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EVALUATING CHEMISTRY LEARNING IN THE INDEPENDENT CURRICULUM: A CIPP MODEL APPROACH

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ABSTRACT

Chemistry is often perceived as a challenging subject due to its abstract and complex nature, making program evaluation essential to assess the quality and effectiveness of instruction. This study aims to evaluate the implementation of the chemistry learning program using the CIPP model (Context, Input, Process, and Product) at SMKN 2 Soromandi, Bima Regency. The focus is specifically on the chemistry program for Grade X, employing a qualitative descriptive approach through interviews, observations, and document analysis. The findings indicate that the context component of the chemistry learning program aligns with the standards set by the Ministry of Education, Culture, Research, and Technology. However, improvements are still required in the areas of instructional process and differentiated learning assessments. Regarding the input component, the number of students, study groups, curriculum structure, teacher qualifications, and available learning facilities meet the required criteria. The process component reflects effective classroom instruction and well-managed class organization. Finally, in the product component, student learning outcomes were assessed, with 85% of students achieving the minimum competency criteria. Overall, the evaluation of the context, input, process, and product components suggests that the chemistry learning program at SMKN 2 Soromandi is implemented in accordance with national standards, demonstrating effective instructional practices and organized classroom management.

Keywords: Program evaluation; chemistry learning; independent curriculum; CIPP model

1. INTRODUCTION

Chemistry learning within the framework of the Independent Curriculum emphasizes essential content, the development of soft skills, and alignment with the Pancasila Student Profile. The Independent Curriculum is an educational approach that grants autonomy to

teachers and students to design and implement learning based on local contexts and individual potential. However, several challenges arise in its implementation, including increased teacher workload in adapting to the new curriculum, limited access to adequate resources, and students' struggles to adjust to a more autonomous learning approach (Azkiah & Hamami, 2021). Common issues encountered include difficulties in implementation, insufficient teacher and student preparedness, and limited evaluation of the curriculum's impact on educational quality. Teacher readiness is a critical factor in effectively delivering the Independent Curriculum. Educators must possess a deep understanding of the curriculum framework as well as the pedagogical competencies to support student-centered learning. Furthermore, the availability and quality of instructional materials aligned with the Independent Curriculum – such as modules, textbooks, and supplementary learning resources – are essential (Farwati, Metafisika, Sari, & Sholeh, 2022). In developing learning tools, teachers are expected to reference national educational goals and align them with the dimensions of the Pancasila Student Profile, aiming to produce graduates with strong Pancasila values. These tools are structured according to learning achievements at each phase, with chemistry subjects primarily focusing on Phases E and F.

Chemistry, as a component of Natural Sciences (IPA), encompasses abstract and complex concepts intended to foster students' conceptual understanding. However, in practice, students often resort to rote memorization rather than meaningful comprehension. Compounding this issue is the rapid advancement of scientific knowledge and technological discoveries, which can overwhelm learners. Students frequently express confusion, boredom, and difficulty in engaging with chemistry due to the subject's abstract nature, the continuous and cumulative structure of the material, the large volume of content, and the need for both conceptual and computational proficiency. Moreover, students face difficulties with technical terms, conceptual understanding, and calculations, contributing to low motivation and interest in the subject. External factors, such as ineffective teaching methods, negative peer influence, and less conducive learning environments, further exacerbate these challenges (Priliyanti, Muderawan, & Maryam, 2021). Many students perceive chemistry as irrelevant to their needs and capabilities, leading to a sense of obligation rather than intrinsic motivation to learn. This aligns with findings from Prayunisa (2022), which indicate that students often regard chemistry as a particularly difficult subject, with low levels of interest and engagement, especially as it is compulsory for science-track students. The high failure rate in mastering chemistry content is closely related to the intrinsic characteristics of the subject itself. As Seliwati (2017) points out, chemistry is largely abstract, sequential, and rapidly evolving. It involves simplifications of real-world phenomena, an extensive amount of content, and requires mastery of specialized terminology, factual knowledge, and abstract principles. These characteristics necessitate not only memorization but also deep conceptual understanding, posing a significant challenge for many learners.

Several high schools in Bima Regency have adopted the Independent Curriculum as their operational curriculum, including SMKN 2 Soromandi, which has implemented it in their instructional activities. In response to this development, the present study aims to evaluate the chemistry learning program under the Independent Curriculum framework using the CIPP (Context, Input, Process, and Product) evaluation model. The CIPP model provides a comprehensive and systematic approach to program evaluation, enabling an in-depth analysis of the contextual relevance, resource inputs, implementation processes, and learning outcomes

associated with the program. The central research question guiding this study is: How is the chemistry learning program in the Independent Curriculum at SMKN 2 Soromandi, Bima Regency evaluated using the CIPP model? Accordingly, the primary objective of this study is to assess the effectiveness and implementation of the chemistry learning program by examining its context, input, process, and product components through the lens of the CIPP evaluation model.

2. METHODS

This study was an evaluative research project that employed a qualitative descriptive approach. It aimed to gather in-depth information on the implementation of the chemistry learning program using the CIPP (Context, Input, Process, and Product) evaluation model developed by Stufflebeam (1971). This model enabled a comprehensive evaluation by examining the program's contextual background, resource inputs, instructional processes, and outcomes. The data collected were qualitative in nature and obtained from multiple sources to ensure depth and credibility. The respondents in this study included the principal, one vice principal, three chemistry teachers, and thirty-two students of SMKN 2 Soromandi, totaling 38 participants. Data collection techniques included interviews, observations, and document analysis. The instruments used consisted of interview guides, observation checklists, and documentation forms. To ensure the validity of the data, the researchers applied both source triangulation and technique triangulation. Source triangulation involved comparing data from different respondents, while technique triangulation referred to the use of multiple data collection methods. The data were analyzed using qualitative data analysis procedures based on the CIPP evaluation model, which guided the interpretation of findings across the four evaluation components.

Table 1. Chemistry Learning Program Evaluation Data Sources

Component	Aspect	Indicator	Data Source	Technique/Data Collection Tool
Context	Learning Program Objectives	Chemistry learning objectives	Headmaster Teacher	Interviews and document analysis
Input	Student	Number of students, student background	Headmaster	Questionnaire guidelines
	Curriculum	The curriculum used	Headmaster	Questionnaire guidelines
	Teaching materials	Teaching materials used	Teacher	Questionnaire guidelines
	Teacher	Number of chemistry subject teachers and their qualifications	Teacher	Questionnaire guidelines
	Learning Resources	Classroom, library and laboratory	Classroom	Observation guidelines
	Implementation and learning activities	Independent learning, discussion between students, discussion between students and teachers	Classroom Teacher	Observation guidelines Questionnaire guidelines

	Use of learning media	Video learning textbooks, learning audio, infocus, PPT presentations, and learning software	Classroom Teacher	Observation guidelines Questionnaire guidelines
Process	Benefits of laboratories and libraries	Laboratory usage, laboratory usage schedule, number of student visits to the library, number of chemistry book collections	Classroom Student	Observation guidelines Questionnaire guidelines
	Assignment type assignment	Independent assignments, group assignments, project assignments and independent practice.	Student	Questionnaire guidelines
	Teacher administration	Compiling CP, TP, ATP and modules, correcting student assignments and tests, creating exam schedules, creating teaching materials, conducting assessments.	Teacher	Questionnaire guidelines
Product	Student Learning Outcomes	Daily test results, PTS and PAS	Teacher	Document Analysis

The following table presents aspects and evaluation criteria.

Table 2. Aspects and criteria for evaluating chemistry learning programs

Research variables/objects	Aspects evaluated	Success criteria
Student	Laboratory learning Using the library as a learning resource	There are learning activities in the laboratory There is data on the number of student visits to the library
Curricullum	Curriculum Document CP Chemistry Phase E Teaching Module or RPP	There are curriculum documents, Chemistry Phase E learning CP, and Chemistry Module/RPP
Teaching and learning activities	Suitability of material with competencies taught Preparation for teaching Interaction in learning Use of learning media/modules	There are results of the suitability of the material with the competencies taught There are modules/RPP There is interaction during learning Teachers use learning media/modules
Assessment of student learning outcomes	Summative and formative assessment	The existence of summative and formative assessment results
Educational facilities	Textbooks and learning media	Availability of textbooks and learning media
Educator	Creating modules/lesson plans, learning media, conducting evaluations, holding exams, giving assignments	Teachers carry out tasks in the form of creating modules/RPP, learning media, conducting evaluations, holding exams, daily tests, PTS and PAS.
Learning outcomes	Assessments to determine student learning outcomes include: daily	There is an assessment to determine the learning outcomes of students including

tests, PTS and PAS.	daily tests, PTS and PAS.

3. RESULTS AND DISCUSSION

Components of the Chemistry Learning Program Context

The context evaluation of the chemistry learning program at SMKN 2 Soromandi was conducted through observations, interviews, and document analysis. Several documents were examined, including the content standards, process standards, and assessment standards. Documents developed by teachers, such as Learning Outcomes (Capaian Pembelajaran or CP), Learning Objective Flow (Alur Tujuan Pembelajaran or ATP), and modules or lesson plans (RPP), were also analyzed. The data revealed alignment between the objectives of the chemistry learning program and the standards established in national regulations, specifically Permendikbudristek Number 8 of 2024 on Content Standards, Permendikbudristek Number 16 of 2022 on Process Standards, and Permendikbudristek Number 21 of 2022 on Assessment Standards for Early Childhood, Primary, and Secondary Education. The context evaluation aimed to assess activities related to needs analysis and the alignment of program objectives with established standards (Jati Aurum Asfaroh, 2017). After reviewing the documents prepared by the teachers, it was found that they complied with the standards set by the Ministry of Education, Culture, Research, and Technology. Interviews with the school principal confirmed that all teachers had developed instructional materials aligned with the Merdeka Curriculum, supported by In-House Training (IHT) conducted by the school, as well as participation in Subject Teacher Conferences (MGMP) and other professional learning communities. Similar statements were made by the vice principal for curriculum and chemistry teachers, who emphasized that IHT activities were instrumental in enhancing teachers' competencies and understanding of the new curriculum. However, one noted shortcoming in the implementation was the limited development of materials related to differentiated learning processes and assessment, which are essential components of the Merdeka Curriculum designed to support student-centered instruction.

Chemistry Learning Program Input Components

The evaluation of input components served to support decision-making regarding the implementation of the school's learning program, as the data and information gathered were used to inform evaluation strategies and address existing limitations (Iskandar Tsani, 2021). In this study, the input component included an analysis of students enrolled at SMKN 2 Soromandi, the curriculum in use, teaching materials, teacher qualifications, and the availability of learning facilities and infrastructure. The evaluation findings showed that during the 2023/2024 academic year, SMKN 2 Soromandi had a total student population of 135. The curriculum implemented at the school was the revised Merdeka (Independent) Curriculum, which encompassed core subjects such as Religious Education, Civics, Indonesian Language, English, Mathematics, History, Arts and Culture, Physical Education, Informatics, and Science Projects (including Chemistry, Physics, and Biology), along with subjects related to the school's vocational expertise programs. The teaching materials utilized in the chemistry learning program included government-issued printed textbooks, which were designed to support independent student learning. In addition to textbooks, other instructional materials such as student

worksheets (Lembar Kerja Peserta Didik or LKPD), practical modules, audiovisual resources, PowerPoint presentations, and other multimedia learning tools were also used to enhance the teaching and learning process. The school employed a total of 43 teachers, with three specifically teaching chemistry. Detailed data related to teacher qualifications and other relevant input indicators are presented in Table 3.

Table 3. Teacher Qualification Data at SMKN 2 Soromandi

No	Teacher Qualifications	Amount
1	All Teachers	54 Person
2	Chemstry Teacher	3 person
3	Chemistry Teacher Status	2 ASN and 1 Honorary
4	Chemistry Teacher Professional Education	Certification 1 person
5	Chemistry Teacher Working Period	22 years, 5 years and 2 years
6	Improving Chemistry Teacher Competence	1 Driving Teacher

The learning facilities available at SMKN 2 Soromandi included classrooms, production workshop rooms, library facilities, and laboratory spaces. The evaluation results indicated that the learning environments, overall, were housed in school buildings equipped with adequate supporting facilities and infrastructure. The production workshop served as a space for students to engage in hands-on activities, allowing them to produce creative products that were integrated into the learning process. Monitoring and evaluation of the library facility showed that it was sufficiently equipped, providing an adequate space and a collection of learning resources that supported student learning activities. Furthermore, the availability of a laboratory provided essential support for chemistry instruction, enabling students to better understand abstract chemical concepts through practical, experimental learning. After analyzing the input components – including student demographics, curriculum, teaching materials, teacher qualifications, and learning facilities – it was concluded that these elements were aligned with established educational standards. This finding is consistent with Yunitasari (2022), who emphasized that the input component requires the provision of adequate learning facilities to ensure the effective implementation of instruction. Such facilities are essential in helping teachers achieve student-centered learning objectives in accordance with the goals of the curriculum.

Chemistry Learning Program Process Components

Process evaluation aimed to assess the implementation of learning plans in order to support teachers in conducting effective instructional activities (Fahruddin, 2020). The learning process referred to the execution of lesson plans and instructional modules that had been previously developed by teachers. Data for this evaluation were collected through interviews with chemistry teachers, the vice principal for curriculum, and the school principal, and were further supported by documentation and classroom observations. The implementation of the learning process was facilitated by the manageable class sizes. Based on classroom data and

observations, it was found that the number of students per class at SMKN 2 Soromandi varied significantly depending on the vocational specialization, averaging between 10 to 20 students per class. While the official maximum number of students per class at the vocational high school (SMK) level is 36, the smaller class sizes observed were considered acceptable due to the specific nature of the vocational programs. Nonetheless, it was recommended that student enrollment per class be increased to better align with standard class size regulations and to optimize instructional efficiency.

Teachers' workloads at the school covered the core responsibilities of lesson planning, instructional delivery, student assessment, mentoring and coaching, and additional duties. Interview findings revealed that teachers had developed key instructional components, including Learning Achievements (Capaian Pembelajaran), Learning Objectives (Tujuan Pembelajaran), Learning Objective Flows (Alur Tujuan Pembelajaran), and other supporting tools. Each student possessed a personal copy of the chemistry textbook, which supported independent study. Classroom management was conducted both prior to and during lessons, tailored to the instructional methods and subject matter. The overall classroom conditions at SMKN 2 Soromandi were found to be conducive to learning, with the necessary prerequisites – such as appropriate class sizes, manageable teacher workloads, and sufficient teaching materials – largely met. Observations showed that the learning process was active and student-centered, with high levels of student enthusiasm attributed to the teachers' ability to adapt instruction to student needs. Data from classroom observations, summarized in Table 4, indicated that all aspects of the learning implementation received scores above 3.0. Based on the predetermined scoring rubric, it was concluded that the learning implementation met the criteria for effectiveness.

Table 4. Effectiveness Value of Chemistry Learning Implementation at SMKN 2 Soromandi

Research components	Average score	Klasifikasi			
		Ineffective	Less effective	Quite effective	Effective
Managing learning spaces and facilities	3,5				v
Carrying out learning activities	3,5				v
Managing class interactions	3,6				v
Creating class agreements and instilling positive discipline	3,5				v
Implementation of differentiated learning	3,3			v	
Carrying out evaluation of learning processes and outcomes	3,2			v	
Carrying out learning reflection	3,6				v
Carrying out follow-up of the learning process	3,1			v	
General impression of teacher performance	3,5				v

Chemistry Learning Program Product Components

The product component of this study focused on evaluating student learning outcomes at SMKN 2 Soromandi, as measured by daily tests, the Mid-Semester Assessment (PTS), and the

Final Semester Assessment (PAS). The results of the product evaluation showed that 87% of students achieved scores meeting or exceeding the Minimum Completion Criteria (KKM) standard of 70. This high level of achievement indicated that the chemistry learning process at SMKN 2 Soromandi was effective in terms of student outcomes. The consistency of performance across various assessments suggests that the instructional strategies and learning environment successfully supported students in reaching the expected learning objectives.

4. CONCLUSION

Based on the analysis of data obtained through the four components of the CIPP (Context, Input, Process, and Product) evaluation model, this study concludes that the chemistry learning program at SMKN 2 Soromandi demonstrates overall effectiveness in its implementation, although some areas still require development and improvement.

In the context component, the findings revealed that the objectives and structure of the chemistry learning program were aligned with national education standards, particularly those outlined in Permendikbudristek Number 8 of 2024 concerning Content Standards, Permendikbudristek Number 16 of 2022 on Process Standards, and Permendikbudristek Number 21 of 2022 on Assessment Standards. The program was found to be responsive to the national curriculum framework and school needs. Teachers had developed essential instructional documents, including Learning Outcomes (Capaian Pembelajaran), Learning Objective Flows (Alur Tujuan Pembelajaran), and learning modules, through In-House Training (IHT) and professional learning communities. However, the development of differentiated learning strategies – central to the Independent Curriculum – remained limited, particularly in addressing varied student needs and learning styles.

In the input component, the evaluation showed that the number of students, the organization of study groups, the applied curriculum, teacher qualifications, and the availability of learning resources and facilities were generally in accordance with national standards. Chemistry teachers at SMKN 2 Soromandi had appropriate academic backgrounds and professional competencies. The learning environment was supported by sufficient infrastructure, including classrooms, laboratories, library facilities, and production workshops that enabled the integration of theory and practice. Teaching materials included government-issued textbooks, LKPD (student worksheets), multimedia content, and various instructional media, all of which facilitated student engagement and independent learning.

The process component highlighted that instructional delivery in the classroom was effective, with student-centered learning actively taking place. Teachers were found to manage classroom activities in alignment with lesson objectives, and learning was conducted using appropriate methods and materials. Class sizes, although below the maximum standard, allowed for more personalized instruction, especially within specialized vocational programs. Nevertheless, the study identified weaknesses in time management during instructional sessions, which sometimes hindered the achievement of intended learning goals. Moreover, the application of differentiated learning assessments was not yet fully optimized or systematically aligned with students' individual learning profiles. Although teachers had made efforts to

incorporate aspects of the Merdeka Curriculum, such as flexible learning pathways, the execution of assessment strategies tailored to varied abilities and learning styles remained underdeveloped.

In the product component, student learning outcomes were evaluated based on performance in daily assessments, Mid-Semester Assessments (PTS), and Final Semester Assessments (PAS). The results showed that approximately 85% of students achieved scores meeting or exceeding the Minimum Completion Criteria (KKM) of 70. This high level of student achievement indicates that the learning process has been largely effective in delivering core competencies. It also reflects positively on the overall alignment between curriculum goals, teaching practices, and student performance.

In conclusion, the chemistry learning program at SMKN 2 Soromandi has been effectively implemented in terms of planning, resource allocation, classroom management, and student achievement. The program aligns well with national educational objectives and institutional goals. However, for continuous improvement, it is recommended that the school enhance its strategies for differentiated instruction and assessment, improve time management during lessons, and further invest in professional development for teachers to deepen their understanding and application of the Merdeka Curriculum principles. These steps will help ensure that the program not only meets existing standards but also addresses the diverse learning needs of students more holistically.

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