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Analysis of the Structure and Content of the Independent Curriculum on Basic Law of Chemistry

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ABSTRACT

The independent curriculum is a curriculum that applies due to learning loss that occurred in the 2013 curriculum during the COVID-19 pandemic. Teachers do not understand the concept of the curriculum as a whole so that the independent curriculum is difficult to understand and accept. Therefore, it is necessary to analyze the depth and breadth of the material in the independent curriculum. This study aims to describe the suitability of the structure and content of the independent curriculum on the basic law of chemistry material based on the revised bloom taxonomy, Dave and Dyers taxonomy and chemical standard textbooks. This type of research is descriptive with a qualitative approach. This study used a content structure analysis research design derived from the Model of Educational Reconstruction (MER). The results of the research obtained in structural analysis are: (1) the elements of chemical understanding are in accordance with the revised bloom taxonomy, (2) the element of process skills only dominates abstract skills, (3) the elements of the pancasila profile contain abstract skills and the realm of attitudes. Meanwhile, in the content analysis, namely: (1) the breadth of material in CP basic laws of chemistry is appropriate in the high school book from the Ministry of Education and Culture, (2) the depth of material there are some materials that are not suitable based on the chemistry textbook written by Brady edition 7.

1. Introduction

The curriculum is a tool that is used as a reference in developing a learning process that contains student activities that can be sought to achieve an educational goal in general and learning objectives in particular. After independence, the curriculum in Indonesia underwent changes and was grouped based on curriculum groups, starting from the Lesson Plan curriculum (curriculum

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1947, 1952, 1964, 1968), goal-oriented curriculum (1975, 1984, 1994), competency-based curriculum (KBK) 2004, curriculum at the education unit level (KTSP) 2006, and curriculum 2013 (Kurniasih, 2014) . Based on the Decree of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia Number 56 of 2022 concerning Guidelines for Curriculum Implementation in the Framework of Learning Recovery that the current curriculum is the independent learning curriculum which is an improvement due to learning loss from the 2013 curriculum that occurred due to the COVID-19 pandemic.

The independent learning curriculum is a curriculum with diverse learning that focuses on essential materials so that students can explore concepts and strengthen competencies in sufficient time (Nurani, 2022). According to Rachmawati (2022), some teachers still do not accept the implementation of the independent curriculum, namely because teachers do not understand the concept of the curriculum as a whole, so the independent curriculum is difficult for some teachers to understand and accept. The curriculum plays an important role in education, because it is related to determining the direction, content and process of education so that it can determine the qualifications of graduates in an educational institution.

Teachers are very instrumental in implementing the freedom of learning policy, namely contributing collaboratively and effectively working with school curriculum development to organize and compile materials, textbooks, and learning content. Teacher involvement in the curriculum development process needs to be done to adjust the curriculum content to the needs of students in the classroom (Yulianti, 2022). The learning process that does not use teaching modules properly has been ensured that the delivery of content to students is not systematic, so that learning occurs unbalanced between teachers and students (Maulida, 2022).

The breadth of the material relates to the amount of material content contained in the book based on the subject matter that has been determined. While the depth of the material is related to how detailed the concepts that students must learn based on the amount of material content on the subject matter (Setiawan, 2018).

Based on this description, it is necessary to conduct an analysis of the structure and content of the independent curriculum in high school chemistry subjects. Structural analysis was carried out by analyzing the suitability of the CP formulation in the independent curriculum based on the cognitive level of students guided by the revised bloom taxonomy, process skills and pancasila profile guided by abstract performance and affective domain. Content analysis is carried out by analyzing the breadth and depth of material in the form of material coverage and material sequence guided by chemistry in accordance with standard textbooks limited by high school textbooks from the Ministry of Education and Culture.

2. Methodology

The type of research used in this study is descriptive research with a qualitative approach. The design of this study is an analysis of the structure and content adopted from the first part of MER (Model of Educational Reconstruction) (Duit, 2012). Structural analysis addresses the appropriateness of analysis of knowledge levels, skills and attitudes based on the revised bloom taxonomy, Dave and Dyers' taxonomy. Meanwhile, content analysis discusses the order and suitability of material from standard textbooks that are limited to science textbooks from the Ministry of Education and Culture.

Data collection techniques using literature studies. Data analysis techniques using Miles and Hubberman. Research instruments are content standard analysis Tables, knowledge level analysis Tables, attitudes and skills on basic chemical law material and material analysis Tables (multiplerepresentation) on basic chemical law material. Data sources were obtained from teacher books and Natural Science student books issued by the Ministry of Education and Culture, General Chemistry books by Brady, and Learning Outcomes issued by the decision of the research, development and book agency number 28 of 2021.

3. Results and Discussion

Content Standards Analysis

The results of the content standard analysis were obtained from learning outcomes and analyzed the subject matter contained in books issued by the Ministry of Education and Culture and textbooks from universities. The results of the content standard analysis are in Table 1.

Judging from the results of the content standard analysis, the depth of material contained in teacher books and student books issued by the Ministry of Education and Culture starting from the characteristics, types and ways of writing chemical reactions, this can make prerequisite material in understanding the basic laws of chemistry related to chemical reactions and the basic laws of chemistry can also be applied in daily life. While the results of the analysis are based on textbooks, the relevant material is the basic laws of chemistry divided into three, namely the law of conservation of mass, the law of fixed proportions and the law of multiple comparisons.

While the basic laws of chemistry according to Gay-Lussac are explained in textbooks in the chapter on the nature of gases. Because Gay-Lussac's law deals with the ideal gas law which involves a volume of gas that reacts with other gases so that it can form a new gas. The basic law material of chemistry is located in Phase E which applies to grade X high school in the independent curriculum (Aditomo, 2021).

Table 1. Analysis of Content Standards on the Material of the Basic Laws of Chemistry

Learning Outcomes (CP)	Ministry of Education and Culture		Textbooks	
	Material	Sub materials in the Teacher's Book and Student Book	Material	Sub material in the textbook
Write down chemical reactions and apply basic laws of chemistry	Basic Laws of Chemistry	1. Characteristics, Types and how to write chemical reactions	Chemical and atomic/molecular matter	1. Law of conservation/conservation of mass
		2. 4 Basic laws of chemistry (Lavoisier, Proust, Dalton, Gay-Lussac)	Dalton and atomic theory	2. Fixed law of comparison
		3. Basic Laws of Chemistry to solve cases in everyday life	Gas properties	3. Law of multiple comparisons
			None	Gas Properties
				1. Molecular form of gas
				2. Pressure measurement
				3. Gas law
				4. Stoichiometry using the gas law
				5. Ideal gas law

Judging from the results of the content standard analysis, the depth of material contained in teacher books and student books issued by the Ministry of Education and Culture starting from the characteristics, types and ways of writing chemical reactions, this can make prerequisite material in understanding the basic laws of chemistry related to chemical reactions and the basic laws of chemistry can also be applied in daily life. While the results of the analysis are based on textbooks, the relevant material is the basic laws of chemistry divided into three, namely the law of conservation of mass, the law of fixed proportions and the law of multiple comparisons. While the basic laws of chemistry according to Gay-Lussac are explained in textbooks in the chapter on the nature of gases. Because Gay-Lussac's law deals with the ideal gas law which involves a volume of gas that reacts with other gases so that it can form a new gas. The basic law material of chemistry is located in Phase E which applies to grade X high school in the independent curriculum (Aditomo, 2021).

Analysis of the level of knowledge, attitudes and skills (structural analysis) on the basic laws of chemistry

The results of this analysis use learning outcomes that have been issued by the Ministry of Education and Culture which consists of three elements, namely: elements of chemical understanding, elements of process skills and pancasila profiles. The results of the analysis are presented in the form of a Table contained in Table 2.

Table 2. Knowledge Level Analysis

Learning Outcomes (CP)	Knowledge Level
Write down chemical reactions and apply basic laws of chemistry	<ul style="list-style-type: none"> Knowing (C1) Apply (C3)
1. Observe Able to choose the right tools to make measurements and observations. Pay attention to the relevant details of the object	<ul style="list-style-type: none"> Select (C1)
2. Questioning and predicting Identify questions and problems that can be investigated scientifically. Students connect existing knowledge with new knowledge to make predictions	<ul style="list-style-type: none"> Predict (C2) Identify (C1)
3. Plan and conduct investigations Learners plan scientific investigations and carry out operational steps based on correct references to answer questions. Students make measurements or compare dependent variables using appropriate tools and paying attention to scientific rules	<ul style="list-style-type: none"> Doing (C3) Compare (C2)
4. Processing, analyzing data and information Interpret the information obtained honestly and responsibly. Analyze using appropriate tools and methods, assess the relevance of the information found by including reference references, and conclude the results of the investigation	<ul style="list-style-type: none"> Processing (C3) Analyze (C4) Interpreting (C2) Rate (C5) Summing Up (C5)
5. Evaluate and reflect Students are brave and polite in evaluating conclusions through comparisons with existing theories. Shows the advantages and disadvantages of the investigation process and its effect on the data. Point out problems with the methodology and propose suggestions for improvement for the next investigation process.	<ul style="list-style-type: none"> Evaluate (C5)
6. Communicate results Communicate the results of the investigation as a whole including security, environmental and ethical considerations supported by arguments, language and scientific conventions appropriate to the context of the investigation. Shows systematic thinking patterns according to a specified format.	<ul style="list-style-type: none"> Show (C1)

Table 3. Skill Level Analysis

Learning Outcomes (CP)	Concrete Skills	Abstract Skills
Write down chemical reactions and apply basic laws of chemistry		
1. Observe Able to choose the right tools to make measurements and observations. Pay attention to the relevant details of the object	<ul style="list-style-type: none"> Doing (P2) 	<ul style="list-style-type: none"> Observing (KA1)
2. Questioning and predicting Identify questions and problems that can be investigated scientifically. Students connect existing knowledge with new knowledge to make predictions		<ul style="list-style-type: none"> Questioning (KA2)
3. Plan and conduct investigations Learners plan scientific investigations and carry out operational steps based on correct references to answer questions. Students	<ul style="list-style-type: none"> Doing (P2) 	<ul style="list-style-type: none"> Try (KA3)

make measurements or compare dependent variables using appropriate tools and paying attention to scientific rules		
4. Processing, analyzing data and information Interpret the information obtained honestly and responsibly. Analyze using appropriate tools and methods, assess the relevance of the information found by including reference references, and conclude the results of the investigation	● Reasoning (KA4)	
5. Evaluate and reflect Students are brave and polite in evaluating conclusions through comparisons with existing theories. Shows the advantages and disadvantages of the investigation process and its effect on the data. Point out problems with the methodology and propose suggestions for improvement for the next investigation process.	● Show (P3)	● Reasoning (KA4)
6. Communicate results Communicate the results of the investigation as a whole including security, environmental and ethical considerations supported by arguments, language and scientific conventions appropriate to the context of the investigation. Shows systematic thinking patterns according to a specified format.		● Serving (KA5)
1. Critical Reasoning		● Reasoning (KA4)
2. Creative		● Creating (KA6)

Table 4. Attitude Level Analysis

Learning Outcomes (CP)	Attitude
Write down chemical reactions and apply basic laws of chemistry	
1. Observe	● Select (A2)
Able to choose the right tools to make measurements and observations. Pay attention to the relevant details of the object	● Paying attention (A3)
2. Questioning and predicting Identify questions and problems that can be investigated scientifically. Students connect existing knowledge with new knowledge to make predictions	● Connecting (A4)
3. Have faith, fear God, and have a noble character	● Practice (A5)
4. Global Diversity	● Practice (A5)
5. Working together	● Practice (A5)
6. Self-sufficient	● Practice (A5)

Based on the results of the analysis that has been carried out on the formulation of Learning Outcomes (CP) from the independent chemistry curriculum, it can be seen that the analysis was carried out on the dimension of knowledge referring to the revised bloom taxonomy by Anderson and Krathwohl, the skill domain (abstract skills and concrete skills), and the affective / attitudinal domain proposed

by Krathwohl and Bloom. In accordance with Permendikbud No.20 of 2016 concerning Graduate Competency Standards, "Graduate competency standards which are criteria regarding the qualifications of graduate abilities that include attitudes, knowledge and skills".

Based on Permendikbud No.20 of 2016, at the high school level students must have factual, conceptual, procedural and metacognitive knowledge where the knowledge comes from the knowledge dimension in the revised bloom taxonomy. This is also in line with Permendikbud No.21 concerning content standards and Permendikbud No.56 concerning process standards, namely knowledge obtained from remembering, understanding, applying, analyzing, evaluating and creating activities (Education, 2016). While skills are also obtained from observing, questioning, trying, reasoning, presenting and creating activities (Education, 2013). Based on this, structural analysis can be done by analyzing the formulation of CP which is guided by the revised bloom taxonomy

The material of the basic laws of chemistry is contained in the learning outcomes of the elements of chemical understanding, namely "Writing chemical reactions and applying the basic laws of chemistry". In this CP, in knowledge level analysis, there are two dimensions of cognitive processes, namely knowing (C1) and applying (C3). Knowing is pulling back information stored in long-term memory to compare it with information just received (Anderson & Krathwohl, 2015). This is in line with the formulation of CP, namely in writing chemical reactions so that the Operational Verb (KKO) used is to know. While applying includes the use of a procedure to solve problems or conduct practice questions (Widodo, 2005). This is also in harmony with the word "apply" in CP i.e. applying the basic laws of chemistry.

Analysis on the process skill element consists of 6 (six) elements, namely observing; questioning and predicting; planning and conducting investigations; processing, analyzing data and information; evaluate and reflect; communicate results. Based on the results of the analysis on the elements, process skills have the first element, namely observing which is a form of abstract skills (KA1). The purpose of observing in this process skill is that learners have attention time in observing an object (paying attention to relevant details of the object) (Dyers, 2019). The second element of process skills is questioning and predicting. This can be categorized into abstract skills (KA2), namely questioning which is an activity related to the type, quality and number of questions asked by students (Dyers, 2019). In this second process skill, students can identify questions and problems that can be investigated scientifically and students connect knowledge they already have with new knowledge to make predictions. This is in accordance with the Abstract Skill (KA2), which is questioning.

The third process skill is to plan and conduct investigations. In this element learners make a plan of scientific inquiry, conducting according to the steps based on the correct source to answer the question. As well as students measuring or comparing dependent variables using appropriate tools by paying attention to scientific rules. Based on this, the second process skill element can be categorized

into abstract skills (KA3) i.e. trying which is the number and quality of sources used, the validity of the information collected and the instruments used to collect the data (Dyers, 2019).

The fourth process skill is processing, analyzing data and information. In this element, students can analyze the information obtained such as students can use the right tools and methods to assess the suitability of the information obtained. This element can be categorized into abstract skills (KA4), namely reasoning because students can develop interpretation, argumentation and draw conclusions from the information (Dyers, 2019). The fifth process skill is evaluation and reflection. This element can also be categorized into abstract skills (KA4), namely reasoning because students can evaluate or assess and reflect through comparisons with existing theories so as to show the existence of theoretical relationships from 2 or more sources that do not contradict (Dyers, 2019).

The sixth process skill is communicating results. In this element, learners can communicate the results of investigations based on considerations and ethics in arguing and language according to the context of the investigation. Based on this, it can be categorized into abstract skills (KA5), namely presenting because students can present or communicate the results of studies (from observing to reasoning) in the form of writing, graphics, electronic media and others (Dyers, 2019).

The analysis of the pancasila profile also consists of 6 (six), namely Faith, Fear of God, and noble character; Global Diversity; mutual cooperation; self-sufficient; critical reasoning; and creative. Elements of the pancasila profile Faith, fear of God who is true and has a noble character; Global Diversity; Mutual and independent cooperation can be categorized into the affective realm (A5) of practice. Because the activities contained in the first to fourth pancasila profiles are activities in the form of practice. According to Krathwohl & Bloom in Ariyana (2018), practice or characterization is a form of integration of all value systems that a person already has that can affect his personality and behavior patterns. While the fifth element is critical reasoning where learners can obtain and process information and ideas, analyze and evaluate reasoning, reflect on thoughts and thought processes and make decisions. Related to this, critical reasoning can be categorized into abstract skills (KA4), namely reasoning which is a form of developing arguments and conclusions that show the relationship of facts / concepts / theories from 2 or more sources that do not contradict (Dyers, 2019). The sixth pancasila profile element is creative which is an activity carried out by students in making or designing something according to their own thoughts. Based on this, creative can be categorized into abstract skills (KA6), namely creating that can produce ideas, designs or decisions (Dyers, 2019).

Analysis of the depth of matter and the breadth of matter (content analysis) on the material of the basic laws of chemistry

Content can include revealing and clear knowledge such as knowledge of chemical concepts, theories or facts as well as procedural knowledge (skills or

actions mastered) in obtaining knowledge (Sartika & Yusmaita, 2020). Analysis of the depth and breadth of the material is carried out to produce recommendations for the appropriate sequence of material to be studied on the basic laws of chemistry. The breadth of the material is related to the amount of material contained in the book based on the subject matter that has been determined. While the depth of the material is related to how detailed the concepts that students must learn based on the amount of material content on the subject matter (Setiawan, 2018). Not only science content but processes and views on science can also be involved. Research methods for clarification of subject matter are analytical and content and text analysis can be carried out (Duit, 2010).

Based on the content analysis that has been done, the depth and breadth of the material in the CP formulation studied on the topic of basic laws of chemistry are in accordance with the material in the standard textbook, namely general chemistry by Brady. However, there is a slight difference in the formulation of CP with standard textbooks. The material of the chemical reaction equation is not in one chapter with the basic laws of chemistry but is in a different chapter, namely in the chapter on elements, compounds and the periodic Table. The material of the basic laws of chemistry is also not fully explained in one chapter on the basic laws of chemistry. The Gay-Lussac law is described in the chapter on the nature of gases. Because Gay-Lussac's law has a relationship with the gas law, which is the ratio of volume in a gas. The material of the chemical reaction equation is combined in one CP with the basic laws of chemistry, this can synchronize the equations of chemical reactions with reactions that exist in the basic laws of chemistry. Chemical reaction equation material can be used as a prerequisite material in learning the basic laws of chemistry. Based on the results of the analysis, it can be concluded that the overall depth of material and breadth of material on the topic of basic chemical laws contained in the CP formulation are appropriate based on the standard textbook, namely the 7th edition of the general chemistry book by Brady.

Analysis of the relationship between CP and the sequence of matter on the basic laws of chemistry

The final result from CP analysis to material depth and breadth analysis results in an analysis of the relationship between CP and material sequence which is the result of content structure analysis in this study. Based on the results of the CP analysis and the order of the material, it can be seen that the compatibility between the order of material based on the textbook based on the textbook of teachers and students issued by the Ministry of Education and Culture with the demands of the material to be studied is contained in the formulation of the CP formulated in the independent curriculum and the formulation of the structure of elements of chemical understanding, elements of process skills and the profile of pancasila is in accordance with the scientific rules used (revised bloom taxonomy, skill domain and affective domain).

4. Conclusion

Structural analysis of the formulation of CP in the independent curriculum of chemistry with bloom's taxonomy there is a conformity of the formulation of CP elements of chemical understanding. As for the elements of process skills and pancasila profiles, there is a suitability based on Dave and Dyer's taxonomy, namely abstract skills and affective domains. Content analysis shows a match between the order of material based on General Chemistry textbooks which are limited to high school textbooks from the Ministry of Education and Culture. There is a match between CP and content structure. However, another evaluation is needed for analysis of the CP formulation regarding the suitability of the material and the structure of the CP formulation.

Confession

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