Utilisation of mind map and TPACK within-pair check to enhance communication skill

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Abstract. The urgency of improving skills is a problem in one of the schools in Yogyakarta, especially communication skills in learning. Therefore, this study aims to improve communication skills by utilising mind mapping and TPACK (Technological Pedagogical and Content Knowledge) in a pair of checks. The subjects of this study were thirty-eighth-grade students of Junior High School (JHS) of 5 Banguntapan Yogyakarta, totalling thirty-two students. This research is qualitative research with a class action research design. Classroom action research by referring to the Kemmis & McTaggart model, namely through stages (1) planning; (2) implementation; (3) observation; (4) reflection. The four stages are carried out in cycles. Data collection is done by observation, questionnaire and documentation. Observations were made to find out the pair of mind check assisted with mind maps. The questionnaire is filled in by students to find out communication skills. Documentation to document student and teacher activities during pair check assisted with a mind map. Data analysis techniques using quantitative descriptive analysis with percentages and qualitative descriptive. The results showed that the average communication skills increased by 5.55%.

1. Introduction
The era of revolution 4.0 requires everyone to make changes always, so they can prepare themselves in facing global competition. This era of revolution caused a change in the way of life and work [1]. Oral and written skills are very important to help all the challenges of the Revolutionary Era 4.0. Also, each individual has a role as social beings to do a social interaction to fulfil their needs, such as emotion, mind, dreams, and hopes through oral and written [2].

Each individual can develop ability in their academic and professional life by elaborating communication, leadership, and entrepreneurial skills [3], [4]. Furthermore, communication skills are needed by students to engage in learning activities, so they can find their knowledge when collaborating with other students. Nowadays, the student-centred learning process has been developed in Indonesia. Thus, students are required to be independent and can complete, as well as socially responsible, collaborating, and providing assessment [5].

The results of observations of learning science in a class of VIII A at Junior High School (JHS) of 5 Banguntapan Yogyakarta show that most students still have difficulty to focus when learning.
in learning science have used learning facilities such as projector, teaching aids, and laboratory equipment in schools. However, students still have halted on communicating, both verbal and written. The questions only arise from a few students. Students take notes as the teacher’s notes on the board and cannot use these notes optimally. Students are less optimal in understanding the topic because when studying, they did not make their notes. In a group discussion, it was dominated by only a few students and it seemed that students still rarely expressed their opinions, asked questions or shared assignments. One problem with scaffolding is that students have difficulty in transferring habits that they have mastered in the classroom for communicative use outside, challenging the idea that learning means forming a set of habits [6]. These factors come up as difficulties in doing assignments, especially in describing the material in front of the class.

Learning objectives will be achieved if the learning process students gain meaningful knowledge and learning experiences, which can engage students actively and optimally [7]. In the learning process, the most important thing is to improve a variety of skills that can be used to solve problems in real-life situations of students [8]. Through the pair check type cooperative learning model assisted with a mind mapping is expected to improve students’ communication skills as results, the understanding of science material will improve significantly. This model attracts students to think critically with a deep level of accuracy [9]. The use of mind mapping allows students to associate with the concept of material quickly, develop their creativity and be able to retell what they summarised [10].

Class teachers, in this case, are also required to have Technological Pedagogical And Content Knowledge (TPACK) capabilities. TPACK as the fundamental skill to effective teaching and understanding of concept representation by the use of technology; pedagogical techniques that use technology constructively to teach content; knowledge of the factors that cause difficulties or clarity in learning a concept, and ways that support technology to solve some of the problems experienced by students; knowledge of students' initial knowledge and epistemological theory; and knowledge of how to use technology to construct knowledge, grow or establish epistemology[11]. The technology integrated into mind check assisted pair mind teaching in this study can be in the form of video utilisation and powerpoint slides.

2. Method
This research is a classroom action research involving the Kemmis and Taggart models, namely (1) planning, (2) implementation, (3) observation, (4) reflection conducted in cycles. This CAR was carried out for four months in the odd semester. This class action research was carried out in a class of VIII A at JHS of 5 Banguntapan, Yogyakarta. The subjects of this study were eighth-grade students, many 32 students.

Collect research data used to observation, questionnaires, and documentation. The observation phase is an activity recording or data retrieval to be acquainted with the effects of the action that have reached the target. Observations were made by using an observation sheet to conceive the activities of teachers and students when implementing the pair check type assisted with mind mapping in the class of VIII A, looking at the communication skills that emerged during the learning process. The documentation was a list of student names and photos of learning activities in class. The questionnaire was filled by students to find out communication skills towards the implementation of natural science learning by applying a mind mapping based pair check. This assessment is carried out by friends in a team, which uses as a triangulation of research data. An indicator of the success of this action is the activities of teachers and students improvement from the initial conditions to the first cycle, and from the first cycle to the next cycle. This class action research was declared successful when 50% of communication skills aspects in learning science reached a percentage of ≥70%.

The implementation of the learning process has been measured by an assessment which uses two choices scales (yes with a score of 1, not with a score of 0). The results will be described as descriptively. Improved student communication skills used Likert scale. The status that presented on the instrument is 5: Strongly Agree; 4: Agree; 3: Enough; 2: Disagree; 1: Disagree strongly. The score of communication skills was calculated by the total score of the acquisition of students' communication skill items
compared to the maximum score multiplied by one hundred per cent. Reference in determining the standard classification of communication skills can be seen in table 1.

| Predicate  | Score   |
|------------|---------|
| Very good  | 81 – 100|
| Well       | 61 – 80 |
| Enough     | 41 – 60 |
| Less       | 21 – 40 |
| Very less  | 0 – 20  |

3. Results
Class action research in a class of VIIIA at JHS of 5 Banguntapan Yogyakarta was carried out in two cycles. In the first cycle, it was held for three meetings; the first meeting talked about Force and Newtons’ first law, the second meeting talked about Newtons’ second law and Newtons’ third law. The third meeting was held to evaluate and fill in a peer questionnaire. In the first cycle, the researcher prepares the lesson material such as the lesson plans using mind mapping based pair check, observation sheets, learning media needed for learning, and research, documentation and questionnaire instruments.

The implementation of the action and observation in the first cycle as follows the teacher presents the concept with a learning video. When the teacher conducts discussions, the students still look shy to answer and respond to the teacher’s questions. The teacher divides students into eight heterogeneous groups. In one group, there are two couples namely a trained partner and observing partner. Students seem uncomfortable when sitting with other students, especially those of different gender. Several students sitting far from each other and some even chose not at one team table. There has been no election of the chairman and in choosing a pair of partners is still according to their respective desires. The teacher has not confirmed the way to choose the partner and the role of each partner.

Then, the teacher distributes the questions or text, manila paper, and worksheet to each pair. Some partners have not written their identity on paper and worksheet. The teacher teaches how to make mind mapping. After that, the teacher asked students to read the textbook with a partner. At the time of video playback, students have not added the material obtained in mind mapping. In the question and answer session, students do not dare to present the mind mapping that was made. Therefore, the teacher finally appointed several students to present the results of the worksheet. Students' abilities are still lacking in asking questions, responding or expressing opinions. Most teacher questions answered with all the students in the class simultaneously.

The teacher asks the results of worksheet and video analysing in mind mapping. The teacher has not asked students to read textbooks and add notes in their mind mapping and some couples have not written what was studied, both video and worksheet in mind mapping completely. It can happen because students have not ready yet to create their ideas in mind mapping. It seems that students have not been able to carry out discussions properly; some couples are quiet dependent on other couples or their partners. The teacher has gone around but has not travelled around all the tables, in order that, the teacher has not confirmed the concepts that have been written on mind mapping and worksheet in each pair. The teacher has not given a clear time limit at this stage.

The teacher allows students who act as trainers to ask questions about the contents of the text reading to partners, and the trainer checks partner answers. Students are also still confused in formulating questions so that it takes a long time. At this stage, the teacher gives a coupon paper, but the partner does not thoroughly understand the explanation of the coupon gives. It appears that several pairs of students are also still confused about their roles. During the question and answer session, it appeared that several partners were still opening books and mind mapping. The couple also looked confused to determine whether the other pair's answer was correct or not, so there was still a commotion when giving coupons. The coupons given were unclear and scattered under the table.
The teacher allows the partner to change roles. The teacher has not reminded each pair to give their partner time to think the answer. At the time of switching roles, some students were not ready with the questions so it takes a longer time. Some students check answers by opening a book and they do not read their mind mapping or memories that they have understood in the study of material or reading.

Each pair returns the first team and matches each other's answers. At this stage, mind mapping is also checked from each pair in one group to be able to provide input to the other pairs. The teacher has not instructed the pairs to present the mind mapping that has been made to the other pair. The teacher has not asked student representatives to read mind mapping to the front of the class. Some students cheat on the results of other couples' mind mapping.

The teacher guides and provides direction for questions and answers from students. Students have not submitted questions that are difficult to answer, and it seems students also have not been able to understand the importance of mind mapping in learning. Some students tend to be passive, and the same students so dominated the class. At each stage, the team checks the answers, but the teacher is less evident in asking each pair to check and check the other pair’s answers. The time given by the teacher is limited. No pair protested against the coupon decision, and there were some students who did not get a coupon. Some students have not noticed and checked the answers from the group/team/partner.

The teacher should give the team that gets a lot of coupons a gift, however, the teacher has not given a reward because the teacher has troubles in calculating the acquisition of coupons and the truth of the group's answers on worksheet and mind mapping. The learning time has run out so the teacher directly carries out closing activities. The results of students' communication skills in the first cycle are shown in Figure 1 below.

![Figure 1. Student Communication Skills VIII A Banguntapan State Middle School in First Cycle](image)

Figure 1 shows that the percentage of communication skills in the first cycle in the evaluation aspect is below 70%. Students are less able to understand the meaning of each data in different ways, less able to see content or data through different ways or perspectives, less able to show the truth of various data or opinions and less able to distinguish facts and conclusions. This is also supported by the mind mapping results of several pairs and the lack of students knowledge in presenting their mind mapping to others.

Based on the implementation and observation stages, this research reflection produces several recommendations for improvement in the next cycle. There are several recommendations for the next cycle as follows:

- The teacher should set the place and way of sitting students in order to students focus well. Students who are passive collaborate with active students, have a good understanding of concepts and ways of communicating, are regrouped so that they can help students learn. The teacher clarifies the role of the pair by adding the writing of partners and coaches to each team. The teacher also reminds them to have a sitting side by side to each other’s partners. In concrete terms, the teacher exemplifies how to create the core reading into mind mapping and the use of colour, especially in making branches that must be developed in mind mapping.
• When walking around, teachers can reprimand students who are still passive or have not helped their partners and can also assist in solving difficulties faced by students and direct the division of tasks in pairs. The teacher intensifies mentoring in each group in checking the mind mapping that is made and aligns the concepts if any, are not appropriate. The teacher clarifies the time limit at each stage.

• The teacher shares different material between the two pairs in a team so that students more easily understand what is stated in mind mapping. Mind mapping is exchanged one with another pair, and at the question-making stage, each pair is given time to make questions based on the mind mapping they hold and write them down on the question paper.

• The pair of trainers can learn and check answers by looking at the mind mapping held. The teacher reminds the pair of trainers and partners to give time to think in answering questions during question and answer between pairs.

• For checking answers, the teacher can ask each team to attach the mind mapping results and ask student representatives to present the team mind mapping.

• For easy calculation of coupons, coupons are affixed to each mind mapping. After that, the teacher can give awards to the best group.

The second cycle was also held for three meetings. A meeting was held with the material Skeleton with the material Muscles and Disorders of Motion Disorders in Humans and Prevention Efforts and thirdly an evaluation and questionnaire/peer assessment were held. The first phase is carried out the same as in the previous cycle and the implementation of actions in this cycle implements recommendations for improvement of reflection cycle I. Based on the results of observations, the implementation of the mind mapping based pair check has been carried out as planned. The teacher has been able to make the improvements suggested in the cycle I well. This resulted in more effective and efficient learning time. Students appear to be more attentive and enthusiastic in participating in learning activities. Students can actively learn to gain knowledge by being guided by the teacher. The implementation of learning is more dominant student-centred so that learning is more meaningful for students. The results of students' communication skills in cycle II are shown in Figure 2 below.

Figure 2 shows that the percentage of communication skills in the second cycle in the evaluation aspect was already above 70%. After studying the media, worksheet, and textbook, students understand the meaning of each data in different ways, identify the content or data through different ways or perspectives, can show the truth of various data or opinions and are less able to distinguish facts and conclusions. This is followed by the mind mapping results of several pair who have described the interrelation of concepts and the growing courage of students to present their mind mapping to others in front of the class.

The second cycle reflection was discussed with collaborators, the teacher had captured the intention of improvement and could improve and implement the solutions offered / mutually agreed upon in the implementation of a cycle I so that they did not experience new problems and indicators of learning success had been achieved as expected. The teacher feels happy because the implementation of the pair
check type cooperative learning model with mind mapping can run smoothly. Students also feel they can learn in a fun way.

4. Discussion
This study shows that the application of mind mapping based pair check can improve the communication skills of eighth-grade students of JHS of 5 Banguntapan. The improvement of communication skills is shown in Table 2.

Table 2. Communication skills of the class of VIIIA students in cycle I and cycle II

| Aspects     | 1st Cycle | 2nd Cycle |
|-------------|-----------|-----------|
| Expression  | 70.6      | 73.8      |
| Evaluation  | 68.2      | 73.5      |
| Respons     | 73.6      | 74.7      |
| Negotiation | 71.6      | 84.2      |
| The mean of communication skills | 71 (Good) | 76.55 (Good) |

The results showed that the mean of communication skills in cycle II increased from cycle I, from 71% to 76.55% in cycle II. This happens because the mind mapping based pair check makes it easy for students and their partners to recall what they have learned and communicate it with fellow partners, teammates or with friends from other group teams. Students have a chance to practice their way of communication between students hence, students get used to being able to express, quickly evaluate, respond and negotiate between friends one partner, one team or one class. Structured communication is very different in cooperative learning classes.

Meaningful learning is an essential component that can great if it integrated into new framework concepts and relevant concept [12]. Mind mapping is a revolutioner system of learning which connected to students ideas [13]. Mind mapping can provide opportunities for students to be more active and motivated in learning by luring students to be more imaginative and creative in developing their potential brain work and thought patterns so students can think actively, critically, full of ideas, and easily manage as well as remembering all forms of information conveyed by the teacher. Students can learn to take notes or much material in an interesting form more densely and clearly. Mind mapping stimulates students’ creative thinking and encourages [14]. Mind mapping can help the brain to organise, remember, compare and make connections so that it can facilitate the addition of new information. If students can represent or manipulate a complex set of relationships in a diagram, they are more likely to understand those relationships, remember them, and to be analyse their component [12]. Life is inexorably busy, and if it is potential to keep a set of notes that takes only minutes to review before each session, this can get preparing for a teaching session less demanding on time [15]. In the learning process, the crucial part is the transfer concept or idea to students. Learning assisted mind mapping is a
grand way to each student determine which concepts, ideas, or information end up being represented in their maps [16].

The learning outcomes in the form of optimal communication skills are also due to the integration of technology in learning so that mind check assisted pair maps can be useful. In this case, the role of the teacher who is capable of TPACK as one of the keys to conducting peer check is assisted with mind maps. TPACK offers a framework for understanding how teachers’ flexible knowledge of content, pedagogy, and technology interacts and enables teachers to apply effective instructional practices during integration technology in teaching [17].

All of the phase and media will lead students to complete their communication skills. Communication skills are critical skills needed in work and daily life. Verbal and nonverbal are types of communication skills that can be teaching in the class [18]–[20]. Verbal and nonverbal of communication skills make the students more comfortable to face their social life [21]. Self-empowered more productive than the others who never train their communication skills [22]. Then, communication skill is a part of the self-developing program [4]. Therefore, students can get many skills as long as they attempt to be active in the learning process. Case action research has been done to show that communication skills can be improved by training. Students need another to practice their skills and communicate their ideas. Nerve system will take voice wave in a place to another place so that communication can work out their nerve system [23]. A lot of communication skills benefits can be caught by students, such as informative, educative, persuasive, and entertainment [24]. Students strive to show systematic ideas in the learning process [25], [26].

Conclusions
The mind map and TPACK within-pair check can improve student’s communication skill. The results showed that the average communication skills in the second cycle increased with a gain of 5.55%. The effectiveness of implementation mind map within-pair check is supported by teacher’s TPACK.

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