CHAPTER I
INTRODUCTION

1.1 Background

Changes and developments are unavoidable in various fields of life, including the field of education (W. Pratiwi & Alimuddin, 2018). One of the signs of changes and developments that occur in the field of education is the change and development of the curriculum. According to Rusman (2009) (in Sudarsono, 2016), the curriculum is one component that has a strategic role in the education system both nationally and within the scope of schools. The importance of the curriculum in the world of education causes the curriculum to be perfected. This improvement is carried out by adjusting the curriculum content to the criteria of 21st-century education, which must reflect critical thinking and problem-solving skills, creativity and innovation abilities, communication skills, and collaboration skills (N. P. W. Pratiwi et al., 2019).

Completion of the curriculum is carried out based on Permendikbud No. 59 of 2014 concerning the 2013 Curriculum for Senior High Schools/Madrasah Aliyah in Appendix I states that one of the bases for improving the curriculum is the existence of internal and external challenges (Widana, 2017). Internal challenges, among others, are related to the condition of education associated with educational demands that refer to the 8 (eight) National Education Standards covering management standards, cost standards, infrastructure standards, educators and education personnel standards, content standards, process standards, assessment standards, and standards. graduation competence (Suharman, 2017). External challenges faced by the world of education are related to the flow of globalization and various issues related to environmental problems, advances in technology and information, the rise of creative industries, culture, and the development of education in the international world (Widana, 2017).

Regarding the issue of the development of educators in the international world, the 2013 Curriculum is designed with various improvements including

improvements to content standards and improvements to assessment standards (Widana, 2017). Completion of content standards in the form of replacing material that is not following material that can stimulate students to think critically and analytically based on international standards (Fanani, 2018). Meanwhile, the improvement of assessment standards by adjusting assessment models based on international standards to improve students' higher-order thinking skills (Kemendikbud, 2017).

Assessment is the process of collecting and managing information to measure the achievement of student learning outcomes (Simangunsong et al., 2020). Assessment of learning outcomes in the 2013 curriculum which aims to improve students' higher-order thinking skills can be done through assessment instruments, one of which is in the form of a test instrument. The test used contains questions containing HOTS (Higher Order Thinking Skills). In the revised Bloom's taxonomy published in 2001, HOTS questions are classified at the levels of analyzing (C4), evaluating (C5), and creating (C6) (Effendi, 2017).

The HOTS questions are also used by the OECD (Organization for Economic Co-operation and Development) to conduct PISA (Programme for International Student Assessment). PISA is a triennial survey in the fields of reading, math, and science of 15-year-old students to assess the extent to which they have acquired the key knowledge and skills for full participation in society Indonesia is one of the countries that has routinely implemented PISA since 2000. Finally, Indonesia participated in PISA in 2018 obtaining a score, especially in mathematics, of 379. This score is below the average score set by the OECD in mathematics of 500. This causes Indonesia to be ranked 73 out of 79 participating countries.

Based on the PISA results above, it is clear that the skills of Indonesian students is still at the LOTS (Lower Order Thinking Skills) level at the level of remembering (C1), understanding (C2), and applying (C3). One of the causes of the low high-order thinking skills of Indonesian students is the absence of HOTS-loaded questions that can be used by the school (Junaidi et al., 2020). This is in

line with the research conducted by Yenusi et al. (2019) on the results of his analysis of the existence of HOTS questions in high school mathematics books. The math book only contains a few questions that are classified as HOTS in the aspects of analyzing (C4) and evaluating (C5), and there is no single item in the aspect of creating (C6).

Analysis of the problems contained in high school mathematics books was also carried out by Syarifah et al. (2020). Syarifah et al. (2020) conducted an analysis on Mathematics books for SMA/MA Class XI | Compulsory Group by Drs. BK Noormandiri, M.Pd published in 2016 on sequence and series topic. The results of the analysis show that the cognitive level of the question consists of:

1. C1 (Remembering) = 0%
2. C2 (Understanding) = 5%
3. C3 (Applying) = 50%
4. C4 (Analyzing) = 40%
5. C5 (Evaluating) = 2,5%
6. C6 (Creating) = 2,5%

The two books do not yet contain a good proportion of the division. According to Sudjana (2016) (in Rahayu et al., 2020), a good comparison for the criteria for easy, medium, and difficult questions is 3:4:3. Furthermore, based on the opinion of Sudjana (2016), Rahayu et al. (2020) describe the percentages of each level of cognitive development taxonomy, namely: 30% for remembering (C1) and understanding (C2), 40% for applying (C3) and analyzing (C4), 30% for developing (C5) and create (C6).

After conducting further analysis of the questions on the material for sequences and series in the Mathematics book for SMA/MA Class XI | Compulsory Group by Drs. BK Noormandiri, M.Pd published in 2016, it was found that the questions presented did not fully use the stimulus. Stimulus is one of the principles of high-level thinking assessment that is used as a basis for understanding the information that must be presented is contextual and

interesting, usually in the form of introductory texts, visuals, scenarios, discourses, or problems (cases) (Widana, 2017).

In table 1, several HOTS questions for the material on sequences and series are presented in the Mathematics book for SMA/MA Class XI | Compulsory Group by Drs. BK Noormandiri, M.Pd published in 2016 which was shared by Syarifah et al. (2020) based on their cognitive level.

Table 1.1 Questions on Sequences and Series Materials in Mathematics Books for SMA/MA Class XI | Compulsory Group by Drs. BK Noormandiri, M.Pd published in 2016

Question	Cognitive Level	Reason
The sum of the 4th term and 5th term of an arithmetic series is 55, while the 9th term is subtracted by twice the 2nd term is 1. The sum of the first three terms of the sequence is	Analyzing (C4)	Interesting in the process of identifying and associating the properties or features of the new structure
If $a_1, a_2, a_3, \ldots$ is arithmetic series, proof a. $a_2 = \frac{a_1+a_3}{2}$ b. $a_2 = \frac{2a_1+a_4}{3}$	Evaluating (C5)	Striving for an assessment of the elements of external properties
A piece of string 246 cm long is cut into 12 pieces to form an arithmetic series. If the sum of 3 pieces of the shortest rope is 21 cm, what is the length of the longest cut?	Creating (C6)	Interesting process of trying to prepare a plan of completion based on existing methods

Source : Syarifah et al., (2020) dan Noormandiri (2016)

Although the Mathematics book for SMA/MA Class XI | Compulsory Group by Drs. BK Noormandiri, M.Pd published in 2016 did not dominate the questions containing HOTS and the use of stimulus in the questions had not been fully used, but MAN 2 Model Medan (one of the State Madrasah Aliyah in Medan City) still uses the book as teaching material in classes starting from 2018-2020. Although MAN 2 Model Medan already uses the latest revised 2013 curriculum. This was obtained from the results of interviews with subject teachers of MAN 2 Model Medan conducted at MAN 2 Model Medan on November 11, 2021.

Then a diagnostic test was carried out on January 19, 2022. Diagnostic tests were carried out to determine the higher-order thinking skills of MAN 2 Model Medan students. This diagnostic test was conducted in class XI IPA 2 with 32 students taking the test. The material used in the diagnostic test is arithmetic sequences and series. The selection of the material was based on the adjustment of the diagnostic test implementation time with the material being studied by the MAN 2 Model Medan students. Another reason is the Basic Competency (BC) analysis presented by Widana (2017) which shows that the material can be used to assess students' HOTS. The questions used in the diagnostic test are listed in Attachment 1.

The results of the diagnostic test obtained indicate that XI IPA 2 students have difficulty in defining the questions. This is evidenced by students who cannot answer the questions before being given further guidance on the meaning of the questions. In addition, the dominant students of XI IPA 2 did not rewrite statements and questions into mathematical language. Furthermore, in evaluating type questions (C5), students are required to choose a value that meets a variable. The selection of these values cannot be done by XI IPA 2 students as evidenced on the answer sheets of students who cannot prove values that meet these variables. From the results of the diagnostic test, it is known that the skills of the MAN 2 Medan Model students was obtained because the questions are given to them still did not dominate the HOTS-loaded questions and the use of the stimulus in the questions had not been fully used.

To improve the high-order thinking skills of MAN 2 Medan Model students, especially on the material of sequences and series, it is necessary to develop HOTS questions using the right stimulus. The development of HOTS questions is needed to produce HOTS questions that are tested and can be given to students. Giving HOTS questions regularly to students can help students develop students' higher-order thinking skills (Kristanto & Setiawan, 2020). According to Coklin (2012) (in Arifin, 2017) higher-order thinking skills can make students successful (achievement) in school and grow into adults who make positive

contributions to society. This is in line with the opinion of Chandra Eka et al. (2019) higher-order thinking skills can make students qualified and highly competitive Human Resources (HR).

Research on the development of HOTS-loaded questions has been carried out several times, such as the research conducted by Siagian & Sagala (2021) which succeeded in creating 15 valid and reliable HOTS-based questions with difficulty levels in the easy and medium categories. Research conducted by Wewe (2017) succeeded in increasing students' critical thinking skills in learning mathematics from indicators stating the truth of questions or statements and indicators making conclusions. As well as research conducted Febrianti et al., (2017) stated that the development of HOTS questions was able to improve critical thinking skills and higher-order thinking at the elementary, junior high, and high school levels.

Based on some of the problems stated above, I as a researcher want to do research entitled "*The Development of Higher Order Thinking Skills (HOTS) Questions on Sequence and Series Topic at MAN 2 Model Medan in 2022*".

1.2 Problem Identifications

The identity of the problem contained in the background above is

1. Indonesia's low ranking on PISA.
2. The unavailability of questions that can be used by teachers to train students' HOTS.
3. The skill of student, especially student of XI IPA 2 class MAN 2 Model Medan is still LOTS.

1.3 Scope of Study

As for the surrounding space in this study includes the development of HOTS questions sequences and series topic in class XI MAN 2 Medan Model in 2022.

1.4 Problem Formulations

Based on the problems above, the formulation of the problem in this study, namely:

1. How to develop Higher Order Thinking Skills (HOTS) questions on sequences and series topic for class XI MAN 2 Medan Model students?
2. How is the validity and practicality of the Higher Order Thinking Skills (HOTS) questions on sequences and series topic for class XI students of MAN 2 Medan Model?
3. What is the potential effect of Higher Order Thinking Skills (HOTS) questions on number sequences and series in high school students?

1.5 Scope of Problems

Based on the formulation of the problem above, the limitations of the problem in this study are:

1. Develop Higher Order Thinking Skills (HOTS) questions on number sequences and series.
2. The questions developed are descriptive questions based on the revised Bloom's taxonomy at the levels of analyzing (C4), evaluating (C5), and creating (C6).
3. The product trial was carried out in one of the XI class at MAN 2 Model Medan.

1.6 Research Purposes

Based on the formulation of the problem above, the research objectives in this study are:

1. To produce Higher Order Thinking Skills (HOTS) questions on sequences and series topic for class XI MAN 2 Medan Model students.

2. To see the validity and practicality of the Higher Order Thinking Skills (HOTS) questions on sequences and series topic for class XI students of MAN 2 Medan Model.
3. To see the potential effect of Higher Order Thinking Skills (HOTS) questions on the material of sequences and series of numbers in high school students.

1.7 Research Benefits

This research is expected to provide benefits:

1. For the researchers themselves, it can be used as an experience in developing HOTS questions on the material of sequences and series of numbers.
2. For teachers, it can be used as a reference in giving HOTS questions for line and series material to be used in classroom learning.
3. For other research, as a reference material that can be used to conduct further research on the development of HOTS questions for other materials.
4. For students, as a learning reference about HOTS learning.