Analysis of Needs for Developing Higher Order Thinking Skills Test Instruments in Chemistry Learning Model Course

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ARTICLE INFO	ABSTRACT
  	At the university level, developing higher-order thinking skills (HOTS) for college students is very important. Therefore, regular practice with higher-order thinking skills questions is necessary for college students. The absence of research identifying the use of higher-order thinking skills questions in one of the chemistry education programs, specifically in the course on the chemistry learning model, serves as the background for this study. This research aims to analyze the need to develop higher-order thinking skills test instruments in the learning model course. This study is part of the initial stage of research and development, specifically part of the define phase of the 4-D development model. The research involves lecturers and college students from the Chemistry Education Study Program at an Islamic University in South Sumatra. The data obtained from this research are qualitative data presented in descriptive form, including document analysis results and interview data from lecturers and college students. The instruments used to collect the research data include documentation and interview guidelines. Based on the data analysis results, it was found that the mid-semester and final-semester exam essay questions are not yet optimally adequate in facilitating college students to think at a higher level and in accommodating all the materials/topics in the chemistry learning model course. The essay questions that have been used so far tend to utilize operational verbs that fall into the category of low-order thinking skills. Therefore, developing higher-order thinking skills test instruments for the chemistry learning model course is necessary.

INTRODUCTION

The 21st century requires high-quality human resources, so the challenges in the field of education in this century demand the preparation of human resources that are critical, creative, and innovative (Sepriyanti et al., 2022; Badjeber et al., 2020). Najoan & Makawawa, (2023) stated that HOTS (Higher Order Thinking Skills)-based education has become the main focus for preparing the younger generation to face future challenges. Thomas and Thorne define higher-order thinking skills in their article titled "How to Increase Higher Order Thinking" as a way of thinking at a higher level than memorizing or retelling something someone else has said (Taubah, 2019). In line with that, Widiawati et al., (2018) stated that higher-order thinking skills are skills that train students to solve problems that will be faced in the future so these skills are skills that students must possess. Therefore, 21st-century learning is learning that requires higher-order thinking skills. Based on their research, Widiawati et al., (2018) recommend that all educators be able to implement learning activities that stimulate higher-order thinking skills considering the importance of these skills in the 21st century.

Learning oriented towards higher-order thinking skills should make students active in thinking and emphasize critical, creative, and innovative thinking as the path taken to find solutions to existing problems. Therefore, educators should prepare assignments or questions

that stimulate students to think creatively, critically, and solve problems. Students should be given opportunities to develop their thinking abilities to master higher-order thinking skills (Masupupah, 2020; Vania et al., 2022).

Himawan & Suyata (2021) states that a learning process cannot be separated from learning evaluation. The evaluation that needs to be developed and applied to students, especially in the current era of revolution, is evaluation based on higher-order thinking skills. To carry out learning evaluation based on higher-order thinking skills, a measuring tool or instrument is needed that is also based on higher-order thinking skills so that it can measure students' higher-order thinking skills.

At the higher education level, developing higher-order thinking skills for students is essential to comprehensively enhance their abilities and skills in critical, systematic, logical, applicative, analytical, evaluative, creative thinking, problem-solving, and decision-making in an honest, confident, responsible, and independent manner (Widihastuti, 2013). Jayanti (2020) states that one way to train higher-order thinking skills is through practicing higher-order thinking questions. Therefore, students are expected to become accustomed to and trained in solving higher-order thinking questions.

Several studies state that prospective teacher students need to be trained to master higher-order thinking skills. Pratini & Widyaningsih (2018) state that it is necessary to develop the abilities of prospective teachers to master higher-order thinking skills so that they can guide and develop students' higher-order thinking skills in the future. Similar sentiments were expressed by Nazirah et al., (2022), who emphasized that prospective teacher students are expected to have higher-order thinking skills so that they can help enhance the higher-order thinking skills of their students later on. Mutia & Septiana (2022) also stated that prospective educators must be prepared for various challenges that will occur, such as learning using higher-order thinking skills. This is also an obligation for students to learn, and as prospective students, they must master higher-order thinking skills before their students.

Based on the analysis of the semester lesson plans used by several lecturers teaching the chemistry learning model course, and reinforced by the results of interviews with several lecturers who have taught the chemistry learning model course, it was found that the learning process has been directed towards optimizing students' higher-order thinking skills. However, in the assessment process, the test instruments used do not fully measure students' higher-order thinking skills. To find out more about the needs of lecturers and students regarding higher-order thinking skills test instruments, the researcher is interested in analyzing the need for assessment instruments for higher-order thinking skills in the chemistry learning model course.

Research on the analysis of the need for higher-order thinking skills assessment instruments has been conducted by (Amrina et al., 2021). The research carried out by Amrina et al., (2021) aims to analyze the need for HOTS-based assessment instruments in Social Studies Education courses at the Economic Education Study Program, Universitas Sriwijaya. The results showed that both lecturers and students require HOTS-based assessment instruments in PIPS courses. Susiaty & Oktaviana (2019) conducted research aimed at analyzing the need for test instruments on comparative material based on the revised Bloom's taxonomy to measure students' higher-order thinking skills. The results indicated that students and teachers need test instruments based on the revised Bloom's taxonomy to measure higher-order thinking skills, particularly in the topic of comparison, which can serve as a reference for teachers in developing HOTS-oriented questions. The lack of research on the need for higher-order thinking skills instruments in learning model courses has led the researcher to be interested in conducting research aimed at analyzing the need for higher-order thinking skills instruments in learning model courses.

METHODS
Research Design
This research is part of the initial stages of research and development (R&D) that uses the 4-D development model (define, design, develop, and disseminate). This needs analysis is part of the define stage (Sari & Dwi, 2022). In the define stage, the researcher conducted a needs analysis, which included analyzing the semester lesson plans used by lecturers teaching the chemistry learning model course, analyzing the mid-semester and final-semester exam questions used in the course, interviewing the lecturers of the chemistry learning model course, and interviewing college students who had taken the course.

Research Target
This research involves lecturers who have taught the chemistry learning model course and students from the Chemistry Education Study Program at Islamic University in South Sumatra. The college students have already completed the chemistry learning model course.

Research Data
The data obtained from this research consists of qualitative data presented descriptively, including data from document analysis consisting of semester lesson plan documents, mid-semester exam questions, final-semester exam questions, as well as interviews with lecturers and college students.

Research Instruments
The instruments used to collect research data are documentation and interview guidelines. The documentation data consists of semester lesson plan documents, mid-semester exam questions, and final-semester exam questions. The interview guidelines contain questions related to the learning and assessment processes used in the chemistry learning model course. The interviews conducted were semi-structured interviews with lecturers who had taught the chemistry learning model course and college students who had participated in the course. Table 1 presents the list of interview questions for lecturers, and Table 2 presents the list for college students.

Table 1. List of Interview Questions for Lecturers

No	Question
1.	How is the learning process in the chemistry learning model course that you have taught?
2.	What learning model is used when you teach this course?
3.	Does the learning process lead to HOTS learning?
4.	How do you conduct assessments?
5.	What types/forms of test instruments do you use in the assessment process?
6.	Do the assessments align with higher-order thinking skills evaluation?
7.	Do you agree with developing essay questions to measure higher-order thinking skills in the chemistry learning model course?

Table 2. List of Interview Questions for College Students

No	Question
1.	Does the chemistry learning model course make college students enthusiastic about learning?
2.	How is your experience participating in the chemistry learning model learning process?
3.	Do you agree that the material in the chemistry learning model course requires abilities beyond remembering and understanding?
4.	How is your experience related to evaluation in the chemistry learning model course?
5.	What is the form of questions used?
6.	What are the cognitive level or operational verbs used by the lecturer in mid-semester and final-semester exam questions?
7.	Do the questions given use stimulus?
8.	Do you agree if higher-order thinking skills questions are developed to measure high-level thinking skills in this learning model course?

Data Analysis

The data analysis techniques are adjusted according to the type of data. The data obtained from documentation includes the analysis of the semester lesson plan documents, mid-semester and final-semester exam questions, which are analyzed qualitatively or presented in descriptive form. The data from interviews with lecturers who have taught the course of chemistry learning model and the data from interviews with college students who have taken the chemistry learning model course are analyzed qualitatively or presented in descriptive form.

RESULTS AND DISCUSSION
Results of Document Analysis of the Semester Lesson Plan, Mid-Semester Exam Questions, and Final Semester Exam Questions.

The researcher analyzed the semester lesson plan documents, mid-semester exam questions, and final semester exam questions used by lecturers teaching the chemistry learning model course from the 2019/2020 academic year to the 2022/2023 academic year. The semester lesson plan is a learning planning document prepared as a guide for college students in carrying out lecture activities for one semester to achieve the predetermined learning outcomes (Syafarina & Setiawan, 2019). From the results of the analysis of the semester lesson plan developed by the lecturer in charge of the chemistry learning model course in the 2019/2020 academic year, it can be seen that the learning materials or topics taught by the lecturer in charge of the course are in accordance with the curriculum documents in the Chemistry Education Study Program used in that academic year. The learning methods listed in the semester lesson plan are lectures, discussions, and assignments.

The semester lesson plans developed by two lecturers in charge of the course in the 2020/2021 academic year also included learning materials/topics in accordance with the curriculum documents for that academic year. The learning methods listed in one of the lecturers' semester lesson plans are also in the form of lectures, discussions, and assignments. Another lecturer in the 2020/2021 academic year wrote down the learning methods used, namely lectures, discussions, questions and answers via e-learning, zoom meetings, and assignments.

The results of the analysis of the semester lesson plan developed by the lecturer in charge of the chemistry learning model course in the 2021/2022 academic year show that a variety of learning processes have been used by the lecturer. This is reflected in several methods or models listed in the semester lesson plan document, including student-centered learning, discussions, interactive Q&A, collaborative learning, and project-based learning. Likewise, in the next academic year, namely the 2022/2023 academic year, the lecturer in charge of the course wrote down quite diverse learning methods or models in the semester lesson plan document, such as student-centered learning, discussions, interactive Q&A, collaborative learning, and project-based learning.

Based on the analysis of the semester lesson plan that has been carried out, it can be seen that the lecturers who teach the chemistry learning model course have tried to make changes in the learning process. It is known that in the 2019/2022 academic year the learning methods listed in the semester lesson plan only included lectures, discussions, and assignments, while in the 2022/2023 academic year, significant changes began to occur with the use of various learning models, including learning models that can facilitate students to think at a high level. The use of learning models oriented toward higher-order thinking skills is an effort to train and familiarize college students with advanced thinking skills. By implementing HOTS-oriented learning models, educators can prepare college students to think critically and creatively while equipping them with the skills needed to succeed in a globalized era (Muthmainnah et al., as cited in Isrokatun et al., 2024).

In addition to analyzing the semester lesson plan documents developed by the lecturers in charge of the chemistry learning model course, the researcher analyzed the documents of mid-semester and final-semester exam questions in the chemistry learning model course starting from the 2019/2020 academic year to the 2022/2023 academic year.

In the 2019/2020 academic year, the chemistry learning model course was taught by two lecturers, each teaching a different class, but the mid-semester and final-semester exam questions used had the same sentence wording. The fact regarding the mid-semester exam questions for the chemistry learning model course in the 2019/2020 academic year is that they only assessed the cognitive level of understanding. This can be seen from the wording of the mid-semester exam questions, which total 5 questions, all of which use the verb "explain". One example is: "Explain what is meant by approach, strategy, method, model, technique, and tactics in learning?". This question is included in the C2 Bloom taxonomy level which is categorized as low-order thinking skills. All the questions used in the mid-semester exam are included in the conceptual knowledge dimension.

The final semester exam questions used in the 2019/2020 academic year only consist of one question in the form of a project to develop a product integrated with one learning model that must be completed individually. The question was already included in the level of Bloom's taxonomy categorized as higher-order thinking skills. The type of assessment used in this final semester exam was a project assessment. The final semester exam question in the 2019/2020 academic year was to create teaching materials or develop a medium (module/student worksheet/practicum guide) based on a learning model studied in the chemistry learning model course. The module should contain one chapter/subchapter/one session, with complete details from the cover to the bibliography.

In the 2020/2021 academic year, the chemistry learning model course was taught by two lecturers in each different class. Based on the analysis of mid-semester and final-semester exam documents, the lecturers in charge of the course used different mid-semester and final-semester exam questions. The mid-semester exam questions used by the first lecturer in the 2020/2021 academic year consisted of 5 essay questions. Of the five questions, none of the questions were aimed at measuring the high-order thinking skills of college students in the Chemistry Education Study Program. The questions used in the mid-semester exam had a conceptual knowledge dimension with a cognitive level of understanding (C2). An example of a question from the mid-semester exam is: "The use of a learning model has both instructional and nurturant effects. Explain the difference between these two effects!". From that question, it is known that the operational verb used is "explain", which only requires students' ability to understand the difference between instructional effect and nurturant effect. The cognitive level of understanding (C2) is included in low-order thinking skills (Tuela & Palar, 2022).

Meanwhile, the mid-semester exam used by the second lecturer consists of 3 questions. In the first question, college students are asked to analyze 5 articles from national journals from the last 10 years for a specific learning model. Then, for the second question, they are asked to design a learning activity based on the learning model they analyzed in the first question. For the third question, students are asked to explain the differences between learning strategies, learning models, learning approaches, and learning methods. According to the researcher's analysis, the number of questions used has not yet accommodated all the study materials/topics covered before the mid-semester exam, as outlined in the analyzed semester lesson plan document.

The final semester exam questions for the 2020/2021 academic year used by the first lecturer of the chemistry learning model course were in the form of essay questions, with a total of 5 questions. Table 3 shows the details of the cognitive levels of operational verbs in the final semester exam questions used by the first lecturer in the 2020/2021 academic year.

Table 3. Cognitive Levels of Operational Verbs in Final Exam Questions by the First Lecturer of the Chemistry Learning Model Course for the 2020/2021 Academic Year

Cognitive Level of Operational Verbs	Number of Questions	Percentage
C2	2	40%
C4	1	20%
C6	2	40%

Based on Table 3 it can be seen that out of these five questions, there were 2 questions at the cognitive level C2. This means that these questions still assess the low-order thinking skills of college students in the Chemistry Education Study Program. There was 1 question that already used operational verbs at the cognitive level C4 and 2 questions that already used operational verbs at the cognitive level C6 in the question. However, the wording of the questions that use operational verbs at cognitive levels C4 and C6 do not use stimuli. Even though the structure of higher-order thinking skills questions generally uses stimulus (Widana, 2020). The only question that used a stimulus was the one at the C2 cognitive level.

Meanwhile, the final semester exam questions used by the second lecturer of the chemistry learning model course in the 2020/2021 academic year were similar to one of the questions used during the mid-semester exam by that lecturer. In the first question, students were asked to analyze 5 articles for one learning model. The difference in this final semester exam question is that the articles analyzed by the college students are from international journals. In the second question, college students were asked to determine references for selecting a learning model along with their reasoning, and in the last question, students were asked to create a lesson plan using the chosen learning model. According to the researcher's analysis, the proportion of final semester exam questions is insufficient compared to the materials/study content outlined in the semester lesson plan.

Furthermore, in the 2021/2022 academic year, the chemistry learning model course is taught by one lecturer. The mid-semester exam questions used still did not aim to measure students' higher-order thinking skills. The questions were still at the cognitive level C2 (understanding). Meanwhile, the final semester exam questions used already included questions that contained operational verbs at the cognitive levels C4 and C6, with the details as follows: 1 question using operational verbs at the cognitive level C4, 2 questions using operational verbs at the cognitive level C6, and 2 questions using operational verbs at the cognitive level C2. Based on the analysis of the final semester exam document, it was also found that the questions using operational verbs at the cognitive levels C4 and C6 did not include stimuli in the wording of the questions. The knowledge dimension in this final semester exam question includes conceptual and procedural dimensions.

In the 2022/2023 academic year, the mid-semester exam questions for the chemistry learning model course consisted of 6 essay questions, while the final semester exam questions consisted of 5 essay questions. The mid-semester exam still used questions that assessed the cognitive level of understanding. From the analysis of the mid-semester exam documents for the chemistry learning model course in the 2022/2023 academic year, it was also found that there were no questions in the factual and metacognitive knowledge dimensions. The mid-semester exam questions used assessed the conceptual and procedural knowledge dimensions. There were 5 questions in the conceptual dimension, while there was 1 question that assessed the procedural knowledge dimension. The analysis also revealed that out of the 6 mid-semester exam questions, only 1 question used a stimulus. The stimulus was in the form of narrative text.

Meanwhile, for the final semester exam questions for the chemistry learning model course for the 2022/2023 academic year, 2 questions only measured the low-order thinking skills of college students at the cognitive level C2. Several questions used operational verbs at the cognitive levels C4 and C6, with the details being 1 question using operational verbs at the

cognitive level C4, and 2 questions using operational verbs at the cognitive level C6. However, the operational verbs at the cognitive levels C4 and C6 did not include any stimuli. The higher-order thinking skills questions generally use stimuli that can take the form of reading sources, film examples, and other sources that students can respond to by connecting the knowledge they already have (Fanani, 2018; Kristiyono, 2018). The questions used in the final semester exam do not include those from the factual and metacognitive knowledge dimensions. All questions used in the final semester exam fall within the conceptual and procedural knowledge dimensions.

Based on the results of the analysis of the mid-semester and final-semester exam documents, it was found that there were no essay questions available in the mid-semester exam that could be used to measure students' higher-order thinking skills. Meanwhile, in the final semester exam, there were only a few essay questions using operational verbs at the C4 and C6 cognitive levels, but these questions lacked stimuli. Thus, based on the analysis, it can be concluded that the mid-semester and final-semester exams are not yet adequate in accommodating all the materials according to the semester lesson plan in the chemistry learning model course that can be used to measure the higher-order thinking skills of college students in the Chemistry Education Study Program.

Based on the analysis of the semester lesson plans, mid-semester exam questions, and final-semester exam questions, it can be concluded that the lecturers teaching the chemistry learning model course have made efforts to conduct lectures aimed at fostering students' higher-order thinking skills. However, questions designed to measure higher-order thinking skills are still not adequately provided in the assessment process. Higher-order thinking skills is very important to be integrated into the learning and assessment process because it can hone thinking skills that are very important for students (Bunari et al., 2021)

Results of Interviews with Lecturers Who Have Taught Chemistry Learning Model Course

In the needs analysis stage, the researcher also conducted interviews with several lecturers from the Chemistry Education Study Program at an Islamic university in South Sumatra who had taught the chemistry teaching model course. The interview technique requires both parties to interact directly and actively (Rosaliza, 2015). The interviews were conducted to obtain data related to the teaching and assessment processes carried out by lecturers who had taught the chemistry teaching model course. The interviews were conducted twice with different lecturer respondents. The interviews took place in the Chemistry Education Study Program office at an Islamic university in South Sumatra.

Based on the results of the interview with the first lecturer, it can be seen that the learning process carried out in the chemistry learning model course has tried to lead to the higher-order thinking skill learning process, which can be seen from the learning models used in the learning process including the group investigation learning model, the project-based learning model, and the guided inquiry learning model. The test instrument used in the final semester exam questions is in the form of a project that is already directed at higher-order thinking skills where students are asked to create teaching materials based on a particular learning model. However, the final-semester exam questions are in the form of essay questions that do not yet aim to measure higher-order thinking skills. The lecturer stated that there were obstacles in developing higher-order thinking skills questions due to limited time to create questions. Palaka (2023) stated that in practice, writing higher-order thinking skills questions is not an easy thing for lecturers to do, it requires thorough preparation. The research findings of Ali et al., (2021) indicate that some lecturers, when creating questions, pay insufficient attention to the cognitive levels of the questions. The ability to create questions that stimulate students' higher-order thinking skills is still lacking.

Based on the results of the interview with the second lecturer, it can also be seen that the learning processes carried out have also been directed at higher-order thinking skills. From the lecturer's statement during the interview, it was also found that the assessment process conducted in the mid-semester exam and final semester exams involves analyzing journals related to a particular learning model. The journals analyzed during the mid-term exam were national, while the journals analyzed by students during the final semester exam were international journals. The results of this interview are also in line with the results of the analysis study on the mid-semester exam and final-semester exam documents in the Chemistry Education Study Program at an Islamic University in South Sumatra.

From the results of interviews with the two lecturers, it is known that the learning process in the chemistry learning model course has tried to lead to the learning process of higher-order thinking skills. For the assessment process, the lecturers agreed to develop essay questions that can be used to measure the higher-order thinking skills of college students in the Chemistry Education Study Program. The first lecturer revealed that with the HOTS-based chemistry learning model questions that will be developed later, the lecturers who teach in the chemistry learning model teaching team certainly already have validated questions so that they become valid assessment instruments. The second lecturer agreed on the development of HOTS questions to train students to think at a higher level, enabling them to reach the highest level of cognitive ability.

Results of Interviews with College Students from the Chemistry Education Study Program

In addition to interviewing the lecturers of the Chemistry Education Study Program who have taught the chemistry learning model course, the researcher also conducted interviews with several students who have taken the course. Interviews were conducted with 6 students who took the chemistry learning model course in different academic years, with details as follows:

a. 5 College students who have participated in the learning process of the chemistry learning model course in the 2022/2023 academic year.
b. 1 College student who has participated in the learning process of the chemistry learning model course in the 2021/2022 academic year.

Based on an interview with College Student 1, it was obtained that according to College Student 1, this learning model course is interesting and makes college students enthusiastic to learn, because this course studies learning models that will later be used when becoming a teacher. College Student 1 also agreed that this learning model course requires more abilities than just remembering and understanding. The reason for his agreement is that college students not only remember but also know how to design lessons based on the syntax of the learning model. Additionally, the interview revealed that the implementation of the mid-semester and final-semester exams used essay questions, which college students answered manually by handwriting. The questions used did not facilitate measuring college students' higher-order thinking skills, so College Student 1 agreed if higher-order thinking skills questions were developed in this course.

The results of the interview with College Student 2 also obtained information that the chemistry learning model course made students enthusiastic about learning because as prospective teachers they had to prepare a creative learning process so that students would not get bored. Therefore, studying in the chemistry learning model course may enhance college students' creativity in teaching later on. Regarding assessment, College Student 2 stated that the mid-semester and final-semester exam questions were presented in essay format, containing topics relevant to what was learned in class. In terms of cognitive levels in the questions used for the mid-semester and final-semester exams, College Student 2 indicated that they primarily measured understanding. Additionally, when asked about the use of stimuli in the questions,

College Student 2 mentioned that only a small portion of the questions included stimuli. College Student 2 also agreed that essay questions should be developed to assess students' higher-order thinking skills in the chemistry learning model course.

The results of the interview with College Student 3 also showed that she was enthusiastic about the learning process in the chemistry learning model course. The reasons provided by College Student 3 were consistent with those of College Student 1 and College Student 2, namely that the learning model course is very important because, in the learning process, we need to understand the stages involved in teaching when we become teachers later on. From the interview, it was also found that according to College Student 3, all the materials in the mid-semester and final-semester exam questions had been studied, and explained by the lecturer. Additionally, college students explored information and asked the lecturer when they did not understand the material so it made it easy to answer the mid-semester and final-semester exam questions. The format of the questions used in the mid-semester and final-semester exams is essay-based. According to College Student 3, there are questions on the final-semester exam that include stimuli, but they are not very numerous. College Student 3 also agreed on the need to develop higher-order thinking skills questions in the chemistry learning model course because she believes this aligns with the scientific vision of the Chemistry Education Study Program.

The information obtained from the interview with College Student 4 indicates that the learning process conducted in the chemistry learning model course is in accordance with the semester lesson plan. The mid-semester and final-semester exams used in the chemistry learning model course consist of essay questions with operational verbs that are commonly used, such as "explain" and "give examples". Therefore, the cognitive level that is most often measured in the mid-semester and final-semester exam questions is level C2 (understanding). College Student 4 agrees to the development of higher-order thinking skills questions in the chemistry learning model course to train college students to think critically. Yusuf & Widyaningsih (2018) stated that the test instruments used by universities that only cover cognitive domains C1 to C4 make college students' high-level thinking skills less developed. Whereas the ability to solve higher-order thinking skills questions is very important in developing college students' critical thinking skills.

The information obtained from the interview with College Student 5 indicated that the learning process in the learning model course was quite complex, involving explanations of the material from the lecturer, individual assignments, and group assignments. College Student 5 stated that the lecturer provides explanations, and students memorize the explanations of the material presented by the lecturer. However, in addition to memorizing those theories, the lecturer assigns the creation of educational videos. College Student 5 stated that the lecturer provides explanations, and college students memorize the explanations of the material presented by the lecturer. However, in addition to memorizing those theories, the lecturer assigns the creation of educational videos. So, besides the theory, college students also engage in practical activities directly. Regarding the assessment process in the chemistry learning model course, it is known that the mid-semester and final-semester exam questions are in essay form. The questions mostly ask about definitions and explanations. According to College Student 5, if students memorize the theories, then it is easy for them to answer the questions. College Student 5 believes that the questions used are not very critical, even though the college student has not been very accurate in answering those questions. Therefore, the questions do not require students to think at a higher level. Thus, College Student 5 agrees that higher-order thinking skills questions should be developed in the chemistry learning model course.

The interview results with College Student 6 revealed that College Student 6 was enthusiastic about participating in the learning process in the chemistry learning model course. According to College Student 6, college students were allowed to seek solutions independently

when solving problems. When college students searched on their own, they understood the material better. In addition, College Student 6 stated that college students had been asked to make learning videos and lesson plans that were in accordance with one of the learning models. The learning videos made must be in accordance with the lesson plan. So, for example, if a group of college students is given an assignment related to group investigation, then the steps that must be taken must be in accordance with the stages of group investigation. College Student 6 also agreed that the chemistry learning model course requires abilities beyond mere memorization and understanding. College Student 6 also provided information regarding the evaluation or assessment process in the chemistry learning model course. The types of questions used in the mid-semester and final-semester exams were essay questions. The dominant cognitive level in the mid-semester and final-semester exam questions was at the C2 cognitive level (understanding), with the dominant operational verb being "explain". The mid-semester and final-semester exam questions used in this learning model course predominantly did not include stimuli. College Student 6 also agreed that higher-order thinking skills questions should be developed in the chemistry learning model course to challenge college students to better understand how to solve a problem.

From the interviews with six chemistry education college students who have taken the chemistry learning model course, it was found that the students stated that the course made them enthusiastic about learning. The reasons given by the college students were related to the learning process that stimulated their enthusiasm and the importance of the material in this course as a preparation for future teachers in conducting the learning process. From the interviews, it was also found that college students stated that the questions used in the mid-semester and final-semester exams were dominated by the C2 cognitive level (understanding), which has not yet assessed college students' higher-order thinking skills. All interviewed college students agreed that higher-order thinking skills questions should be developed in the chemistry learning model course. According to students, developing higher-order thinking skills questions in this learning model course can train critical thinking, train problem-solving skills, and align with the scientific vision of the Chemistry Education Study Program. The results of Waluyati et al., (2023) research also showed that 80% of college students stated that it was urgent to develop higher-order thinking skills questions.

CONCLUSION AND RECOMMENDATIONS

Based on the analysis results, it was found that the mid-semester and final-semester exam essay questions are not yet adequate in facilitating students to think at a higher level and in accommodating all the materials/topics in the chemistry learning model course. Therefore, it is necessary to develop a higher-order thinking skills test instrument for the chemistry learning model course. The researcher suggests conducting a needs analysis for the development of higher-order thinking skills test instruments in other courses, which will have an impact on the evaluation process of those courses.

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