CHAPTER I
PRELIMINARY

1.1 Problem Background

The National Education objectives contained in the Law on National Education System No. 20 of 2003 states that national education aims to develop capabilities and shape the dignified character and civilization of the nation in the context of educating the life of the nation, aiming at developing the potential of students to become human beings who have faith and are devoted to God Almighty, of good character, healthy, knowledgeable, competent, creative, independent, and become democratic and responsible citizens. Education is the only bridge that leads people to their better futures. Education plays an important role in the development of a country. If a country does not have proper education, it may be left behind by other countries which support education. The development of a country can be determined by whether its citizens have good education or not. The better the quality of education that a country has, the faster it is likely to develop. No matter what global problems that a country is facing, whether it's the elimination of poverty, the creation of peace, or environmental energy problems, the solutions will always include education. It is never done without an education.

The main problem of formal education (schools) in Indonesia today is the low absorptive capacity of students in learning, while the challenges facing the world of education in this millennium era are education must be able to produce human resources that have complete competence, namely attitude competence, competence integrated knowledge and skills competencies (Trianto, 2018:5). Based on the results of the 2018 PISA (Program for International Students Assessment) report, a survey conducted by the Organization for Economic Co-operation and Development (OECD) by assessing 600,000 children aged 15 years from 79 countries every three years to find out the quality of education in the world shows that Indonesia's performance is seen to be lower when compared with the 2015 PISA report. For the reading ability category, Indonesia obtained a

mean 371 compared to the 2015 PISA results which obtained a mean 397, for the mathematical category a mean 379 compared to the 2015 PISA results which obtained a mean 386, and for the ability to perform science has a mean of 396 compared to the 2015 PISA results, which is a mean of 403 (Kemendikbud, 2019). To solve problems and face various challenges in the world of education in order to become a more advanced country, it needs revitalization and strengthening the character of strong human resources. One aspect that can be done to prepare the character of strong human resources in a country is through the development of science-based education processes.

Physics as a science learning is a science that studies symptoms and events or natural phenomena and seeks to uncover the secrets and laws of the universe. Physics learning in essence consists of products and processes. Physics as a product consists of concepts, facts, legal theories, and postulates, while physics as a process means providing hands-on experience to develop competencies so that students explore and fulfill the surrounding nature in a scientific manner. Physics as a product is included in declarative knowledge for students, namely knowledge about something, while Physics as a process includes procedural knowledge for students, namely knowledge about how to do something. This relates to two kinds of knowledge which are distinguished by learning theorists. The physics learning process is more emphasized on the process skills approach, so students can find facts, build concepts, theories, and scientific attitudes that can positively influence the quality of the educational process and educational products.

The physics learning process which is more emphasized on the process skills has been included in the physics learning objectives in high schools according to the Minister of National Education Regulation No.22 of 2007 namely 1) Forming a positive attitude towards physics by realizing the order and beauty of nature and glorifying the greatness of God Almighty. 2) Foster scientific attitudes, which are honest, objective, open, tenacious, critical, and can work together with others. 3) Develop experience to be able to formulate problems, propose and test hypotheses through experiments, design and assemble experimental instruments, collect, process and interpret data, and communicate

experimental results verbally and in writing. 4) Develop the ability to reason in thinking inductive and deductive analysis by using physical concepts and principles to explain various natural events and solve problems both qualitatively and quantitatively. 5) Mastering the concepts and principles of physics and have the skills to develop knowledge, and an attitude of confidence as a provision to continue education at a higher level and develop science and technology.

But in reality today, learning physics in schools has not been able to realize the objectives of learning physics contained in the Permendikbud 2007 that has been stated above. Physics learning is only about conveying facts, concepts, and principles. In line with that, the learning process that is found in general emphasizes more on the achievement of curriculum demands, and in the teaching so far, the habits of learning are as follows:1) Teach theory/definition;2) Examples are given;and 3) given practice questions. Learning is also more teacher centered learning and the teacher has not created a meaningful learning atmosphere for students (Trianto, 2018: 18).

Based on a preliminary study conducted by researchers on October 15th, 2019, through interviews with one of the teachers in the field of physics studies and the distribution of questionnaires to class X Mia students of SMA Negeri 5 Medan, 30 respondents were obtained, the results of an interview stating that the usual learning model applied was conventional learning models, this is supported by the results of the distribution of questionnaires as many as 83% (25 students) states the way teachers teach physics in the class that is lecturing, taking notes and doing assignments. In this case, students passively absorb the knowledge structures provided by the teacher or those contained in textbooks. Learning is just simply conveying facts, concepts, principles to students and the teacher expects that students master and memorize it all. This means that the teacher only prioritizes students' declarative knowledge, that is, students' knowledge of memorizing formulas or laws or equations without regard to students' procedural knowledge, that is, knowledge of how to obtain formulas or equations about the concepts of physics learned. This makes 77% (23 students) state that the obstacles faced when learning physics are the many concepts and formulas that must be

memorized so that it is difficult to understand the material being taught. Knowledge of rote learning is boring and does not foster motivation to learn for students, which is likely to make many students dislike physics and ultimately have an impact on learning outcomes obtained by students. This is in line with the results of the interview which stated that lately student learning outcomes declined considerably from the previous year, this was due to the reduced willingness of students to learn, and was also supported by as many as 67% (20 students) expressed less enthusiasm in participating in learning physics, 23% (7 students) expressed enthusiasm in participating in learning physics, and 10% (3 students) stated it was normal in participating in learning physics, which ultimately impacted the physics learning outcomes of 70% (21 students) getting unsatisfactory grades and only 30% (9 students) who received satisfactory grades. The interview results also state that the Laboratory has not functioned optimally, the teaching aids available in the laboratory are sometimes only used as a medium for delivering material while teaching, teachers rarely invite students to do practical work. This is supported by 66% (20 students) stating that the teacher has never carry out a practicum, 57% (17 students) state that the teacher sometimes uses media or teaching aids in the physics learning process, and as many as 67% (20 students) said that they did not know whether the teaching aids as well as the tools and practicum materials available at the school had fulfilled the needs of the learning material, on the grounds that students had not been invited to do practical work. Practicum activities that are rarely carried out will result in students 'scientific process skills not developing and also have an impact on students' scientific attitudes. So students cannot grow and develop their scientific attitude. This of course makes that the goal of learning physics is actually not achieved.

Students' science process skills are approaches that provide opportunities for students to find facts, develop concepts, through activities or experiences such as scientists. Process skills need to be developed through direct experiences as learning experiences. Through direct experience a person can better appreciate the process or activity that is being carried out (Manalu, 2018: 63). The science process skills of students are very important for every student as a provision for

conducting scientific investigations. The importance of science process skills was also stated by Dimyati (2013: 137) based on the following matters: 1) the acceleration of changes in science and technology that made it impossible for the teacher to act as the only person who channeled all the facts and theories, so that development needed process skills in students. 2) intellectual, emotional, and physical experience is needed in order to obtain optimal learning outcomes. 3) inculcation of attitudes and values as servants of the eternal search for the truth of science.

If we want good learning outcomes from students, it certainly will not be separated from efforts to improve the quality of learning at school. This requires a paradigm shift in education and learning, especially in the types and levels of formal education. These changes must also be followed by teachers who are responsible for organizing learning in the school both inside and outside the classroom. One of the changes in the learning paradigm is the orientation of learning that was originally centered on the teacher (teacher centered) switch centered on smurid (student centered); the methodology which was initially more dominated by expository changes to participatory; and the approach that was originally more textual turned into contextual. All changes are intended to improve the quality of education, both in terms of the process and educational products.

One learning model that can be used to realize changes in the learning paradigm above and to motivate students to improve their science process skills is the inquiry learning model. Inquiry learning is a learning that requires students to know how to find something through an investigation. The general purpose of inquiry learning is to help students develop intellectual discipline and skills. Through the above understanding, the inquiry model that is superior in improving students' scientific process skills and student learning outcomes in this research is Scientific Inquiry because this learning can make students learn by involving them in truly original research problems by exposing them to the field of investigation, helping them acquire, develop, and apply concepts.

Given the important role of the media in helping the learning and teaching process, the Algodoo application provides concrete visual assistance to help coordinate information before the information is learned. The Algodoo application is a unique 2D simulation software from Algoryx Simulation AB. Algodoo encourages students' creativity, ability and motivation to build knowledge while having fun. With Algodoo, students can create simulation scenes using simple drawing tools such as squares, circles, polygons, gears, friction, simple planes, ropes and chains.

The results of the research of several previous researchers indicate the positive impact of the influence of Scientific Inquiry learning on students' science process skills, among others Lubis, M.,dkk (2017), the results showed that science process skills of students who are taught by the teaching model scientific inquiry better than conventional learning. Science process skills of students who can think logically high are better than the students who can think logically low, and there is an interaction between learning model scientific inquiry and conventional learning with the ability to think logically to improve students' science process skills. As well as Khairiyah, N.,dkk (2017) based on the data tabulation obtained the result of science proces skill of student pre-learning in experiment class 32.06 and 31.35 in control class and the result of science process skills post-learning in experiment class 78.13 and 50.91 in control class. Based on t testing, it can be conclude that science process skills of student using scientific inquiry learning model was better than conventional learning. Similarly with Hutahaean, R.,dkk (2017) the results of the study concluded that the science process skills students who apply scientific inquiry learning model using macromedia flash better than students' science process skills with conventional learning.

Previous research on the impact of scientific inquiry learning on student learning outcomes, including Fahrunnisyak & Sinuraya, J (2016) also said that the influence of scientific inquiry learning to increase student learning outcomes and better learning activity. As well as, Pratiwi, Y.,dkk (2016) research results obtained from the results of data analysis and hypothesis testing it can be concluded that there is an influence of the scientific inquiry learning model on

student learning outcomes with the results of one-sided hypothesis test t_{count} = 6.5> t_{table}.

Research related to Algodoo application was conducted by Celik, et al (2015: 40). His research entitled Evaluating and Developing Physics Teaching Materials with Algodoo in Virtual Environment: Archimedes' Principle, states that Algodoo has been exported with quantitative methods about what makes Algodoo suitable for helping teachers explain physical phenomena. Celik identified four criteria for reviewing teacher opinions on simulation programs when used to help students understand Archimedes principles, such as: instructional relevance, ease of programming, convenience of instruction and programs, and format of conformity. The results showed that most teachers were very interested in using simulations to help them when they explained Archimedes's principles in class.

Based on the background of the problems above, the authors conducted a research **"The Effect of Scientific Inquiry Learning Assisted By Algodoo Simulation To Science Process Skill and Student Learning Outcomes Grade X of SMA Negeri 5 Medan".**

1.2 Problem Identification

Based on the background described above, it can be identified that there are several problems, namely:

1. Lack of involvement and activeness of students in the learning process because learning is teacher centered, students only accept concepts, facts that have become and memorize them.
2. The learning model used by teachers is less varied, teachers are more dominant in conventional learning.
3. Physics learning activities that are carried out have not been able to facilitate students to develop their science process skill.
4. Learning outcomes obtained by students are still in the unsatisfactory category.

1.3 Problem Limitation

To provide clear scope in the discussion, it is necessary to limit the problems in this study as follows:

1. The learning used in this study is Scientific Inquiry learning assisted by algodoo simulation.
2. The dependent variable in this study is the science process skills and student learning outcomes.
3. The approach used is the scientific approach.
4. The subject matter in this study is Momentum and Impulses.

1.4 Problem Formulation

Based on the limitations of the problem that has been described, then the problem formulation in this study are:

1. How are students Science Process Skills using Scientific Inquiry learning assisted by algodoo simulation (experimental class)?
2. How are students Science Process Skills using conventional learning (control class)?
3. How are student Learning Outcomes using Scientific Inquiry learning assisted by algodoo simulation (experimental class)?
4. How are student Learning Outcomes using conventional learning (control class)?
5. Are there differences in students Science Process Skills in the experimental class and control class?
6. Are there differences in student Learning Outcomes in the experimental class and control class?

1.5 Research Objective

Based on the problem formulation that has been described, the objectives to be obtained in this study are:

1. To find out how students Science Process Skills using Scientific Inquiry learning assisted by algodoo simulation (experimental class).

2. To find out how students Science Process Skills using conventional learning (control class).
3. To find out how student learning outcomes using Scientific Inquiry learning assisted by algodoo simulation (experimental class).
4. To find out how student learning outcomes using conventional learning (control class).
5. To find out whether there are differences in students Science Process Skills in the experimental class and control class.
6. To find out whether there are differences in student learning outcomes in the experimental class and control class.

1.6 Research Benefits

This research is expected to be useful as follows:

1. As information material related to students Science Process Skills using Scientific Inquiry learning assisted by algodoo simulation.
2. As information material related to student learning outcomes using Scientific Inquiry learning assisted by algodoo simulation.
3. As an alternative information material regarding the selection of Scientific Inquiry learning for the teacher or next iresearcher.
4. As a reference material that can be used by other researchers who intend to conduct similar research.

1.7 Operational Definition

1. Scientific inquiry learning is to involve students in a genuine problem of inquiry by confronting them with an area of investigation, helping them identify a conceptual or methodological problem within that area of investigation, and inviting them to design ways of overcoming that problem (Joyce, et al 2015:150).
2. Algodoo is a digital sandbox for physics 2D simulations. It allows students and teachers to easily create simulated scenes and explore physics through a user-friendly and visually attractive interface (Gregorcic and Bodin, 2017). In this study, algodoo simulations are presented by the teacher to students to

visualize and solve physical phenomena, observe and investigate physical phenomena, so students can hypothesizing.

3. Conventional learning is learning that is usually done by teachers in schools. Conventional learning is learning by using the usual method done by the teacher, namely learning by lecturing, exercises, then giving assignments (Sanjaya, 2013:261).
4. Science process skills are physical and mental skills related to fundamental abilities possessed, mastered, and applied in a science activity (Harlen dan Elstgeest, 1992:22). The components of the science process skills used in this study are: observing, hypothesizing, predicting, designing experiment, finding patterns and relationships, measuring and calculating, communicating effectively (Harlen dan Elstgeest, 1992:51-54).
5. Learning outcomes are abilities students have after they have received their learning experience. Learning outcomes measured in this study are cognitive domains learning outcomes. Aspects of learning outcomes measured are aspects of knowledge, understanding, application, and analysis (Munzenmaier, 2013:6).