Enhancing student achievement using the fungi learning media supported by Numbered Head Together learning

C Sinambela¹, S H K Sirait², N I R F Nasir³, and I Damopolii²,*

¹SMA Advent Supiori, Jl. Sarwarker, Supiori 98573, Indonesia
²Jurusan Pendidikan Biologi, Universitas Papua, Jl. Gunung Salju Amban, Manokwari 98314, Indonesia
³Corresponding author: i.damopolii@unipa.ac.id

Abstract. Even more paper waste was generated daily. It is coming from the workplace or other. In biology topics, paper waste can be reform into learning media, e.g., in fungi topics. The Numbered Head Together (NHT) model can support its application in learning. Examine the effectiveness of fungi learning media supported by NHT learning models to enhance student achievement was the aim of this research. Classroom action research was being used. Eighteen grade X students in a private school were research subjects. Observation sheets were used to observe student activities, while the test was used to measure student achievement. The data were analyzed using the percentage. The results showed that students' activities in the first cycle were 88.09%, and the second cycle was 94.05%. In the first cycle, student achievement was 44.44%, and in the second cycle increased by 38.89 to 83.33%. Findings revealed that student activities and progress could be enhancing by implementing fungi learning media supported by the NHT learning model. Learning media made from paper waste can be used by teachers to improve their students' performance.

1. Introduction
Observations conducted in one class at a private high school found several problems. The problem is that (1) there are fungi learning media that are made in a modern way or use paper waste; (2) students find it challenging to understand the material presented by the teacher; (3) learning is not student-centered; (4) students are passive; (5) they look bored with education; (6) students are less focused on the material that given their teacher; and (7) very few students actively asked questions. Students' completeness on the fungi material was 11.77%. This achievement has not yet reached school standards. The students who complete must reach 80%. It is necessary to use learning media, and implementation requires the support of an appropriate learning model.

Even more paper waste was generated daily. It is coming from the workplace or other. In biology topics, paper waste can be reform into learning media, e.g., in fungi topics. The utilization of paper waste reduces environmental pollution. Of course, the use of paper waste becomes a learning media to support the nature conservation process. In the learning process, learning media plays an essential role in conveying scientific facts to learners. Using media in the learning process makes students interested in learning [1]. An appropriate learning model must support the implementation of learning media. The selection of media and learning strategies must apply to the student learning situation [2,3]. Learning that can be used is the cooperative learning strategy type numbered head together (henceforth NHT).
The cooperative learning model (henceforth CLM) expects teachers to see and consider the learning used for their students [4]. CLM helps students with the challenges of the 21st century [5]. Teachers must implement CLM in the classroom learning to build student development and solidarity [6]. In cooperative learning, there are small groups where students are interdependent [7], create social bonds among group mates [8], improve students’ intrinsic motivation [9], and change students’ intentions to learn [10]. Students do not work alone, but they will collaborate with team members [11,12]. One type of CLM is numbered head together (NHT). However, cooperative learning must be appropriately handled in its implementation [13].

Several studies have shown that the use of NHT learning is right for student performance. For example, as many as 93% in the second cycle achieved complete [14], improved student cognitive learning outcomes, student motivation and retention [15], and even improved the quality of non-science students to understand science [16]. However, on the other hand, the NHT model seems not yet sufficient for student learning outcomes. The mean learning outcome is 69.75 [17]. The mean score is 11.17 out of a total score of 20 [18], and has not yet reached 80% that is complete [19]. Research by Lange, Costley, and Han [20] found that students responded more favorably to other cooperative learning than NHT. Lacking a strong influence from the NHT model, teachers need to complement other practices [21].

Further studies may explore the impact of cooperative learning elsewhere [22]. There need to be other creativities in using NHT [18]. The combination of NHT models and learning media can get good results. The mean score in the last cycle was 71, with students completing 88.2% NHT assisted by visual media [23]. There is an improvement in student achievement when the NHT model combination with learning media.

Judging from the problems in a private school in Manokwari, where student learning outcomes are not optimal, and the use of NHT learning is not optimal to enhance student achievement. On the other hand, environmental conservation support can be done by reprocessing paper waste into learning media. Implementation of learning media made from paper waste can run well if the NHT model supports it. This combination is a good idea for improving student achievement. The research objective was to reveal the effectiveness of learning media supported by NHT learning models to enhance student achievement.

2. Methods

Classroom action research was being used. The action model of Kemmis and McTaggart was used in this research. It consisted of four-stage, that is a plan, act and observe, and reflect. Eighteen grade X students in a private school were research subjects.

Planning stage. The initial planning stages are researchers compiling lesson plans based on basic competencies to be achieved, preparing student worksheets, learning outcomes tests, student observation sheets, and making learning media. Learning media was made from paper waste. Paper waste is blended until smooth and formed into a learning medium. After the media was formed, the painting was done. The expert validates the instrument that has been made. Devices are valid if they get a percentage of ≥ 70%. The validation results are shown in Table 1. Examples of learning media are presented in Figure 1.

| Table 1. Result of expert validity |
|-----------------------------------|
| Learning device | % | Decision |
| Lesson plan     | 85 | Valid, Lesson plan can be use |
| Student worksheet | 85 | Valid, Student worksheet can be use |
| Student observation sheet | 77.5 | Valid, Student observation sheet can be use |
| Test             | 82.5 | Valid, Test can be use |
| Learning media   | 87.5 | Valid, Learning media can be use |
Figure 1. Example of fungi learning media

Action and Observation Stage. This stage is the implementation of the biology learning process. The material taught is Fungi. Learning is carried out based on the lesson plans that have been made. The implementation of the lesson plans follows the Numbered Head Together learning model. Learning activities are divided into three, namely preliminary, core, and closing. When learning is in progress, observations are made for student activities. During the learning process, observation was conducted and assisted by two observers. Observation of student activities consists of seven aspects (see Figure 2).

In the reflection stage, observers and teachers analyzed the results of the observations obtained and corrected the deficiencies found in the first cycle—improvements for consideration in the second cycle to be better.

| No | Range percentage | Category            |
|----|------------------|---------------------|
| 1  | 80 ≤ SA > 100    | Excellent activities|
| 2  | 70 ≤ SA < 80     | Good activities     |
| 3  | 60 ≤ SA < 70     | Moderate activities |
| 4  | 40 ≤ SA < 60     | Less activities     |
| 5  | SA<40            | Very less activities|

This study's indicator is to enhance student learning outcomes on the Fungi material with the Numbered Head Together learning model assisted by fungi learning media. This study's success is if students' scores reach the minimum completeness criteria (MCC), namely 70, and classical completeness by 80%.
3. Results and Discussion

This study has revealed the learning media of fungi supported by NHT learning to foster student activities and obtain good scores. The results of the action revealed that student activity increased at the end of the cycle. Likewise, student achievement shows promising results. The percentage of student activity is shown in Figure 3. Student completeness is presented in Figure 4.

![Graph of students’ activities measurement results](image1)

**Figure 3.** Graph of students’ activities measurement results

Figure 3 shows the percentage of student activities in this research. In the first cycle, it can be seen that six of the seven aspects measured have achieved excellent results, but in the sixth aspect, they get less. That aspect is responding to other groups. In the second cycle, it appears that all aspects of student activities were achieved excellently. The mean of students' activities in the first cycle was 88.09%, and the increase was 94.05 in the second cycle. It was revealed that fungi learning media supported by NHT learning helped foster student activities to be suitable. The teacher’s creativity to create learning based on student needs makes students successful [24].

![Student learning completeness](image2)

**Figure 4.** Student learning completeness

The completeness of student learning shown in Figure 4 looks different. 55.56% of learners in the first cycle experienced failures in learning. They did not reach the minimum completeness criteria. In the first cycle, only 44.44% of students completed successfully. In the second cycle in this research, it was found that 83.33 students reached the minimum standard criteria. Even so, there were still 16.67 students who incomplete. Here it is revealed that there is an increase of 38.89 students who completed. The findings show that the fungi learning media supported by the NHT model can improve students' cognitive achievement.
The reflections that were carried out after the first cycle were: (1) To improve the students being less active in responding when the other group presented the discussion results. The solution given is that the teacher must emphasize by providing additional points to students so that they are actively involved in responding or asking questions about things that are not understood. (2) Classical completeness in the first cycle is still very low, not yet reaching 80%, so the teacher needs to improve the learning process by paying attention to the necessary teaching skills. In the next lesson, students understand the learning material being taught. Teachers facilitate students to be able to learn well. Emphasize the concept of material by optimally utilizing the fungi media. In the second cycle, there was another reflection. It was found that students were increasingly active in learning. Classical completeness reaches 83.33%, so that it meets the standardized completeness criteria, namely 80%. It was decided not to continue to the next cycle.

The use of fungi learning media supported by the HHT model has been proven to increase students' activity and cognitive achievement. The results of the study improve several previous studies using NHT without using learning media. For example, it was found that NHT could improve student learning outcomes, but only reached an average of 69.75 [17]. However, learning using NHT was higher than conventional learning. The achievement of 11.17 from 20 points was still low [18], and NHT encourages students to have the courage to ask questions, answer questions, and have active discussions, enjoy learning. As many as 76% of students complete the cycle at the end [19]. Our findings improve on previous research, where the use of fungi media supported by the NHT learning model has a higher increase in student learning outcomes. On the other hand, the service of paper waste as a basis for making fungi learning media to support the goals of Papua province as a conservation province.

The study's findings also support the research conducted by Leasa, Talakua, and Batlolona [25] that students' scores get better, students become critical, and cognitive abilities are right when they learn using NHT-based learning resources. When NHT learning combined with learning media, it has a higher effect than without the combination [26], makes students motivated, active, and obtains optimal learning [27], cooperative learning combined with learning media can increase student learning outcomes [28].

In the learning, fungi learning media have a function to introduce scientific information to students. Students see using their senses. This activity makes the concept that is received well stored in their memory. Through observation using their senses, students can gain knowledge [29]. The NHT model helps teachers to manage the classroom well. The teacher arranges students to discuss, ask questions, and respond. This activity is what makes teachers successful in teaching while students are successful in learning. In the NHT group, students discuss each other. The group's success is determined by examining the discussion process's findings and providing mutual reinforcement between team members [30]. The results reveal that student activity gets better in the discussion process (see Figure 3). Likewise, the ability to ask students is excellent. Students who cannot ask questions during the learning process can be overcome in NHT learning [31]. The chances of students responding to questions were better [32]. Students become more able to answer and react further if there are additions or objections from other groups. In learning using the NHT model, students must be prepared to respond to or answer questions [33,34]. The combination of fungi learning media supported by NHT learning effectiveness increases student achievement and improves student activities.

4. Conclusion
This action research concludes that the fungi learning media supported by NHT learning effectiveness increases activity and student achievement. Student activity reached 94.05% at the end of the cycle, while students who completed 83.33%. In the future, it is necessary to test the differences in student achievement and their responses to modern media and fungi learning media from paper waste in the context of NHT learning.

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