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Inquiry Based Learning Module to Empower Cooperation Skills

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Article Info	ABSTRACT
	The education in the 21st century focuses on knowledge and encourages students to generate information and encourage developing new skills. The framework of 21st century learning skill is communication, collaboration, critical thinking, creativity and innovation. A cooperation skill in the world of education is an important thing to be done in learning. Therefore, a solution is needed to optimize student empower cooperation skills process by using the teaching material in the form of module. The objective of this research is to know the effectiveness of inquiry based learning module to empower cooperation skills. This research was conducted in one of high school in Surakarta, Indonesia. The research method is quasi experiment, used pretest and posttest design by using two randomly selected classes those were experimental class used an inquiry based learning module and control one used a modules made by biology teachers in Surakarta. The results showed that there were significant differences of learning outcomes between the control and the experimental classes based on the independent samples t-test test results, also seen with the n-gain scores that obtained at 0.78 (middle) in the control class and 0.87 (high) in the experimental class. As the study concluded, using inquiry based learning module in the learning process in effective to empower cooperation skills.

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1.   INTRODUCTION

In the rapid development of science and technology (IPTEK) in the 21st century has an impact on all aspects of life, including in the field of education [1]. In education, they ensure their competitiveness with other nations in the era of globalization [2]. The implications of changing 21st century human thought demand a very big change in national education [3]. Therefore, the curriculum of education in the 21st century focuses on knowledge and encourages students to generate information and encourage developing new skills [4]. The framework of 21st century learning skill according to National Agency for Sertification Profesional (BSNP) is communication, collaboration, critical thinking, creativity and innovation. One form of collaboration is the skill of cooperation.

The results of the National Association of Colleges and Employers (NACE) survey in 2012 (on the quality of human resources) are communication skills, cooperative skills, interpersonal skills, ethics, motivation, GPA, leadership and entrepreneurship skills. The results of the survey indicate that the academic ability is only ranked 17th [5]. Based on these results, the skills of cooperation in Indonesia have not gone well.

The low skills of cooperation also occur among students that students' cooperation skills in learning are not optimal because students will tend to be individualistic, less tolerant and far from shared values [6]. It agrees with [7] that the skills of student cooperation in following the learning process, especially biology is still low, has not been developed by the teacher optimally. In addition to the low skills of cooperation, student achievement was low. The result of requirement analysis in one of the State Junior High Schools in Surakarta, Indonesia shows the low achievement in the field of biology with an average score of 71.85%. Based on the national exam results data shows that on the material of excretory system for three consecutive years from 2014-2016 that is equal to 46% year 2014; 50.50% in 2015; and 46.32% in 2016.

The result of the analysis of the skills of cooperation in two teaching materials in the form of books (teaching materials 1) and modules (teaching materials 2) used in schools shows the score is still low. Indicator team members understand and agree on goals and objectives get a score of 0 on teaching materials 1 and 2; indicator there is a high degree of trust between members and conflict is dealt with openly and worked through get score of 8.33 on teaching materials 1 and 16.66 on teaching materials 2; indicator disagreements did not arouse defensive reactions get a score of 0 on teaching materials 1 and 16.66 on teaching materials 2; indicator there is full participation in leadership; leadership roles are shared by members get a score of 0 on teaching materials 1 and 25 on teaching materials 2; indicator there are effective procedures to guide team functioning; team members support these procedures and regulate themselves score 8.33 on teaching materials 1 and 2; indicator member resources are fully recognised and utilized get a score of 16.66 on teaching materials 1 and 33.33 on teaching materials 2; indicator communications between members are open and participative scored 16.66 on teaching materials 1 and 25 on teaching materials 2; indicator the team members actively listened to each other got a score of 16.66 on teaching materials 1 and 25 on teaching materials 2; indicator the discussion moved forward with succeeding points building on previous ones earned a score of 16.66 on teaching materials 1 and 25 on teaching materials 2; indicator the team has well-established and agreed-on approaches to problem solving and decision making score of 0 on teaching materials 1 and 2; indicator the team experiments with different things of doing things and is creative in its approach get score of 8.33 on teaching materials 1 and 2; indicator the group often evaluates its functioning and processes scores 8.33 on teaching materials 1 and 2.

The module is a learning process about a particular unit arranged systematically, operationally, and directed for use by students, along with the guidance of its use for teachers. The main objective of the module system is to improve the efficiency and effectiveness of learning in schools, both time, facilities and personnel funds to achieve goals optimally [8]. The module with a scientific approach involves a module based on a scientific learning model. The learning process with scientific approach on the subjects ideally implemented through the model with activities that train students to inqury [9]. One of the best learning model is to be applied is through inquiry based learning model. The inquiry based learning model is the maximum student involvement in the teaching and learning process and develops students' confident attitudes about the knowledge that has been found in inquiry learning [10]. Added through the inquiry based learning in learning process can increase students' cooperation skills [11].

Cooperation skills can be taught through an inquiry based learning model in accordance with the Curriculum 2013 that learning using a scientific approach is a learning that is designed in such a way that students are actively involved and participate in learning (Regulation of the Minister of Education and Culture-Permendikbud number 65 of 2013). Efforts in increasing the active participation of students in the learning process in accordance with the Curriculum 2013, researchers develop learning products in the form of inquiry based learning module on excretory system material. Developed modules are expected to support the learning process, guiding students to conduct activities berinkuri through structured activities in the module and the potential to empower the skills of student cooperation in accordance with the demands of the 21st century.

2. RESEARCH METHOD

The research used quasi experiment method, involving two classes (class 11) consisting of 27 and 25 students. Classes were randomly selected by conducting prerequisite test with normality and homogeneity test. The study was conducted in one of the State Junior High School Surakarta, Indonesia.

The research procedure was carried out with Borg and Gall's ten-step development model that was modified into nine steps due to time and cost constraints. The nine modified steps consist of research and information gathering, planning, preliminary product design, preliminary testing, preliminary product revision, limited field trials, second product revisions, operational trials and final product revisions.

To know the cooperation skill of student, using non test technique that is in the form of observation sheet. The observation sheet assesses the skills of student cooperation developed by Crebert et al [12].

The result of preliminary observation skill of student cooperation skill is then calculated by using a kind of microsoft office program called excel and can be presented in Table 1 below.

Table 1. Preliminary Results of Cooperation Skills

No	Indicator	Control Class	Experimental Class
1	Team members understand and agree on goals and objectives	37	39.97
2	There is a high degree of trust among members and conflict is dealt with openly and worked through	41.44	44.41
3	Disagreements did not arouse defensive reactions	40.70	44.41
4	There is full participation in leadership; leadership roles are shared by members	41.44	44.41
5	There are effective procedures to guide team functioning; team members support these procedures and regulate themselves	45.89	48.87
6	Member resources are fully recognised and utilised	45.14	48.86
7	Communications between members are open and participative	48.12	51.08
8	The team members actively listened to each other	43.66	46.63
9	The discussion moved forward with succeeding points building on previous ones	41.44	44.41
10	The team has well-established and agreed-on approaches to problem solving and decision making	40.70	44.41
11	The team experiments with different ways of doing things and is creative in its approach	45.89	48.87
12	The group often evaluates its functioning and processes	37	39.97

The results of the preliminary observation sheet of cooperation skills were obtained based on indicators that emerged in the learning include: 1) team members understand and agree on goals and objectives (37) control class (39.97) experimental class; 2) there is a high degree of trust between members and the conflict is dealt with openly and worked through (41.44) control class (44.41) experimental class; 3) disagreements did not arouse defensive reactions (40.70) control class (44.41) experimental class; 4) there is full participation in leadership; leadership roles are shared by members (41.44) control class (44.41) experimental class; 5) there are effective procedures to guide team functioning; team members support these procedures and regulate themselves (45.89) control classes (48.87) experimental class; 6) member resources are fully recognised and utilized (45.14) class control class (48.86) experimental class; 7) communications between members are open and participative (48.12) control class (51.08) experimental class; 8) the team members actively listened to each other (43.66) control class (46.63) experimental class; 9) the discussion moved forward with succeeding points of building on previous ones (41.44) control class (44.41) experimental class; 10) the team has well-established and agreed-on approaches to problem solving and decision making (40.70) control class (44.41) experimental class; 11) the team experiments with different things of the way (45.89) control classes (48.87) experimental classes; 12) the group often evaluates its functioning and processes (37) control class (39.97) experimental class.

Students' achievement is assessed through an inquiry based learning module developed by the researcher. Activities within the module use the syntax of inquiry based learning by Pedaste et al [13]. They are orientation, conceptualization, investigation, conclusion, and discussion. Inquiry based learning module on excretory system material to empower students cooperation skills get valid results based on validation validation scores by validators, education practitioners and students. The inquiry based learning module earns a score of 4 by the linguist; 3.78 by the material expert; 3.76 by education practitioners; 3.72 by development experts; 3.71 by learning device experts and 3.50 by students. From these results it can be concluded that the module based on inquiry based learning on excretory system materials to empower students cooperation skills are categorized very well, valid and feasible for use in the experimental class.

The difference between the pre-research and post research scores obtained from the control class and the experimental class has been analyzed. In the data analysis, before and after learning was assessed by using an independent sample t-test to see the potential difference between control classes taught using modules made by biology teachers in Surakarta, and experimental classes taught by using inquiry based learning module. After the learning process, the difference between the control class and experiment class between pre-research and post research was analyzed. The N-gain value criterion is presented in Table 2 below.

Table 2. Criteria of N-gain Score and Interpretation

Gain Index	Interpretation
$g > 0,7$	High
$0,3 < g \leq 0,7$	Middle
$g \leq 0,3$	Low

3.   RESULTS AND ANALYSIS

3.1. The Inquiry Based Learning Module on Excretory System Material to Empower Student Cooperation Skills

The inquiry based learning module was developed using five step syntax of inquiry based learning model to empower students' cooperation skills. The module is divided into three chapters of the excretory system material. In the first, meeting the lung excretory system describes the functions, the organs involved, the mechanisms and disorders or abnormalities; the second meeting, the skin excretory system describes the functions, structures, mechanisms, and disorders or abnormalities; and the third meeting, the liver and kidney excretory system describes the functions, the organs involved, the mechanisms and disorders or abnormalities.

Each module chapter contains a structured activity using an inquiry based learning model syntax that is integrated with twelve indicators of cooperation skills. The first syntax is orientation that is integrated with the aspects of trust and conflict, the second syntax is conceptualization which is integrated with the problem-solving/decision making aspect, the third syntax is investigation which is integrated with the aspect of goals and objectives, control and procedures, utilitation of resources, experimentation and creativity, interpersonal communication, listening, flow of communication and expression of differences, the fourth syntax is conclusion integrated with aspectation, and the fifth syntax is a discussion integrated with the leadership aspect.

The percentage of cooperation skills scores in the control class and the experimental class during the learning process can be presented in Figure 1.
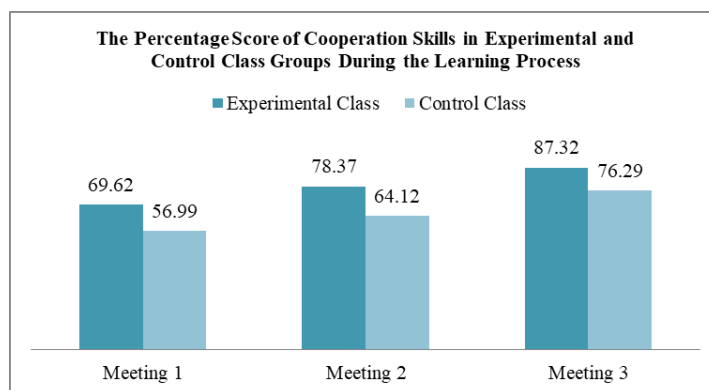

Figure 1. The percentage score of cooperation skills in experimental and control class groups during the learning process

Based on Figure 1 shows that the cooperation skills during the learning process experienced an increasing in each indicator of both control class and experimental class is not so much different score obtained as well as the average score of the results of students' cooperation skills each meeting is always increasing. At the first meeting, students' cooperation skills scored 56.99% in the control class and 69.62% in the experimental class. At the second meeting, students' cooperation skills scored 64.12% in the control class and 78.37% in the experimental class. In the third meeting, students' cooperation skills scored 71.47% in the control class and 87.32% in the experimental class.

3.2. Descriptive Analysis Results of Before and After Researchs on Control and Experiment Classes

The result of descriptive analysis pre research and post research on the control class and the experimental class are presented in Table 3 below.

Table 3. Analysis Results of Before Research and After Research on Control and Experimental Classes

Class Group	Score	Range	Minimum Score	Maximum Score	Mean	N-gain		
						Min	Max	Average
Control	Before	20	40	60	51.20	0.65	0.12	0.78
	After	5	83	88	85.60			
Experimental	Before	20	40	60	51.76	0.82	0.95	0.87
	After	5	93	98	95.52			

Pre research score, post research score and N-gain for cooperation skills in control class and experimental class are shown in Figure 2.
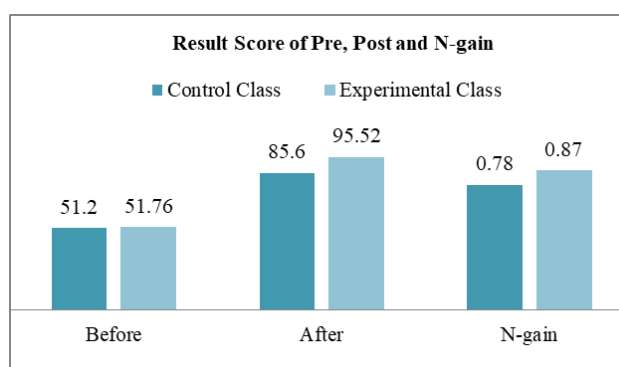

Figure 2. Result score of before, after and N-gain in control and experimental classes

Based on Figure 1 and Figure 2, it can be seen the average score of pre research and post research in the control class of 51.20 and the experimental class 51.76 which means not much different. Results after the study presented in Figure 1 can be seen that the average score after the experimental class experiments is higher than the control class that is equal to 95.52 and 85.60 in the control class. The control group's N-gain and experimental class were both in the high criteria of 0.78 in control class and 0.87 in experimental class.

The inquiry based learning module on the excretory system material has the potential to empower students' cooperative skills. The effectiveness of module based on inquiry based learning is evidenced by the increasing of posttest cooperation skill after learning by using module. The result of the cooperation skills increased from pretest to posttest calculated by the N-gain value as presented in Table 3, obtained by 0.87 in the experimental class and 0.78 in the control class, both the control class and the experimental class included in the high criteria.

Learning through inquiry based learning on cooperation skills is effective in learning because it provides an opportunity for students to do inquiry which is done by working with the group although it takes time to adapt in make an inquiry with members of the group [14]. The results Kamarudin et al [15] concluded in the survey results that have been analyzed shows that students like learning with the formation of a group because they can cooperate, discuss, exchange opinions and work hard with members of the group and help the group success in learning. The results of the experimental class collaboration skills increased at each meeting and showed higher average results compared to the results of the control class collaboration skills as presented in Table 3. It was supported by Opara and Jacinta [16] concluded that the learning through inquiry in the experimental class gets higher score on learning achievement compared to the control class, when during the learning both the experimental class and the control class the students are in the group completing the task with cooperation. Learning through problem solving is more optimal with the mood of students engaging in learning by working together in group formation to be resolved more quickly in solving problems by sharing views to generate many ways to think and solve problems according to group goals [17].

Based on the results of the activities in the module presented in Figure 1, it shows that the activities that have done by students using inquiry based learning syntax potentially empower the students' cooperation skills. Kashefi [18] concluded that the cooperation skills showed significant results that there were differences before learning and after learning by using learning through blended learning when students cooperate and communicate in working on a project. In line with other researchers [19] concluded that learning through blended learning is effective in developing small group collaborative skills because group discussions are more focused, discussions are successful with each group member responding to opinions and work more quickly completed. Designing problem based learning activities shows that it can improve students' cooperation skills during learning by looking during learning that students in collaboration with their groups and should be well prepared in terms of learning environment and facilitating teachers [20].| The result of the research of other researchers [21] concluded that an inquiry based learning model involving students in active, interactive and cooperating activities with other students.

The inquiry based learning module that is used in the learning process can empower the students cooperation skills because in the module are presented the activity which is structured in the form of practice and observation by using inquiry based learning syntax. The results of other researchers [22] concludes that

inquiry based learning by using module is effective in improving students' generic concept understanding and science skills, as well as developing collaborative skills that enable students to learn and work in groups. Khabibah et al [23] concluded that there was a significant difference between the experimental class using discovery learning module and control class using the module commonly used by the school in improving cooperation skills and learning outcomes. In line with the results of Andrini [24] concluded that learning inquiry based learning can not only improve the learning outcomes (cognitive) but can improve psychomotor attitude and skills, because inquiry based learning of student-centered learning, teachers only as facilitators who help students. Other researchers [25] stated that inquiry based learning model is more effective on science learning by helping students actively develop an understanding of science by combining scientific knowledge with reasoning and thinking ability.

Overall, based on the analysis shows that the use of inquiry based learning module on the excretory system material is effective to empower students' cooperation skills. Hughes et al [26] states that cooperation skills are said to succeed not from the final result obtained and because of one member, but from the process as long as each member works in a group. The importance of cooperation skills is not limited to the assigned group but for all students to gain cooperation skills. In line with the Canadian Education Association assertion that inquiry skills are potentially effective in students can work together with other students by building a meaningful new knowledge with the inquiry so as to generate new knowledge gained with the group [27].

4.   CONCLUSION

The inquiry based learning module is effective to empower cooperation skills in the learning process because statistical analysis test results show significant differences between control classes taught by using modules made by biology teachers in Surakarta and experimental class taught by using inquiry based learning module on excretory system material.

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