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How STEAM is a Chemistry textbook for class XI of a public high school in Surakarta

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ABSTRACT

This study aims to analyze the content of the STEAM aspect in the chemistry textbook for class XI. The research method used is descriptive qualitative. Data collection in this study used content analysis techniques. The sampling technique used is purposive sampling. The data sources used are the Chemistry Book for SMA/MA Class XI Specialization in Mathematics and Natural Sciences published by Erlangga in 2016 as book A, Experiment-based Chemistry Student Book published by Tiga Serangkai in 2014 as book B, and Chemistry Student Books for SMA/MA Class XI publisher Intan Pariwara in 2016 as book C. Basic Competencies analyzed in the three books, namely Hydrocarbon Compounds and Petroleum represent KD which are conceptual-theoretical, Reaction Rate represents KD which is mathematical, and Chemical Equilibrium represents KD which is abstract-complex. The results showed that books A, B, and C already contained all aspects of STEAM in various basic competencies. The contents of STEAM aspects in book A are 80 statements, book B are 85 statements, and book C are 121 statements. In Books A and C, the aspects of STEAM that are mostly covered are the mathematical aspects, while the aspects that are mostly published in Book B are the science aspects. The aspects of STEAM that are least contained in books A and B are the artistic aspects, while in book C are the technical and artistic aspects. Thus, in books A, B, and C, the artistic aspect has a low amount of load. Research on the content of STEAM and HOTS aspects needs to be carried out in more depth with a different approach regarding the integration of STEAM and HOTS aspects, especially in textbooks and other learning resources.

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INTRODUCTION

The world is currently entering the 21st century which is characterized by the rapid development of science and technology. The very rapid development of technology apart from facilitating access to unlimited information apparently also raises various complex problems that require a variety of knowledge and skills to solve them. The world of education is one aspect of life that is closely related to the development of science and technology. Learning in the 21st century is required to be able to develop the quality and competitiveness of students both from the aspects of knowledge, attitudes and skills (Usman, Asrizal, & Kamus, 2017). Educational institutions are one of the institutions that play an important role in preparing individuals to master the skills of acquiring knowledge and innovation, skills in utilizing technology and information, and other skills that can be applied to work and survive (Wijaya, Sudjimat, & Nyoto, 2016).

The 21st century learning can be a medium to equip students with knowledge and skills that can be applied primarily in the process of solving problems that arise in life. The skills that are the demands of 21st century learning have been formulated by Partnership for 21th Century Learning the so-called 4C skills include Creativity and Innovation, Critical Thinking and Problem Solving, Communication, and Collaboration (Nuraeni, Feronika, & Yunita, 2019). Critical thinking is included in the realm of higher order thinking (HOTS) which is one of the skills that must be mastered as a response to the rapid development of science and technology so that students can be wiser in responding to the information they receive. In addition, these skills will also be very useful in the process of solving problems in life. Brookhart (2010) has defined HOTS into 3 (three) aspects, namely HOTS as transfer of knowledge, HOTS as critical thinking skills, and HOTS as problem solving skills. All aspects of HOTS need to be mastered and accustomed to in school learning so that students are able to practice their skills in solving difficult problems in their lives.

PISA is a global scope research to determine students' mastery of HOTS in a country, including Indonesia. The PISA results on 2018 show that Indonesia is ranked 74th out of 79 countries for the reading category. Meanwhile, for the category of mathematics and science, Indonesia ranks 73rd and 71st respectively out of a total of 79 participating countries. In addition to PISA, students' HOTS abilities on a national scale can be identified through the results of the National Examination (UN), because the questions in the current National Exam already contain questions in the HOTS category as one of the steps to improve the quality of education. The national exam results on 2019 show that the average national exam result for high school level (IPA) throughout Indonesia is 46.79 with an average chemistry subject of only 50.87. The average value of chemistry scores shows that low national exam results in chemistry occur in almost all schools in Indonesia, one of which is Surakarta City. The average National Examination for chemistry subjects for the high school level of the Science study program in Surakarta in 2019 shows a value of 69.95.

The low results of Indonesia's PISA and the average UN scores indicate that students' mastery of HOTS in Indonesia is still low, so that the quality of Indonesian education is still far behind other countries. Students in Indonesia still have difficulties when solving questions that require them to apply several concepts and stages of completion, non-routine questions that require reasoning, and contextual questions. Students also often encounter difficulties when there are questions that require them to apply a concept in an unfamiliar context, questions that require them to infer or predict data from several variables, and questions of understanding abstract concepts. The students' low mastery of HOTS certainly must be addressed as soon as possible. Research conducted by Putri, Ahda, & D. (2018) found that the learning process that has been taking place so far has not been directed effectively to hone students' higher-order thinking skills.

Higher-order thinking skills can be developed through contextual learning so as to stimulate students' curiosity and high-order thinking skills, one of which is through STEAM integrated learning. STEAM learning is learning that integrates science, technology, engineering, art, and mathematics. Through STEAM learning, students can be trained to apply the knowledge they have acquired to solve the problems they face and develop their skills in using technology so that their creativity and critical thinking skills can develop (Permanasari, 2016; Sa'ida, 2021). STEAM learning is a form of learning that can be applied to answer the demands of learning in the 21st century. STEAM integration in learning can develop various knowledge and skills in students. This is because in STEAM learning, students are stimulated to be curious so that higher-order thinking skills, problem solving, and the ability to work together can be developed (Purnamasari, Handayani, & Formen, 2020).

The application of the STEAM approach in learning can offer opportunities for students to develop the skills needed in the 21st century, for example communication skills, critical thinking, leadership, teamwork, creativity, and various other skills without compromising the breadth of insight in the sciences and humanities. This is because learning with the STEAM approach is in the form of contextual learning, so that it is able to direct students to explore their abilities with a method that suits them. Through STEAM learning the ability of students to collaborate, work together, and communicate will be honed. Learning will also reveal the diverse works of students both individually and in groups (Mu'minah & Suryaningsih, 2020).

Arts in STEAM is able to develop student creativity which is useful for bringing out various innovations. It is known that art learning is able to develop a variety of student skills such as creativity, critical thinking, innovation, collaboration, interpersonal communication, and cognitive skills (spatial reasoning, abstract and divergent thinking, self-creativity, openness to experience, and curiosity) (NEA, 2016; Swaminathan & Schellenberg, 2015). In line with that, Katz (2018) has defined STEAM as the interaction of art with curriculum and learning in the scope of science, technology, engineering, and mathematics. As an approach to learning, STEAM can accommodate students to generate ideas or ideas based on science and technology through thinking and exploring activities in solving problems based on five integrated scientific disciplines so as to produce solutions that are very precise, attractive, effective and efficient (Nurhikmayati, 2019).

STEAM consists of 5 (five) aspects, namely science, technology, engineering, art, and mathematics. The scientific aspect is defined as a concept related to natural phenomena and the changes that occur due to human activities (Asrizal & Dewi, 2018). According to Revee (2015) science is the study of the universe including natural laws related to physics, chemistry and biology. Technological aspects cover various fields that involve the application of human knowledge, skills and abilities in producing something that can facilitate life activities (Bruton, 2017). The technical aspect is the design process in making a product or work step (Bruton, 2017). The aspect of art is knowledge related to aesthetic value or beauty. Art can make learning more interesting because it involves elements of aesthetics or beauty in it (Apriliana et al., 2018). The mathematical aspect is the science of numbers, operations, relationships, and shapes (Revee, 2015). Mathematics helps in interpreting, analyzing information, simplifying and solving problems, assessing risks, making decisions, making models, and explaining abstract and concrete concept problems (Bruton, 2017). STEAM aspect analysis in this study was based on indicators of 5 (five) STEAM aspects, namely science, technology, engineering, art, and mathematics which were analyzed using a silo approach, namely analyzing the content of 5 (five) STEAM in textbooks separately.

The learning process still uses books as learning resources used by students. In Bonnie B. Ambutser, the results of EPIE's research stated that the use of textbooks in the learning process in class was 75%, while the use of textbooks for homework was 90% (Awaliyah, Feronika, & Agung, 2015). A study conducted by Prakoso (2021) suggested that of the 3 (three) class X chemistry textbooks analyzed, only 1 (one) book contained 5 (five) aspects of STEAM, although the composition was not balanced, while 2 (two) books others have not yet included all aspects of STEAM. Based on these facts, an analysis of STEAM content in chemistry textbooks for class XI also needs to be done. This is in line with the statement made by Wahyu, Fathurohman, & Makos, (2016) that analysis of textbooks is very important as an evaluation to improve the quality of learning in Indonesia. Through the analysis of textbooks, textbooks can also be developed so that teachers can choose and adjust textbooks according to the learning objectives that have been set.

METHOD

This study used descriptive qualitative method. Descriptive research is a research method in which a researcher collects data, then analyzes the data critically and draws conclusions based on the facts at the time the research took place. This study examines the 3 (three) textbooks that are most widely circulated in several public high schools in Surakarta because the indicators of the Science, Technology, Engineering, Arts, and Mathematics (STEAM) in chemistry textbooks for class XI is very important to study to find out aspect indicators Science, Technology, Engineering, Arts, and Mathematics (STEAM) in the chemistry textbook for class XI has been loaded to support the fulfillment of the objectives of the applied curriculum. The three books are book A used by 2 schools, book B used by 3 schools, and book C used by 3 schools. The research was conducted from October 2021 to March 2022.

Research Objectives

The data in this study are in the form of STEAM aspect indicator content in XI grade chemistry textbooks. The data sources in this study were the 3 (three) textbooks for chemistry class XI that were most widely used in SMA Negeri in Surakarta.

Research Object Retrieval Techniques

The research object taking technique used was purposive sampling. Purposive sampling is a sampling technique with certain considerations (Sugiyono, 2018). In this study, the researcher considered several criteria in selecting research objects, namely (1) meeting the eligibility standards for books used in learning according to the applicable Regulations of the Minister of Education and Culture of the Republic of Indonesia includes content feasibility, presentation feasibility, language feasibility, and graphics feasibility; (2) based on the 2013 curriculum; (3) is a chemistry text book for class XI with different authors and publishers; (4) chemistry textbooks used in public high schools in Surakarta.as a result, 3 (three) textbooks were used in the study, namely the Chemistry Book for SMA/MA Class XI Specialization in Mathematics and Natural Sciences, published by Erlangga as book A, Experiment-based Chemistry Student Book, published by Tiga Serangkai as book C, and Student's Book. Chemistry for Class XI SMA/MA published by Intan Pariwara as book C.

Research Procedure

The research began by determining three types of chemistry textbooks for class XI which would be analyzed based on predetermined criteria. Furthermore, from each of the three textbooks, Basic Competencies (KD) were selected to be analyzed. Selection of Basic Competency (KD) is carried out based on the characteristics of learning materials, namely conceptual-theoretical, mathematical, and abstract-complex. Furthermore, the selected XI class chemistry textbooks were analyzed for STEAM aspect content using validated STEAM aspect load analysis instrument sheets. The research data from the three raters were then tested for reliability using the inter-rater reliability test or ICC. Then an analysis of the research data was carried out to describe the content of the STEAM aspect in the XI class chemistry text book.

Research Data Collection Techniques and Instruments

The data collection technique used is content analysis technique. The research data in the form of STEAM aspect indicator content was obtained by analyzing the selected KD from each of the analyzed textbooks. The analysis was carried out by reading and understanding the elements of the text on each page in the book and then matching them with the STEAM aspect indicators listed on the validated STEAM aspect analysis instrument sheet. Analysis of STEAM aspects in research based on indicators of 5 (five) STEAM aspects, namely science, technology, engineering, art, and mathematics which were analyzed using the silo approach, namely analyzing the content of 5 (five) STEAM in the textbooks separately. Prior to use, the research instrument was validated first using a research instrument validity test with expert validation techniques. The validation results were then analyzed using content validity with the Gregory formula, in Formula 1.

$$Cooeficient\ of\ content\ validity = \frac{D}{(A + B + C + D)} \qquad (1)$$

Where:
A: both panelists disagree
B: panelist I agrees, panelist II disagrees
C: panelist I disagree, panelist II agrees
D: both panelists agree

Data analysis in this study begins with calculating the reliability between raters. The inter-rater reliability test is determined using the inter-rater reliability test or *Interclass Correlation Coefficient* (ICC). This reliability test was developed by Pearson (Widhiarso, 2011) which can be applied if a study involves many raters and the results of the assessment scores are continuum or measurement data. Next, count the number of occurrences of each STEAM aspect indicator in the XI grade chemistry text books being analyzed. The amount of STEAM aspect indicator content is grouped based on the characteristics of the Basic Competences analyzed in each book.

RESULT AND DISCUSSION

Result

Class XI high school chemistry textbooks were analyzed based on the STEAM aspect content (*Science, Technology, Engineering, Arts, and Mathematics*) with content analysis techniques. STEAM aspect content analysis was carried out using a silo approach, namely analyzing the content of the five STEAM aspects in the textbooks separately. This study involved three raters, namely rater 1 was a researcher, rater 2 was a student, and rater 3 was a chemistry teacher. The results of the calculation of the intra-class correlation coefficient or ICC for the STEAM aspect load analysis in books A, B, and C are presented in Table 1.

Table 1. Inter-Rater Reliability Test Results for STEAM Aspect Load Analysis

Books	**R. *alpha***	**ICC**		
	Marks	***Single Measures***	***Average Measures***	**Category**
A	0.999	0.998	0.999	*Excellent agreement*
B	0.999	0.998	0.999	*Excellent agreement*
C	0.999	0.998	0.999	*Excellent agreement*
Average	0.999	0.998	0.999	*Excellent agreement*

Based on Table 1, information can be obtained that books A, B, and C have value*average measures* ≥0.999, meaning that the average agreement among raters for STEAM analysis in the three books is very good, so that the analysis of the STEAM aspects in the three books can be continued. The results of the STEAM aspect load analysis in books A, B, and C according to the three raters are as shown in Table 2.

Table 2. Results of STEAM Aspect Load Analysis in Books A, B, and C

STEAM Aspect	**STEAM Aspect Load Amount**				
	Rater 1	**Rater 2**	**Rater 3**	**Average**	**% Average**
Book A					
Science	24	22	23	23	28.75
Technology	9	9	7	8	10.38
Engineering	9	9	8	9	10.88
Art	1	1	1	1	1.25
Mathematics	41	38	38	39	48.75
Total	84	79	77	80	100
Book B					
Science	27	26	25	26	30.59
Technology	13	12	11	12	14.12
Engineering	18	16	17	17	20.00
Art	8	7	7	7	8.59
Mathematics	24	22	22	23	26.71
Total	90	83	82	85	100
Book C					
Science	34	33	30	32	26.76
Technology	24	24	23	24	19.64
Engineering	15	15	14	15	12.18
Art	15	14	15	15	12.18
Mathematics	36	35	35	35	29.25
Total	124	121	117	121	100

Based on Table 2, the average number of STEAM aspects in book A is 80 statements, book B is 85 statements, and book C is 121 statements. In books A and C, the aspect of STEAM that is most widely covered is the mathematical aspect, while the aspect most published in book B is the aspect of science. The STEAM aspect that is at least covered in books A and B is the artistic aspect, while in book C are the technical and artistic aspects. Thus, in books A, B, and C, the artistic aspect has a low amount of content.

STEAM aspect content analysis in chemistry textbooks for class XI in terms of 5 (five) aspects, namely aspects of science, aspects of technology, aspects of engineering, aspects of art, and aspects of mathematics. the description of the results of the content analysis of each aspect of STEAM in books A, B, and C is as follows in Figure 1.

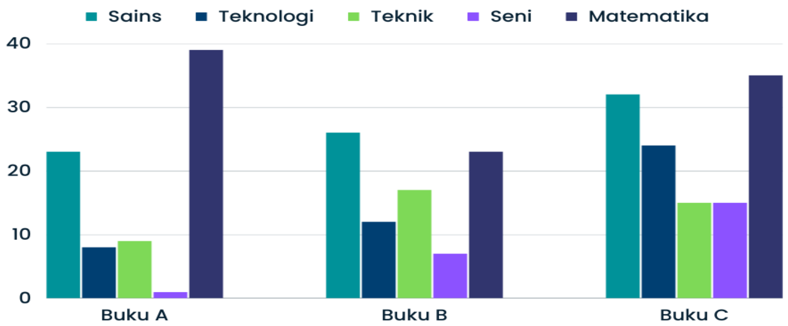

Figure 1. Results of STEAM Aspect Analysis in Books A, B, and C

Discussion

Science

The content of science aspects in textbooks is indicated by the presence of text elements which contain one of the indicators which includes stimulation that relates surrounding phenomena to material (S1), describes phenomena that occur around (S2), asks questions after making observations (S3), makes decisions related to phenomena that occur around (S4), explain the macro and sub-micro relationships of phenomena that occur around (S5), and evaluate and design scientific evidence (S6). The content of science aspects in textbooks plays a role in training students to understand and associate problems with natural phenomena and changes that occur due to human activities so that students do not only memorize concepts (Asrizal & Dewi, 2018; Pratiwi & Ramli, 2019).

The results of the analysis of science aspects in the XI class chemistry textbooks show that this aspect has been included in the three textbooks analyzed on KD of hydrocarbon and petroleum compounds, reaction rates, and chemical equilibrium. Based on Figure 1, the science aspect is the aspect that is most widely contained in book B. Meanwhile, in books A and C this aspect is the aspect that has the second highest amount of content after the mathematical aspect. These results indicate that the textbooks in circulation are still dominated by scientific content. This is also explained in the results of research conducted by Yuanita & Kurnia (2019) which shows that the scientific aspect is the aspect that is most widely included in the themes being analyzed. Following are the results of the content analysis for each indicator of the scientific aspect in books A, B, and C, can be shown in Figure 2.

Based on Figure 2, it is known that there are 2 (two) indicators that dominate the content of scientific aspects in the chemistry textbooks for class XI SMA being analyzed, namely the S1 indicator (stimulation that links surrounding phenomena to the material) and the S6 indicator (evaluating and designing scientific evidence). The content of the two indicators is the reason for the large number of scientific aspects in the three textbooks analyzed.

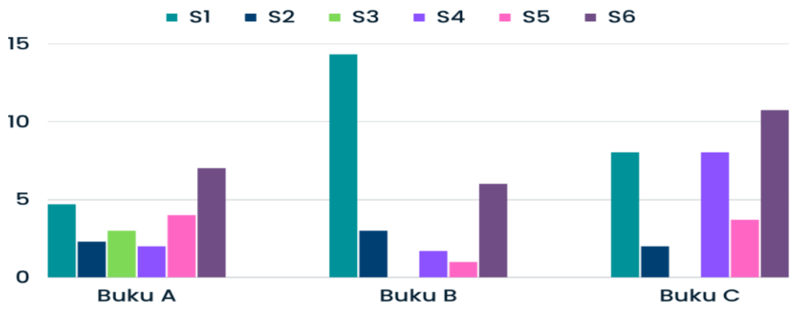

Figure 2. Results of Analysis of Indicators of the Science Aspect in Books A, B, and C

Most of the S1 indicators in books A, B and C are displayed in the format of pictures of the surrounding phenomena along with their descriptions. The amount of stimulating content that associates surrounding phenomena with learning material can make it easier for students to build an understanding of the concepts of the material being studied. While the S6 indicator is mostly contained in the format of practical activities or experiments in the laboratory. The existence of practicum activities is able to direct students to be active and independent in building understanding based on observations so that the learning experienced becomes more meaningful. In addition, the implementation of practicum activities can hone various skills of students, one of which is higher-order thinking skills.

Technology

The content of technological aspects in textbooks can be demonstrated by the existence of text elements that inform an innovation as a result of human thought processes in the form of hardware and software that are created to facilitate human work in order to create a higher quality life (Yuanita & Kurnia, 2019). This information can be in the form of statements regarding the development of new technology (T1), the use of new technology (T2), the application of technology in everyday life (T3), the use of software in learning (T4), and the use of internet networks in learning (T5).

The results of the analysis of technological aspects in chemistry textbooks for class XI show that books A, B, and C already contain these aspects. Based on Figure 1, this aspect is the aspect that has the third largest amount of content in book C, while in books A and B this aspect has the fourth highest amount of content. This aspect is contained in the KD of hydrocarbons and petroleum, reaction rates, and chemical equilibrium in the three books analyzed. Following are the results of the analysis of each indicator of the technological aspect in books A, B, and C, as follows in Figure 3.

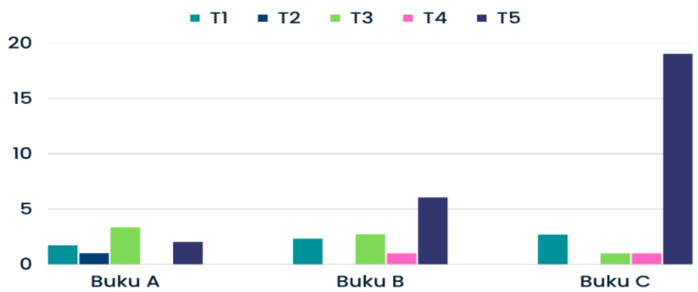

Figure 3. Results of Analysis of Technology Aspect Indicators in Books A, B, and C

Based on Figure 3, the content of technological aspects in book A is dominated by information on the application of technology in life related to learning materials (indicator T3), such as oil platforms for taking petroleum, petroleum multilevel distillation columns for petroleum processing, gas station machines for distributing gasoline used as fuel, and *catalytic converter* to prevent air pollution in vehicle exhaust. The use of some of these technologies makes technology a medium to make it easier for humans to solve problems they face in life. While the contents of the technological aspects in books B and C are dominated by information or activities that invite students to take advantage of the internet network (indicator T5). Students are invited to access the listed website link which contains learning materials. This shows that books B and C have made technology a support for student activities to find and obtain explanations related to learning materials and related natural phenomena. In addition, the use of technology in books B and C is also shown by its use *software* (T4 indicator), such as consumption *Microsoft Power Point* or the like to make *slide* presentation. There is 1 statement excerpt in book B and 1 statement excerpt in book C. The content should be increased because the use of software can increase the effectiveness of the implementation of the learning process which has an impact on increasing understanding, learning outcomes, and students' skills.

Engineering

The content of technical aspects in textbooks is closely related to the knowledge and skills to design, apply, replicate and engineer a work in the form of equipment, systems and machines that can be used by humans to speed up and facilitate the production process of goods and services (Yuanita & Kurnia, 2019). The results of the analysis of technical aspects in the chemistry textbooks for class XI high school in Figure 1 show that this aspect has been included in the three books analyzed, although the number is still small. This aspect load is contained in the KD of hydrocarbons and petroleum, reaction rates, and chemical equilibrium. The results of the analysis are based on 4 (four) indicators, namely completing project assignments (E1), integrating chemistry with other sciences (E2), applying learning materials in the process of solving a problem (E3), and informing solutions to various problems in everyday life. day (E4). Following are the results of the analysis of each technical aspect indicator in books A, B, and C, can be shown in Figure 4.

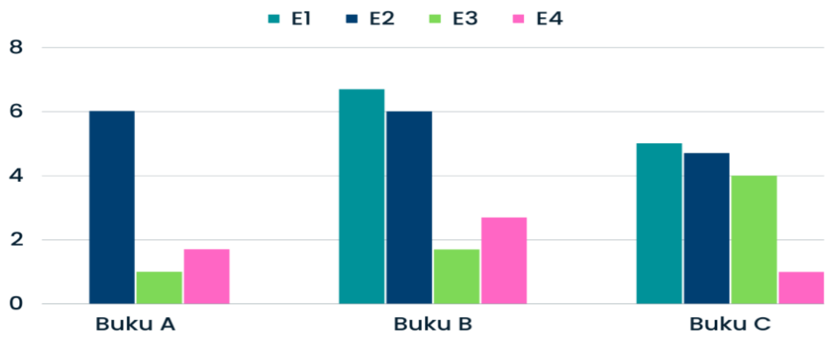

Figure 4. Results of Analysis of Technical Aspect Indicators in Books A, B, and C

There are 9 citations for the technical aspects in book A, 18 citations for book B, and 15 citations for book C. Based on Figure 4, in general the content of the technical aspects in books A, B, and C is dominated by activities that encourage students to combine chemistry with other sciences to solve a problem (E2). In book A there are 6 quotes that encourage students to combine chemistry with mathematics to solve problems. In book B there are 6 quotes that encourage students to combine chemistry with several other sciences such as mathematics, art, and technology. Whereas in book C there are 5 quotes that encourage students to combine chemistry with mathematics or technology. The quotations are many in number and most of them are contained in the work steps in practicum activities or experiments in the laboratory. As previously mentioned, the scientific aspects in books A, B, and C are dominated by practical activities or experiments in the laboratory, so there are also many work steps that encourage students to integrate chemistry with other sciences.

In books B and C there are indicators of technical aspects which show the most amount of content, namely activities that encourage students to complete project assignments (indicator E1), 7 citations in book B and 5 citations in book C. Most of the content is packaged in a column entitled “Project Tasks”, including: 1) Project Task “Cramping Fruit with Carbide” (Book B, p. 31); 2)

Project Task: design and conduct experiments on factors affecting shifts in the direction of equilibrium (Book B, p. 138); 3) Project Task "Creating a Framework for Hydrocarbon Compounds" (Book C, p. 26), and 4) Project Task "Making Biogas" (Book C, p. 46)

Project assignments contain complex problems that require students to be able to design, solve problems, make decisions, investigate, and be independent in solving the problems they face so as to develop students' scientific skills and attitudes. Therefore, the content in book A should also be equipped with project assignments so that students' skills can also develop along with their mastery of knowledge. The three books analyzed did not contain many activities that develop students' skills for defining problems, designing, assembling, or operating something. There are only a few design and fabrication activities included in the project assignment. The information content related to solutions to problems in everyday life is also only about 1-3 quotes in each book. The limited amount of content can hinder the development of students' problem-solving skills in everyday life.

Art

The content of artistic aspects in textbooks is closely related to design, creativity and innovation. Therefore, the integration of aspects of the arts in learning is expected to be able to reduce the pressure felt by students and increase learning motivation, activeness, cognitive abilities, and creativity of students (Purnamasari, Handayani, & Formen, 2020). The results of the analysis of the art aspect in the XI class chemistry textbook in Figure 1 show that this aspect has been included in books A, B, and C, but in small quantities. This aspect is the least covered in the three books analyzed. The fulfillment of artistic aspects in the books analyzed varies. The art aspect is found in book A only in KD of hydrocarbons and petroleum. In book B, artistic aspects are contained in KD of hydrocarbons and petroleum and reaction rates. Meanwhile, book C contains art aspects in KD of hydrocarbons and petroleum, reaction rates, and chemical equilibrium. The following is the result of the analysis of the content of the artistic aspect indicators in books A, B, and C, can be shown in Figure 5.

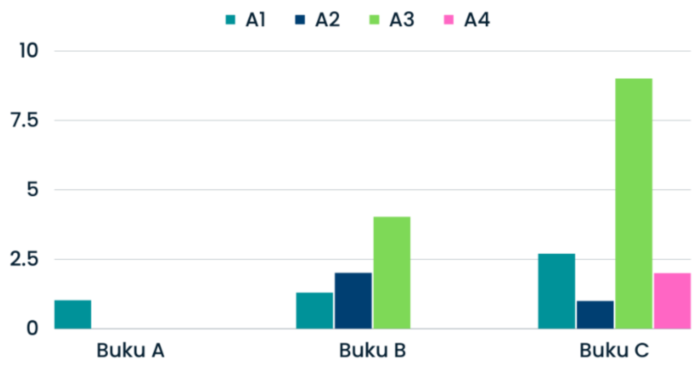

Figure 5. Results of the Analysis of Art Aspect Indicators in Books A, B, and C

Based on Figure 5, the indicators that appear in all the books analyzed are only indicator A1. This indicator is also the only indicator of the artistic aspect that appears in book A, namely activities that encourage students to produce creative and innovative products or works. In book A KD hydrocarbons and petroleum, page 29 contains assignments that encourage students to make posters about the process of forming petroleum, refining, and the use of each fraction in a systematic way. In book B, students are directed to color the arrangement of molecules and make presentation slides. Whereas in book C, students are directed to make posters, molimod, and activated charcoal from tools and materials around them. These activities develop the creativity of students to produce interesting products or works as a solution to the problems they face. In addition, the learning process that takes place can also be more interesting and fun so that it is expected to increase students' understanding of the concept of learning material.

In books B and C, there are indicators loaded with the largest number, namely communicating ideas effectively (indicator A3). This skill includes aspects of art in terms of communication that really need to be mastered by students. Much of this content is contained in books B and C because there are many discussion activities accompanied by the activity of conveying the results of the discussions in front of the class. In book B there are 4 discussion activities while in book C there are 9 discussion activities. However, these three books have not properly facilitated students to develop their abilities to socialize their products or works to the public. Only book C contains 2 excerpts containing activities to socialize his products and works to the public. The limited content in textbooks can make students' creativity to introduce their products or work to the public less fully developed. In fact, such ability is one of the important abilities that must be owned by every individual in this century.

Mathematic

The content of mathematical aspects in textbooks with numeration, patterns of change and relationships, space and form, skills for thinking rationally and logically and reasoning, and using them in a systematic and structured manner (Yuanita & Kurnia, 2019). Analysis of the content of the mathematical aspects of textbooks is based on 4 (four) indicators, namely applying mathematical symbols (M1), applying numeracy skills to solve problems (M2), interpreting experimental data and results (M3), and formulating conditions or problems mathematically (M4).).

The results of the analysis of the mathematical aspects in the XI class textbooks show that these aspects have been included in the 3 (three) books analyzed. Based on Figure 1, it is known that this aspect is the aspect that appears the most in books A and C, while in book B this aspect is the second most appearing aspect after the science aspect. In general, the results of the research show that the content of the scientific aspects and the mathematical aspects has an almost equal amount. These results are similar to research on the analysis of STEM content in high school physics textbooks for class X semester 1 which shows that the presentation of the number of aspects of science and aspects of mathematics in the five books analyzed is almost the same (Agnezi, Khair, & Yolanda, 2019). Mathematical aspects are known to appear in KD of hydrocarbons and petroleum, reaction rates, and chemical equilibrium in both books A, B, and C. The results of the analysis of the load on the mathematical aspect indicators in books A, B, and C are shown in Figure 6 as follows:

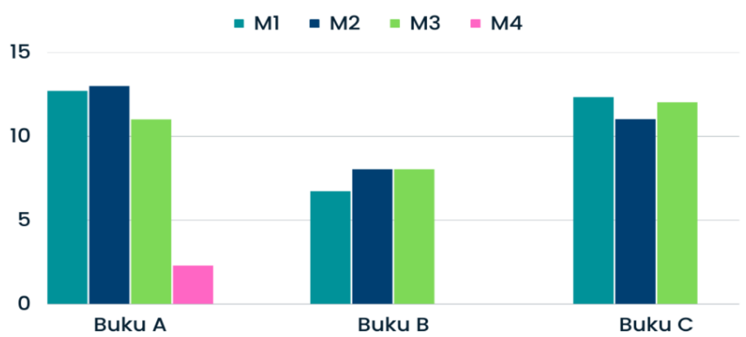

Figure 6. Results of the Analysis of Mathematical Aspect Indicators in Books A, B, and C

The contents of many mathematical aspects are found in books A, B, and C because there are many elements of the text that apply mathematical symbols to facilitate students' understanding (indicator M1). Apart from that, in the three books there are also many activities that require students to apply numeracy skills (indicator M2) and interpretation of data and research results (indicator M3). It is very important to integrate these contents in textbooks because the results of PISA show that the ability of Indonesian students to relate mathematical concepts to everyday problems is still low (Akmal & Asikin 2022). The mathematical aspects in books A, B, and C are mostly covered in

KD reaction rates compared to KD in hydrocarbons and petroleum and chemical equilibrium, because these KD contain a lot of activities that require students' numeracy skills and interpretation.

CONCLUSION

The STEAM aspect content in book A is 80 statements, book B is 85 statements, and book C is 121 statements. The STEAM aspect is contained in 3 (three) various Basic Competencies. In book A, aspects of science, technology, engineering, and mathematics are included in the KD, which are hydrocarbons and petroleum, reaction rates, and chemical equilibrium. Meanwhile, the art aspect is only contained in KD of hydrocarbons and petroleum. In book B, the aspects of science, technology, engineering, and mathematics are contained in the KD of hydrocarbons and petroleum, reaction rates, and chemical equilibrium. While the artistic aspects are contained in KD of hydrocarbons and petroleum and reaction rates. In book C, aspects of science, technology, engineering, art, and mathematics are included in KD of hydrocarbons and petroleum, reaction rates, and chemical equilibrium. The results of this study indicate that the STEAM aspect content is still presented partially. Therefore, researchers expect the development of textbooks that integrate STEAM aspects of content in a complete and proportionate manner into textbooks and other learning resources to improve the quality of Indonesian student resources to be able to solve problems faced and compete in the international world of work. Thus it will make it easier for educators to apply it in learning so that it makes it easier for students to master it. Research on the content of STEAM and HOTS aspects needs to be carried out in more depth with a different approach regarding the integration of STEAM and HOTS aspects, especially in textbooks and other learning resources.

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