergmann et al, 2011 in Halili & Zainuddin, 2015).

The data analysis revealed that the average score for students' collaboration skills in group work using this approach was initially in the good category in cycle I, and then progressed to the excellent category in cycle II. This finding highlights the effectiveness of the problem-based learning model and the flipped classroom approach in fostering collaboration among students. By engaging in activities such as watching instructional videos, conducting group discussions, and solving problems together, students had the opportunity to actively participate, share ideas, and work collectively towards common goals. The clear and shared goals of the team, as well as the defined responsibilities and roles of each member, likely contributed to the improved collaboration skills observed in cycle II.

Moreover, the use of the Canva application as a tool for group assignments enhanced collaboration skills further. This virtual platform allowed students to collaborate asynchronously, providing flexibility in coordinating their efforts and contributing to the completion of tasks. The ability to communicate effectively, respect diverse opinions, and exchange information among group members were crucial aspects observed in the improvement of collaboration skills.

Overall, the research findings demonstrate the positive impact of the problem-based learning model supported by the flipped classroom approach on students' collaboration skills. This approach encourages active participation, fosters effective communication, and promotes teamwork among students. The use of technology tools like the Canva application further enhances collaboration by providing a virtual platform for students to collaborate and work together effectively. These findings have important implications for educators and suggest the value of incorporating such approaches into teaching practices to promote collaboration skills among students.

Conclusion

Based on the data analysis, it can be concluded that the use of the problem-based learning model supported by the flipped classroom approach can improve students' collaboration skills in grade X-7 at SMA Negeri 1 Kasihan. In Cycle I, the average score of students' collaboration skills when working in groups was in the good category. However, in Cycle II, students demonstrated excellent collaboration skills. The use of the Canva application as a tool for group assignments further enhanced collaboration skills, as students were able to collaborate virtually or asynchronously.

One supporting factor for this conclusion is the active engagement and participation of students in the problem-based learning model supported by the flipped classroom approach. The flipped classroom approach allows students to access instructional materials and resources outside of traditional classroom hours, which prepares them to actively contribute during class time. This pre-learning phase equips students with foundational knowledge and encourages them to take responsibility for their own learning. As a result, when students gather in the classroom or collaborate virtually using the Canva application, they can focus on applying their knowledge, exchanging ideas, and working collaboratively to solve problems. This active involvement and preparation contribute to the observed improvement in students' collaboration skills in Cycle II.

Furthermore, the use of the problem-based learning model with the flipped classroom approach also helps improve students' communication, coordination, cooperation, and information exchange skills. During the learning process, students are encouraged to discuss, share ideas, and work together in groups to find solutions to social problems. Through these discussions and collaborations, students learn to communicate effectively, coordinate tasks within the group, work as a team, and exchange relevant information to achieve common goals. This process strengthens students' collaboration skills comprehensively.

Various factors play a role in the success of improving students' collaboration skills in this research. Additionally, this research also contributes significantly to the development of problem-based learning methods supported by the flipped classroom approach, as well as the utilization of the Canva application technology to enhance virtual collaboration among students. Therefore, this research can serve as a reference for the development of more effective learning approaches to enhance students' collaboration skills in various educational contexts.

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