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The Effectiviness of Student Teams Achievement Division and Scrambel Combined Model on Collaborative Skills and Conceptual Knowledge Mastery of Class X SMAN 1 Semparuk on Bacteria

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Abstract: This study aims to analyze whether or not there is a significant difference in collaboration skills and mastery of conceptual knowledge of students who follow the STADBEL combined model learning in the experimental class with students who follow the Make a Match model learning in the control class on the subject of bacteria class X SMAN 1 Semparuk. In this study used non-equivalent control group design. The research sample was students of class X MIPA SMA. Sampling used cluster random sampling technique. The instruments used consisted of conceptual knowledge mastery tests and non-test collaboration skills in the form of questionnaires and self-assessment questionnaires of student responses to learning and student responses to learning models. Learning with the STADBEL combined model can be effective on collaboration skills and mastery of conceptual knowledge of students. A Sig value of 0.027 < 0.05, it is concluded that there is a significant effect of the STADBEL combined model on collaboration skills and mastery of conceptual knowledge of students. These results indicate that the STADBEL combined model effectively improves collaboration skills and mastery of conceptual knowledge of students of SMAN 1 Semparuk class X IPA on the subject of bacteria.

Keywords: Collaboration; Combined model; Effectiveness; Mastery of conceptual knowledge

Introduction

21st century education aims to shape students' intelligence abilities in learning so that they are able to solve problems that exist in their surroundings. 21st Century Education is an education that integrates knowledge, skills and attitudes, as well as mastery of communication science technology. These skills can be developed through many examples of activity-based learning in accordance with the characteristics of competencies and learning materials (Insyasiska et al., 2015). To address increasingly complex problems in a rapidly changing society, educators must coach students to use 21st century skills to think and act like real scientists, asking questions, conducting investigations, developing examples, teamwork, and communicating ideas (Kelley et al., 2016).

Entering the 21st century learning era is a learning transition that demands a change in the teacher-centered learning approach to a student-centered learning approach. The 21st century skills learning process is known as 4C skills, namely creativity, critical thinking, communication, collaboration. 21st Century Skills are essential for teaching knowledge in depth and demonstrating understanding through performance (Muhali, 2019). 21st century learning is inseparable from 21st century skills, one of which is learning and innovation skills. Thus, students are expected to have

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these skills in accordance with their field competencies. The application of 4C in 2013 curriculum learning if actually carried out in schools will have a tremendous impact on the nation's next generation to face the challenges of 21st century life (Sugiarti et al., 2018).

One of the 21st century skills is the ability to collaborate. Collaborative skills are one of the skills that invite students to be actively involved in cooperation and interaction during learning, so that learning becomes easier to understand. Collaborative skills can be applied in learning that invites active and communicative students to collaborate and compromise (Junita et al., 2020). Collaboration is specialized social interaction and learning where group members can actively and constructively solve problems (Lee et al., 2015). Cooperative skills are the ability to participate in any activity, build relationships with others, value mutual relationships and work together as a team to achieve a common goal (Lee et al., 2015). Collaborative skills are the ability to work together effectively and show respect for different team members, speak fluently and exercise the willingness to make decisions necessary to achieve a common goal (Greenstein, 2012).

In addition to collaborative skills, it is important to assess students' conceptual knowledge. Therefore, this research not only focuses on the area of collaborative skills, but researchers also continue to focus on the conceptual outcome aspect of knowledge management. Conceptual knowledge is a person's ability to understand or comprehend something that is known and remembered. In other words, understanding means knowing something and being able to see it from various points of view (Sudijono, 2020). Conceptual knowledge is a fundamental and important step in the teaching process and students are guided directly to understand concepts. Concepts become the basis for students to understand the material provided by the teacher so that students can demonstrate appropriately according to their understanding. Assessing conceptual knowledge to determine student success after the lesson is given by the teacher. In addition, it can be determined whether the teaching materials and models and methods used are suitable for students (Rosdianto, 2019).

In the biology department of the 2022/2023 school year in class X IPA SMAN 1 Semparuk, the cooperation skills of most students are still weak. This is because students are used to learning individually. Based on the results of school observations, students have not shown good cooperation skills. The average collaborative skills of students in the first observation were cooperation 2.42, flexibility 2.24, communication 2.40, compromise 2.18 and responsibility 2.40.

Based on the research of Nurwahidah et al. (2021), initial observations and interviews with biology teachers at Madrasah Aliyah Negeri 1 Dompu, Dompu Regency revealed that students still lack collaborative skills. In addition, teachers still lack pedagogical collaboration skills. Another observation that shows that students' cooperative skills are still weak is the lack of cooperation to complete group tasks both at school and at home, namely the tendency to do tasks between one or two people.

Poor collaboration skills and unchanged student learning methods also caused the knowledge results of Class X IPA students of SMAN 1 Semparuk in the 2022/2023 academic year. Students' knowledge scores on bacteria material were collected for Class X, 14 students for Class A (Completed) and 17 students for Class B (Completed). Students will be successful if the average score of KKM SMAN 1 Semparuk Bacteria >75. Students' incompleteness in learning biology shows that students' mastery of concepts is still weak, which is caused by several factors from the students themselves, teachers and the learning environment, and suggested learning strategies that are not varied with strategies, students are not interested and uninterested are not motivated in learning. In essence, course students not only receive information from the teacher, but also through interaction and learning together with their peers, thus creating a more active teaching atmosphere.

Yusup's research (2019), where students' knowledge of bacteria in biology subjects is still lacking. Of the 42 students, only 9 students or 21.43% passed and even 33 students or 78.57% did not pass, with an average of 56.92. KKM is allocated 70.

The problems that arose at SMAN 1 Semparuk were caused by the Biology teacher during the teaching and learning process. There are still many user methods or models that have not changed and still emphasize on teacher centeredness. During the teaching and learning process usually students are less involved in learning activities, afraid to ask questions or express opinions, do not cooperate in groups, students do not respect friends who are not close friends, and students underestimate when they are learning. This method makes students more easily bored in biology class, which weakens student motivation and lowers cognitive outcomes. Therefore, a new strategy is needed to implement biology learning.

Based on this, the researcher aims to find the best student learning improvement solution that can improve student collaboration and student conceptual knowledge by applying the STADBEL combined model, which is a learning solution and covers the shortcomings of both collaboration. In both models, students work in small groups, which allows them to work more effectively and efficiently. The researcher chose STAD and Scrambel because it supports the achievement of

collaborative indicators where learning can create a situation where students can share ideas and build their own knowledge, meaning that improving collaborative skills and knowledge students can. This STADBEL combined model will be used in one teaching unit at a time, assuming that each model has advantages that can be used in the teaching and learning process by influencing students' collaborative skills and conceptual knowledge of bacteria material can affect SMAN Class X. 1 Semparuk. The application of the STADBEL combination model in the learning process of bacterial material allows students to interact more, cooperate, communicate, compromise and adapt with teammates with teammates. Thus, students can understand the knowledge of the concept of bacteria. In addition, another advantage of the STADBEL combined model is that it involves students more in learning biology by helping each other, interacting and working in groups, providing a lot of data to students to solve problems and they can help each other to understand the material. Like that that the classroom atmosphere is more comfortable.

Based on the description above, the author feels the need to conduct research that focuses on combining two learning models that are likely to effectively manage students' collaborative skills and conceptual knowledge. In this case, the researcher was encouraged to conduct a study entitled "The Effectiveness of the Student Teams Achievement Division and Scrambel Combined Model on Collaboration Skills and Conceptual Knowledge Mastery of Class X High School Students on the Subject of Bacteria".

Method

This research is quantitative. The method used is quasi experiment with non-equivalent control group design. This research will use various data collection techniques, namely tests and questionnaires to obtain conclusions. The subject of this research is one class consisting of 30 experimental class students and 30 control class students at X SMAN 1 Semparuk. Tests will be given to see the improvement of conceptual mastery knowledge and questionnaires will be given to see students' collaboration skills.

Result and Discussion

Data Description of Collaboration Skills and Conceptual Knowledge Mastery Results

The average collaboration ability of students in both classes has increased, but the increase in the experimental class is greater when compared to the control class.

Table 1. Description of Collaboration Skills Activity Results

Description	Experiment Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Rata-rata	60	86	57	80
Min	50	75	50	75
Max	75	100	75	85

From this figure 1 about the activity of experimental class collaboration skills assessed by the observer Mrs. Yuliana Sihotang, S.Pd with the results of working together 93%, flexibility 80%, compromise 85%, communication 83 and responsibility 90%. Of the five aspects assessed, cooperation obtained the highest score. While the control class indicators of working together 82%, responsibility 84%, compromise 78%, flexibility 80% and communication 76%.

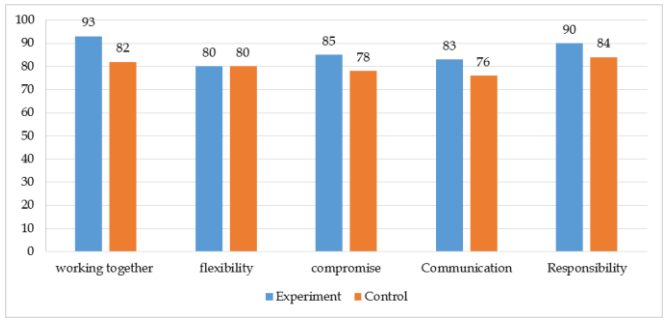

Figure 1. Student collaboration activity

Based on table 2, the results show that there is a difference in the ability to master students' conceptual knowledge between the experimental class and the control class.

Table 2. Description of Conceptual Knowledge Mastery Results

Description	Experiment Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
Sample	30	30	30	30
Min	35	50	30	40
Mx	70	95	70	95
Mean	51	78	49	69
SD	8.47	12.1	9.9	13.2

Table 3. Distribution of Mastery of Conceptual Knowledge

Interval	Category	Experiment		Control	
		N	%	N	%
< 74	Not Compleat	6	20	12	40
>74	Compleat	24	80	18	60

Based on table 3, it can be concluded that descriptively the ability to master the conceptual knowledge of students on the subject matter of class X bacteria in the experimental class meets the criteria for

completeness while the control class has not met the criteria because it still has not reached the average value of KKM> 75.

Hypothesis Test Results

Normality Test Analysis of Collaboration Skills and Conceptual Knowledge Mastery

If the correlation coefficient > r table, the data is multivariate normally distributed, meaning that the data in this study is multivariate normally distributed.

Table 4. Normality Test Results

Data	Coefficient	Sig.	Decision
Experiment	0.972	0.000	Normal
Control	0.973	0.000	Normal

Analysis of Homogeneity Test of Collaboration Skills and Conceptual Knowledge Mastery

Box's Test of Equality of Covariance Matrices is used to test the homogeneity of the covariance matrix. The result of the homogeneity test of collaboration ability and mastery of conceptual knowledge in the experimental class and control class is a significance value of 0.351 > 0.05, then Ho is accepted. So the covariance variance matrix can be considered the same (homogeneous).

Effectiveness of STADBEL Combined Model on Collaboration Skills and Conceptual Knowledge Mastery

Based on the results of hypothesis testing on Manova, a significance value of 0.027 < 0.05 was obtained. From these results it can be concluded that there is a significant difference between the experimental and control classes in the management of collaboration skills and conceptual knowledge. The use of the STADBEL combination model not only deals with concepts related to learning materials, but also actively participates in discussions. Students are trained to solve problems independently, collect information and communicate research results. Students not only actively participate, but also help each other and work together to solve problems. Haris (2016), utilizi a collaborative model with the ability to value teamwork and ownership while succeeding positively. According to Anwar (2006) suggests that teachers or lecturers can choose and combine two learning models to get different learning models. The combination of the two learning models is expected to strengthen each other, so that its application in the classroom will make students better understand the concepts of bacteriology.

In learning, students are not only responsible for themselves, but also for their group. With this STADBEL combined model, students can strengthen their self-confidence because they are motivated by other group members. Students also train their communication skills in discussions to exchange ideas (Astiti, 2018). Collaboration skills make the group move as a harmonious unit, making it easier to achieve group success in overcoming group problems. Basic problems such as differences in opinion and differences in heredity such as ethnicity, sect, race and religion in the group can be resolved quickly and do not hinder the discussion process in the group (Indrawan et al., 2021). Groups that function harmoniously make it easier for students to solve problems, especially during learning. Student participation in discussions and debates results in students building deeper knowledge to improve collaborative skills and conceptual knowledge management (Fransen et al., 2013).

Based on the above discussion, the STADBEL model can effectively improve students' collaborative skills and conceptual knowledge, because it improves students' learning outcomes, and the level of improvement is reflected in students' scores, independent learning resulting from this STADBEL learning can increase students' self-confidence, increase students' social flexibility and improve relationships between all students in one class, encourage students to be more active, increase students' creativity and increase their competitive spirit. According to Noor (2021), students can encourage members to work together, try to adapt to group members so that they can exchange ideas, help students to respect each other's opinions and accept criticism from group members, solve problems in the group by being kind and responsible. They are responsible for making decisions and helping students develop their ability to understand concepts.

Collaboration Skills Activity and Student Self-Assessment

Students' collaboration skills are measured from the scores obtained from the collaborative activity form assessed by the observer and from the self-evaluation form completed after learning. Then from the data of both classes both experimental and control classes get very good and good class scores, no one gets enough scores, and less good. This shows that the collaborative skills of the experimental and control classes are effective or successful. Looking at the percentage, it can be said that the ability to work together is high. This research is in accordance with the opinion of Zulfia et al. (2019) that learning with a collaborative model can improve students' ability to work together when solving is easier and easier. This is in accordance with Zubaidah (2016) that one of the skills needed in the 21st century is the ability to collaborate, where the form of developing student communication is the collection of knowledge in groups. Cheruvelil et al. (2014), Team members work well and take care of each other professionally and personally, have common goals and are passionate

about achieving goals so that team members have collaborative skills. Purwaaktari (2015) states that learning that emphasizes mutual learning relationships makes students more effective than learning alone, who do not understand become understand with the help of colleagues because they can participate more actively. Koening (2011), Learning that is able to increase the sense of responsibility, empathy, cooperation and mutual trust affects the improvement of cooperation skills in accordance with the framework of cooperation so that team members consider that cooperation is a shared responsibility and appreciate the individual contribution of each team member. In addition, they also demonstrate the ability to work effectively and respectfully with diverse teams.

Judging from the self-assessment sheet regarding student responses to learning (collaboration skills), student responses to the learning model and observer responses to the learning model can be seen in the table below.

Table 5. Student Self-Assessment and Observer Response

Data	Experiment	Control
Student self-assessment of learning	81%	74%
Students' self-assessment of the learning model	90%	81%
Observer response to the learning model	85%	79%

The results of the experimental and control classes are different. The results obtained from students' responses to learning showed that the experimental class had higher collaboration skills than the control class. The results of the criteria for students' responses to learning, the experimental and control classes are in the excellent response category, and the results of the observer response criteria to the learning model, the experimental class is in the excellent response category while the control class is in the good response category. This is in accordance with the research of Mawadah and Authary (2020), the response given turned out to get a good response from students, which is in a very positive category to take part in learning with the application of the coorperative learning model, a sense of pleasure is also caused by the cooperation of each group in understanding the Learner Worksheet (LKPD) to arouse confidence that they are able to understand the task. Then Kartila (2019) states that the collaborative model provides a positive response to cognitive, psychomotor and affective development. However, the improvement of cooperation skills can be hindered by several individual factors. Lee et al. (2015) that collaborative skills become difficult due to several factors of competition, friendship, individual personality, number of group members, individual competition situations, competition and limited learning time.

Learners' Conceptual Knowledge Mastery

Based on data analysis that the results of mastery of conceptual knowledge the significance value is 0.01 <0.05, then Ho is rejected and Ha is accepted, meaning that there is a significant difference in the mastery of conceptual knowledge of students in experimental and control classes. So it can be concluded that the experimental class and control class have a significant effect on the mastery of conceptual knowledge. This research is in accordance with the opinion of Jahidin (2019), which states that cooperative learning strategies have a significant effect on mastery of biological concept knowledge. The existence of a significant effect can be interpreted that the difference in mastery of biological concepts as a result of the application of learning strategies. The above results regarding the STADBEL combined model are in accordance with the opinion of Syaharani (2018) that, cooperative learning models can affect mastery of biological concepts. Roaisyah (2016) then states that collaborative learning models can influence the results of conceptual knowledge management. Thus, the research used the STADBEL model, which is otherwise in line with Hayati (2017) understanding of collaborative learning that the learning objectives help learners achieve optimal learning outcomes and develop social learning skills. These results are supported by Arends (2012) view, that student-directed learning carried out in groups raises interest, ability and growth in thinking about subject concepts. Suprijono (2009) explains that cooperative learning models can encourage effective learning, which is learning characterized by the fact that students more easily learn something useful, such as facts, skills, values and concepts.

N-Gain Test Analysis

The N-Gain test was conducted to determine the improvement of collaboration skills and mastery of students' conceptual knowledge. This test was conducted on pre-test and post-test data of experimental and control classes. The results of the N-Gain test for collaboration skills and conceptual knowledge mastery are in table 5 and table 6.

Tabel 6. N-Gain Test Results of Collaboration Skills

Class	Pre-Test	Post-test	*N-Gain*	Criteria
Experiment	60	86	0.62	Medium
Control	57	79	0.56	Medium

Based on these results, the experimental class has a higher average N-Gain value of collaboration skills compared to the control class. This shows that the

STADBEL combined model has better effectiveness than the Make a Match model.

Table 7. N-Gain Test Result of Conceptual Knowledge Mastery

Class	Pre-Test	Post-test	N-Gain	Criteria
Experiment	51	78	0.55	Medium
Control	48	69	0.4	Medium

Based on these results, the experimental class has a higher average N-Gain value of conceptua l knowledge mastery compared to the control class. This shows that the STADBEL combined model has better effectiveness than the Make a Match model.

From the increase in collaboration skills of experimental and control classes calculated using the N-Gain formula, it can be seen that the N-Gain value of the experimental class is 0.62 which is included in the moderate category, while the control class is 0.56 including the moderate category. Based on these results, it can be concluded that the experimental and control classes are effective in improving collaboration skills. Septiawati et al. (2021), state that collaboration includes designing, working together, considering all points of view, participating and contributing, communicating, listening to others, and helping them find answers to various difficulties. Osman et al. (2011) stated that, collaboration encourages to interact with each other, articulate their perspectives and resolve differences in understanding, and supports students to build understanding of the topic.

Correlation

The correlation test was conducted to determine whether there is a relationship (correlation) between two variables, namely collaboration skills and mastery of conceptual knowledge. This correlation test was carried out by looking at the results on the posttest of the two abilities. The analysis used is Pearson Correlation. The correlation test results can be seen in table 8.

Table 8. Correlation of Collaboration Skills with Conceptual Knowledge Mastery

Data	*r*	Sig.	Decision
Collaboration Skills	0.501	0.000	Medium
Conceptual Knowledge Mastery	0.501	0.000	Medium

Based on Table 8, it is known that the value of Sig. (2-tailed) < 0.05, then H0 is rejected and Ha is accepted, this means that there is a positive and significant relationship between collaboration skills and mastery of conceptual knowledge. In addition, it is also known that the Pearson Correlation value is 0.501. So based on the correlation interpretation, the level of relationship between collaboration skills and mastery of conceptual knowledge of students on the STADBEL combined model is quite strong. This means, the higher the collaboration ability, the higher the mastery of conceptual knowledge.

Collaboration skills contribute to the achievement of students' conceptual knowledge because collaboration activities allow students to be active in the learning process. During collaboration, students are responsible for completing tasks and the various knowledge they have. This is in accordance with the research of Brindley et al. (2009), where collaboration involves sharing knowledge to produce richer knowledge through joint investigation and achievement of shared meaning. Eshuis et al. (2019) that collaboration increases the number of students in the learning process, thus leading to increased conceptual knowledge. These results are in line with research (Shofiyah et al., 2022), collaborative skills have a fairly strong relationship with cognitive control. Group collaboration offers opportunities for constructive work with peers and enriches knowledge and understanding of concepts so that learning outcomes are also better (Agustanti et al., 2022). Reading problems together, they share thoughts or ideas so that it leads to the formation of new knowledge (Santrock, 2017). In addition, during collaboration, there is interaction between group partners, this interaction encourages cognitive conflict, reveals differences in each other's knowledge, which improves students' conceptual understanding (Graesser et al., 2018).

Conclusion

Based on the formulation of the problem and hypothesis, it can be concluded that there is a significant difference in the experimental class using the STADBEL combined model with the control class using the Make a Match model related to collaboration skills and mastery of conceptual knowledge with a significance value of 0,027. These results indicate that the STADBEL combined model effectively improves collaboration skills and mastery of conceptual knowledge of students of SMAN 1 Semparuk class X IPA on the subject of bacteria.

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Author Contributions

The results of this study can provide empirical information about the effectiveness of the STADBEL combined model in relation to students' collaborative skills and mastery of

conceptual knowledge. This knowledge can strengthen the theory or the concept of the STADBEL combined model, especially the effectiveness of collaborative skills and mastery of students' conceptual knowledge.

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Conflicts of Interest
The authors declare no conflict of interest.

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