



Implementation of Independent Curriculum Differentiation Learning in Physics Learning in High School Completed with Literature Review and Bibliometric Analysis

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ABSTRACT

The Independent Learning Curriculum is a new curriculum introduced in Indonesia to restore learning during the pandemic. This research aims to analyze the implementation of independent curriculum differentiation learning at Hang Tuah 5 High School Sidoarjo as the final result of the Field School. Field Introduction Activities (PLP) courses taken for student education programs. This research used an observation method for 16 weeks, and interviews were also conducted aimed at various respondents, and related to the implementation of independent curriculum in schools. The result of this research is the implementation of an independent curriculum. influences many aspects of the field of education. The Independent Curriculum has been implemented at all grade levels, starting from the EX stage to the FXI and FXII stages as a reference for the learning activity process. The implementation of the independent curriculum at Hang Tuah 5 Sidoarjo High School is going well and is supported by various facilities that support good learning at all school levels. The implementation of the Pancasila Student Strengthening Profile is going well, the implementation of learning prioritizes the development of student abilities and is following the environmental conditions around the school.

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1. INTRODUCTION

Education is one way to shape and develop the quality of individuals in a country. This aims to increase the country's progress in various fields including technology, infrastructure, food, and so on (Rahayu et al., 2022). Education is about knowledge and skills and guiding students in their behavior. The education system in Indonesia emphasizes that students must not only focus on knowledge aspects but must also focus on cultural values. Education in Indonesia prioritizes cultural values as the identity of the Indonesian nation itself while remaining oriented towards intellectual progress. Thus, educators must be able to play the role of parents who guide students in understanding information and their environment (Sari et al., 2023). Therefore, the relationship between teachers and students is very important in the learning process (Lestari et al., 2022).

In Indonesia, curriculum implementation has undergone various changes and improvements over the past few years. In the past year, the curriculum that has been created and begun to be implemented in almost all schools in Indonesia is the Independent Curriculum. Freedom to Learn is a new policy program of the Ministry of Education and Culture of the Republic of Indonesia which was launched by the Minister of Education and Culture (Prahani et al., 2020). The independent curriculum is oriented toward learning design that gives students the freedom to explore their potential. Learning designs are developed to improve the quality of learning processes and outcomes, especially for students (Lestari et al., 2022). This curriculum development is an instrument for improving the quality of education. The correct education policy will be seen through the implementation of the curriculum because "curriculum is the heart of education" which determines the progress of education (Rahayu et al., 2022). The existence of an independent curriculum is a reorganization of the national education system in Indonesia which (Yamin & Syahrir, 2020) "states that this statement is to welcome change and progress in the nation. Thus, it can adapt to changing times. The independent curriculum supports students to develop according to their potential and abilities because the independent curriculum provides critical, quality, expressive, applicable, varied, and progressive learning.

Curriculum implementation in schools should be carried out optimally to meet the target of achieving good quality education. In its implementation, it needs to be adapted to the conditions and needs of the school. The Independent Curriculum gives schools the freedom to manage the education system in the school itself. One of the principles that must be considered in determining the curriculum development model is the implementation of teaching and learning activities carried out by teachers and students. As an important part of implementing the curriculum, teachers must always be ready for changes in educational policies. Thus, teachers are truly ready to implement the National Curriculum, all parties involved must play a real role in the action (Lutfin et al., 2023).

Structure and guidelines for the self-study curriculum in secondary education physics subjects: This document explains the structure and guidelines for the self-study curriculum in secondary education physics subjects. This document contains important points and conclusions from the Decree of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia Number 262/M/2022 concerning Amendments to the Decree of the Minister of Education, Culture, Research and Technology of the Republic of Indonesia. Republic of Indonesia. 56/M/2022 concerning Guidelines for Curriculum Implementation in the Context of Learning Recovery for the Implementation and Preparation of Physics and Science Study Programs at the High School Level. The Independent Belajar Curriculum material explains the main characteristics of the Independent Belajar Curriculum which

supports learning recovery. Apart from that, it also highlights that the independent learning curriculum emphasizes project-based learning to develop soft skills and character, following the profile of Pancasila students. Focus on the main points. Thus, teachers have enough time to study basic skills in depth such as reading, writing, and math. Flexibility for teachers to provide differentiated learning according to student abilities and adapt to local context and content at Hang Tuah 5 Sidoarjo High School.

Physics at Hang Tuah 5 High School is one of the specialization subjects taught at school. Hang Tuah 5 Sidoarjo High School is the first-generation driving school to use the Independent Curriculum Phase E (Class X) and Phase F (Class XI). Physics is included in the science group consisting of Physics, Chemistry, and Biology. Physics is taught for 3 lesson hours per week with an allocation of 72 lesson hours for regular activities and 36 lesson hours for co-curricular projects. Basic Physics for Science and Engineering Volume 2 is one of the reference books used for studying physics at Hang Tuah 5 High School. This book discusses material about electricity, magnetism, optics, and modern physics. Hang Tuah 5 High School also has a physics laboratory which is equipped with adequate practical equipment.

2. METHOD

The research method used in this research is qualitative. Qualitative methods are research methods used to examine the natural conditions of objects and research results emphasize meaning rather than generalizations. The type of research used is descriptive research because it includes a pure description of problems regarding a person's program and/or experiences in a research environment. The choice of this method is based on research objectives which require actual and contextual field data. Thus, it leads to the process of interpreting field data and the relationship between the problems being studied. The data collection techniques used in this research are observation, interviews, and documentation. Observations were made through observations of physics learning in the EX phase and FXI phase classes. Interviews were conducted with sources to obtain data from more in-depth sources. The results of observations and interviews will be more reliable if supported by data in the form of writing or images. Thus, in this research, there is a data recap carried out through documents from the school.

The most important data analysis technique is related to collecting data first, namely by collecting various kinds of data in the field both before entering the field, during the field, and after completing activities in the field. Data collection carried out in this research used observation, interview, and documentation techniques. Analysis consists of three streams of activities that occur simultaneously, including data reduction, data presentation, and drawing conclusions/verification. Then the three flows are described as follows. Data reduction is part of the analysis. Focused data reduction takes place continuously throughout a qualitative research-oriented project. The most frequently and generally used method for presenting data in qualitative research is in the form of narrative text.. Thus, it can make it easier to understand what is happening in the field, design the next work steps based on what has been understood, or verify the data that has been displayed. Miles & Huberman define a presentation as a collection of structured information that provides the possibility of drawing conclusions and taking action.

The data analysis technique in this research was carried out by reflecting on the results of interviews with several teachers and deputy principals at Hang Tuah 5 Sidoarjo High School. The data obtained in this research is in the form of observations, interviews, and field notes. Thus, the conclusions made are also verified during ongoing field research. Verification also consists of rethinking that crosses the researcher's mind during writing, a review, or may be

part of a joint discussion and spending energy reviewing and exchanging ideas among peers to develop intersubjective agreement or also extensive efforts to place a copy of a finding in another set of data. The conclusion does not only occur during the data collection process but needs to be verified. Thus, it can truly be accounted for. Systematically the data analysis process uses an interactive data analysis model.

3. RESULTS AND DISCUSSION

This research used the bibliometric analysis method which is a quantitative method to analyze bibliographic data in articles or journals. The method used in this study is bibliometric analysis which can help researchers to strengthen the results of research in target schools. Metadata is taken from the Scopus database with the keyword "Independent Curriculum". There are 7780 documents related to keywords.

As shown in **Figure 1**, the topic of the independent curriculum has become very popular, especially in the last 5 years, namely 2019-2024. With the implementation of the independent curriculum, many authors have made journals about it to find out the advantages and disadvantages of implementing the curriculum which is predicted to replace the previous curriculum, namely the 2013 curriculum or K13. From the results of the literature review starting in 2019 there were 411 documents, in 2020 it increased to 495 documents. The same thing also happened in 2021-2022 which reached more than 500 documents. Even in 2023, it was more than 600 documents. In the first quarter of 2024, there are already 145 documents which are projected to exceed the results from last year. Several examples of the published papers are shown in **Table 1**.

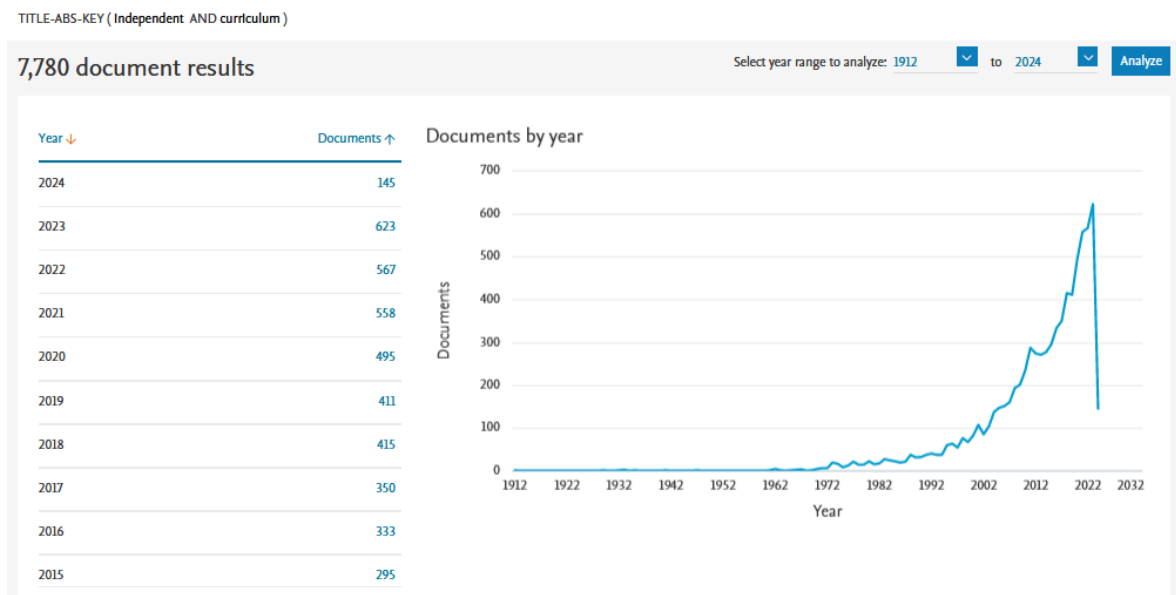


Figure 1. Results from Scopus database using the word “independent curriculum”.

This increase is in line with the instruction to implement the independent curriculum in all schools, although initially only the driving schools were considered ready to implement it. One of them is Hang Tuah 5 Sidoarjo High School, in the first year it implemented an independent curriculum. Thus, in the third year, or the 2023-2024 school year, the entire batch has implemented an independent curriculum. Although there are some differences in learning, with the appropriate delivery method, it will produce brilliant results. Target schools are also increasingly ready to implement differentiated learning. This is one of the characteristics of the independent curriculum.

Table 1. The research on the implementation of the independent curriculum in schools.

Topic	Research result	Reference
Analysis of the Implementation of the Independent Curriculum in Overcoming Class Retention in Senior High Schools	Implementing the Independent Curriculum in schools can overcome the problem of class retention. The success of the policy to avoid class retention in the Independent Curriculum relies heavily on the realization of quality and meaningful planning, implementation, and assessment of learning and prioritizing important principles in the Independent Curriculum. Implementation of the curriculum must be carried out by referring to various regulations, instructions, and guidelines for implementing the Independent Curriculum in terms of planning, implementation of learning, and assessment.	Aegustinawati and Sunarya (2023)
Analysis of the Implementation of the Independent Learning Curriculum in Padangsidempuan State High Schools	The implementation of the independent learning curriculum at Padangsidempuan City Public High School has been implemented 100%. This is known based on the results of questionnaires and interviews with several teachers at state high schools in the city of Padangsidempuan. Then the implementation of the National Standard School Examination at Padangsidempuan City Public High School was changed to a school assessment which was carried out 100%. Implementing minimum competency assessments and character surveys requires teachers to be more creative in determining assessment materials and developing assessments for their students. To create an effective, efficient, student-oriented learning implementation plan (RPP) at the Padangsidempuan City Public High School, it has been implemented 100% following the independent learning curriculum. Writing the Learning Implementation Plan (RPP) is done efficiently and effectively. Thus, teachers have more time to prepare it and evaluate the learning process itself.	Hutabarat et al. (2022)
Implementation of the Independent Learning Curriculum in Driving Schools	A driving school is a school that has the spirit of movement and wants to make a change. Driving schools are required to build a digital school concept in the implementation of their teaching and learning activities. By using an independent curriculum, changes can be felt in schools, teachers are more flexible to be as creative in teaching as possible and are more aware of student's interests, talents, needs, and abilities. The independent curriculum learning process at driving schools refers to the Pancasila student profile which aims to produce graduates who are competent and uphold character values. The principal as a school leader must be able to move, direct, and inspire teachers to want to change towards better education. Apart from that, good cooperation is needed between teachers, school principals, government agencies, parents, and related parties. Thus, the implementation of the independent curriculum in driving schools can be realized optimally.	Rahayu et al. (2022)

Table 1 (Continue). The research on the implementation of the independent curriculum in schools.

Topic	Research result	Reference
Implementation of the independent curriculum in terms of learning mathematics and implementation of P5 (studies at SMA Negeri 12 Tangerang Regency)	The implementation of the independent curriculum has been implemented in class 10 starting in the 2022-2023 school year. The structure of the independent curriculum consists of 3 main activities, namely extracurricular, co-curricular, and extracurricular. To create fun learning, teachers prepare learning models that are varied and focus more on student activity. The learning models that are often used are Problem-Based Learning (PBL) and project-based learning (PjBL). Meanwhile, in co-curricular activities, a project to strengthen the profile of Pancasila students (P5) was carried out. P5 activities are carried out to strengthen the profile of Pancasila students, namely the character of students who are following Pancasila values. P5 activities ran smoothly, starting with distributing tasks to teachers (as coordinators, facilitators, and accompanying teachers), determining themes and sub-themes, and then implementing P5 in blocks for one month. The P5 implementation report will be given at the end of the school year.	Septiani (2022)
Analysis of the Implementation of the Independent Learning Curriculum for Students at SMA Negeri 1 Junjung Sirih	The existence of an independent learning curriculum is an effort to improve the quality of education in Indonesia to meet the needs of the times. The independent learning curriculum does not only make students smart. However, it is also marked by Pancasila values which are said to be a form of profile for strengthening Pancasila students. P5 activities are the application of differentiated learning in the independent learning curriculum where this activity functions to develop skills and potential. P5 activities aim to improve students' skills by producing different products, projects that are tailored to the profile of Pancasila students and adapted to the themes set by the Ministry of Education and Culture. School principals and teachers must continue to encourage themselves to work together to align the independent learning learning plan with the driving school program. The education department should always provide guidance and support to school principals and teachers in implementing the independent learning curriculum and the introduction of driving school programs.	Armadani et al. (2023)
	Applying this independent curriculum, students focus more on creation, their minds contain creative and innovative ideas for doing or making. Teachers must be able to be critical and actively able to adapt to the community environment around students. Thus, teachers need to adapt and convince students by trying to carry out learning. Thus, it can run smoothly. Thus, the knowledge and understanding they gain lasts for a long period of time in their future lives. One thing that must be avoided during the implementation of an independent curriculum that has many project programs is the student's mindset. Avoiding students' thoughts that school is not fun, friends are naughty, and subjects are difficult, students are more willing to learn.	Ramadhan and Warneri (2023)

Table 1 (Continue). The research on the implementation of the independent curriculum in schools.

Topic	Research result	Reference
Analysis of Student Diversity and Implementation of the Independent Curriculum in Physics Subjects	<p>These things are quite difficult for teachers. Thus, teachers have to do extra work. Teachers must be able to help students achieve learning goals well. Thus, students can be ready to accept new material and students are required to be able to achieve learning goals. The assessment in the independent curriculum and the 2013 curriculum is also different, in the 2013 curriculum there is an assessment of knowledge and skills, whereas in the independent curriculum there is no knowledge and skills value but there is a project value. The value of this project includes the value of skills and knowledge.</p> <p>From the results of identifying the diversity of students, it can be concluded that the diversity of students, if we look at their readiness, the percentage who have not yet mastered the prerequisite material is 35.29%, the group who are ready to learn the material and have mastered the prerequisite material is 47.06%, and the proficient group is 17.65%. The diversity of students when viewed from their interests (hobbies) is most dominant, namely sports (33.3%) and music (24.2%). The diversity of students seen from learning styles is dominated by auditory (58%), then kinesthetic (30%), and visual (12%). The final diversity of students is that socially, they all enter the peer relationship phase, while from an emotional perspective, all students have good emotions and respect each other. Regarding the relevance of learning to curriculum demands, it can be concluded that the teaching modules are prepared in accordance with the demands of SMEs. The teaching modules that have been prepared are classified as complete versions. However, there is no information related to differentiated learning in the teaching module. The learning process is in accordance with the demands of SMEs by implementing student centered learning, however the assessment itself is still not implemented according to the demands of the curriculum regarding providing feedback to students.</p>	Arrohman, D. A., & Lestari, T. (2023).

Hang Tuah 5 Sidoarjo High School was one of the first classes of driving schools in Sidoarjo Regency. Thus, the implementation of the P5 program was immediately implemented by the school in the first year of implementing the Independent curriculum. As a private school at a young age, many obstacles were experienced in the first year of curriculum implementation. Thus, the teaching and learning process for the generation implementing this curriculum was less effective. In implementing the Independent Curriculum at Hang Tuah 5 Sidoarjo High School, the subjects chosen are following students' interests. The learning process implemented is in the form of differentiated learning. Thus, classes will be grouped based on abilities and results of diagnostic tests carried out when they are new students and reinforced again when initial learning is carried out.

The class selection process for students does not fully suit students' interests due to limited classroom space. Thus, the school is divided into 25 different class models. In grade 10,

students have taken psychological tests and interviews with the Guidance and Counseling team to determine their interests in the future. The task of the Guidance and Counseling team is to direct students to choose courses according to their future aspirations.

Schools distribute Google forms containing specialization subject packages such as packages A1, A2, A3, A4, and B1, B2, B3, and B4 where package A covers the science group and package B includes the social sciences group. Example A1 with Mathematics, Physics, Biology, and Economics subjects and B2 with Sociology, Economics, Biology, and Physics subjects. Of the 25 classes provided, the school provides facilities for student understanding by conducting socialization and providing information that not all four specialization subjects chosen can be met by all students. Thus, what is most likely to happen is that of the 4 subjects chosen by students, only 3 to 2 subjects are fulfilled. Several examples are in **Table 2**.

Table 2. EX phase curriculum structure.

Subjects	Lesson hours /Week	Regular Activities/ Week (year)	Project/Week (year)	Total Class hours /Year
Religious Education	3	72 (2)	36 (1)	108
Pancasila And Civic Edu	2	54 (2)*	18*	72
Bahasa Indonesia	4	108 (3)	36 (1)	144
Mathematics	4	108 (3)	36 (1)	144
Science				
Physics	3	72 (2)	36 (1)	108
Chemistry	3	72 (2)	36 (1)	108
Biology	3	72 (2)	36 (1)	108
Social				
Sociology	3	72 (2)	36 (1)	108
Economy	3	72 (2)	36 (1)	108
History	3	72 (2)	36 (1)	108
Geography	3	72 (2)	36 (1)	108
English Edu	2	54 (2)*	18*	72
Sports Edu	3	72 (2)	36 (1)	108
Informatics	3	72 (2)	36 (1)	108
Art and Culture	2	54 (2)*	18*	72
Javanese Edu	2	72 (2)	-	72
Maritime	1	36 (1)	-	36
Leadership Laboratory	1	36 (1)	-	36
Study club	1	36 (1)	-	36
Total	49	1.278	486	1.764

This class selection technique is certainly very mature with the hope of not harming students. Schools require a minimum of 2 subjects from those they choose to be fulfilled by preparing 25 types of classes. Even though there are only 8 classes available, for the class division to be better, for example, if a student choosing Physics, Chemistry, Sociology, or Economics is suddenly moved to Biology, Economics, and Geography classes, it must make the student uncomfortable. Thus, schools put these students in Mathematics, Physics, Chemistry, Sociology or Mathematics, Physics, Chemistry, and geography classes. Several examples are in **Table 3**.

Based on interviews with the Vice Principal of Curriculum, the implementation of the 2013 Curriculum is more mature and holistic. The 2013 curriculum has entered the revision and refinement stage which takes into account various student skills, both affective, psychomotor, and cognitive. All aspects like that are also contained in the Independent Curriculum, but they seem to be more simplified, for example inputting report cards with just

one number. According to the Deputy Principal for Curriculum at Hang Tuah 5 Sidoarjo High School, the implementation of the 2013 Curriculum is more holistic than the current Independent Curriculum. However, it cannot be denied that the development will later be perfected like the 2013 Curriculum which has been around for a long time, considering that the Independent Curriculum is still a prototype.

Table 3. FXI and FXII phase curriculum structure.

	Subjects	Lesson hours /Week	Regular Activities/ Week (year)	Project/ Week (year)	Total Class hours /Year
Regular (A)	Religious Education	3	72 (2)	36 (1)	108
	Pancasila And Civic Edu	2	54 (2)*	18*	72
	Bahasa Indonesia	4	108 (3)	36 (1)	144
	Mathematics	4	108 (3)	36 (1)	144
	History	2	54 (2)*	18*	72
	English Edu	2	54 (2)*	18*	72
Regular (B)	Sports Edu	3	72 (2)	36 (1)	108
	Art and Culture	2	54 (2)*	18*	72
	Javanese Edu	2	72 (2)	-	72
Elective Subjects	Subjects 1	5	108 (5)	-	180
	Subjects 2	5	108 (5)	-	180
	Subjects 3	5	108 (5)	-	180
	Subjects 4	4	144 (4)	-	144
	Subjects 5	3	108 (3)	-	108
Maritime		1	36 (1)	-	36
Leadership Laboratory		1	36 (1)	-	36
Study club		1	36 (1)	-	36
Total		49	1.548	216	1.764

For 2 years, student characteristics have still been present in the 2013 Curriculum. Thus, the Deputy Principal for Curriculum includes a flow of heterogeneity in the class if, for example, K13 is cooperative. Grouping students also looks effective in the sense that peers will teach. Thus, they can help each other with students who are already capable and need more understanding. The differentiated learning that is applied feels less humane, because of the grouping. Therefore, in its implementation, heterogeneity learning will occasionally be applied.

Teachers are presented with projects and questions. Hang Tuah 5 Sidoarjo High School has physics, biology, and chemistry laboratories. Laboratory facilities can be said to be adequate and based on accreditation instruments, the laboratory standards of which have been met by the school. However, equipment in the laboratory must expire and wear out if it is not regularly maintained and calibrated. The school always tries to procure equipment every year according to needs, even though it is not yet complete, the school has tried to rejuvenate the equipment in the laboratory.

Hang Tuah 5 Sidoarjo High School is one of the schools that has three standardized laboratories in Sidoarjo Regency. Apart from the laboratory, Hang Tuah 5 Sidoarjo High School also has a smart class that supports the teaching and learning process in an independent curriculum. Smartclass is also equipped with a smartboard which functions to support the teaching and learning process and make students more interactive in learning.

Implementing differentiated learning will be more difficult and requires mature methods. Students who are grouped with the same type, especially the low type, will produce less than optimal learning because there is no motivation from these students. In comparison, when heterogeneous learning is implemented, it will make the learning atmosphere more interactive and interesting. Apart from that, in implementing differentiated learning, not all teachers at Hang Tuah 5 Sidoarjo High School can understand and control the learning in their classes. However, some are able and successful in implementing it, even though it is not 100% correct. Therefore, the implementation of differentiated learning still refers to the respective subject teachers.

The physics learning implemented at Hang Tuah 5 Sidoarjo High School has implemented the Independent Curriculum. Physics classes at Hang Tuah 5 Sidoarjo High School start in the FXI Phase with 5 classes out of 8 available classes. Physics learning has implemented differentiation learning which divides students into several groups according to the results of diagnostic tests at the start of learning. Students are divided into the following criteria: students with low & no effort, low & effort, middle & no effort, middle & effort, and high & effort abilities.

This can be seen in alternative energy material project activities, which use solar panels as a power source. Two application models are provided, for the high group they make a house while the low group makes a fan. Both models produce the same output, namely the change in energy produced by the solar panels. The high group arranges a house that contains lights in it, on the other hand, the low group which makes the fan will see the results by looking at the movement of the fan. Even though they look different, this makes students observe the process of changing energy from solar panels.

The implementation of physics learning with the Independent curriculum is carried out by preparing learning tools that are tailored to students' needs. At the EX phase level, physics learning is given in 3 JPs with 1 meeting, while at the FXI and FXII phase levels, physics learning is given in 5 JPs with 2 meetings. Hang Tuah 5 Sidoarjo High School students are active learners and prefer practice over theory. Thus, in physics learning, more practice is applied both in the classroom and outside the classroom. Physics learning in class always focuses on students using group discussion methods or student demonstrations of material. Physics learning outside the classroom is implemented to eliminate drowsiness and boredom and create an atmosphere that allows students to express themselves more freely and explore information. However, learning that utilizes the physics laboratory cannot yet be fully implemented, due to insufficient space.

4. CONCLUSION

The curriculum is a component in the field of education that will always develop. Curriculum development never stops because it is a continuous and cyclical process that is in line with developments and changes in society's demands. Hang Tuah 5 Sidoarjo High School, which is an educational unit under the Hang Tuah Foundation, also follows developments. The learning process is carried out following the Independent Curriculum because as a first generation driving school, it must be the pioneer in implementing the Independent Curriculum.

Hang Tuah 5 Sidoarjo High School as the first generation of driving school implemented the Independent Curriculum. The implementation of the Independent Curriculum has been seen, one of which is in differentiated learning. Grouping talents and interests affects increasing student competence. As a driving school, Hang Tuah 5 Sidoarjo High School is an independent sharing school because it has succeeded in developing its learning tools. The implementation

of the Independent curriculum at Hang Tuah 5 Sidoarjo High School is considered good and needs to be improved in the future. Indications of the implementation of the Independent Curriculum have been seen in the form of differentiated learning, especially in physics learning. The implementation of the Independent Curriculum at Hang Tuah 5 Sidoarjo High School seeks to follow the learning competency standards contained in the Independent Curriculum.

By implementing the Independent curriculum, classroom management can be more organized, although implementation is not yet optimal and tends to be difficult in terms of implementing differentiated learning. Suggestions for the government before implementing curriculum reform are that it is better to examine various factors, not just because of the new curriculum project. Suggestions for teachers to be able to anticipate obstacles found in the learning process and quickly adapt to existing changes.

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6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors confirmed that the paper was free of plagiarism.

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