

Science Curriculum in Non-formal Education: Case Study to Improve the Quality of Non-Formal Education

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Abstract

Background – Equivalency education (packages B and C) is part of non-formal education, providing an alternative educational pathway for students who experience obstacles in obtaining formal education. Therefore, the role of non-formal education is crucial, and curriculum implementation, particularly in science learning, needs to be strengthened.

Urgency of Research – This article analyzes the implementation of the science curriculum in non-formal education to improve the quality of the science learning process. In-depth studies of the implementation of the science curriculum in non-formal education are still limited, so further research is needed on the implementation of science learning in this context.

Research Objectives – Research on the implementation of the science learning curriculum in non-formal education was conducted at SKB Purwokerto and PKBM Harapan Bangsa, with respondents comprising science tutors, non-formal education managers, and learners from each institution.

Research Method – This research employs a case study approach with a qualitative approach. The qualitative approach was chosen to gain a deep and comprehensive understanding of the implementation of the science curriculum in non-formal education.

Research Findings – The main findings of this study indicate that the learning planning in the equivalency program has adopted an inclusive and differentiated approach, using an andragogical approach, while ensuring that science learning is relevant and beneficial to the learners. Meanwhile, the learning process during the 2023 study still applied to the 2013 curriculum and was implemented flexibly to meet the learners' needs.

Research Conclusion & Novelty – This study empirically proves that the implementation of the science curriculum in non-formal education has been effective by applying the principles of student-centeredness, inclusiveness, and andragogy. The flexibility of the science curriculum's implementation has been proven not to reduce the quality of learning but rather to increase the relevance and impact of science learning, in line with the characteristics of non-formal education.

Keywords: science curriculum, non-formal education, quality of non-formal education, equality education

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INTRODUCTION

Education plays an important role in individual human development, apart from being the basic foundation for the development of knowledge and technology, education also acts as a driving force for better individual development. This is because education is able to provide them (students) with better job opportunities so that their standard of living becomes better than before. On the other hand, education can stimulate critical, creative thinking and the formation of good character. This is in line with the findings of the study Blossfeld & von Maurice (2019); Yurchenko et al., (2023); Alla, (2024) which emphasizes that education is a person's lifelong journey towards self-improvement and is an invaluable investment in the development of each individual.

Indonesia, as mandated in the 1945 Constitution, holds a firm commitment to providing equal opportunities to all its citizens in obtaining a decent education. These efforts are reflected in the education system law number 20 of 2003, in addition to obtaining the fundamental right to a decent education. The education management system universally recognizes that education is divided into three pathways, namely informal education, formal education and non-formal education (Darmawan et al., 2020; Tisza et al., 2020; Ilyas et al., 2025).

Informal education is education that does not have a formal structure and is obtained through direct experience of an individual's daily life which is the result of the individual's social interaction with other individuals and is usually formed from the family environment and surrounding community environment (Murray, 2021; Zulkarnain & Raharjo, 2019; Shofwan et al., 2024). Agree with this statement O'Connell & Lucić, (2021) states that informal education also has a significant role in the process of developing each individual's potential. Based on this, informal education is lifelong learning that is not limited or stops after the individual completes formal or non-formal education.

As is well known, formal education in Indonesia is the provision of education that is passed through official school channels starting from kindergarten/RA level to tertiary level and all countries recognize that formal education is the main pillar in education. However, it is unfortunate that not all citizens have easy access to obtain proper formal education because it is influenced by several factors such as geography, economics and even personal conditions that make it impossible to obtain proper formal education. Therefore, there needs to be a solution for those who experience these obstacles by providing equal educational opportunities.

In response to these problems, non-formal education is here to provide a solution for those who are hampered in obtaining formal education. In line with this, research conducted by Adams et al., (2020) and Costas Batlle, (2019) highlighting that non-formal education is an alternative in overcoming educational gaps. This is because non-formal education has a role as an addition or substitute or even a complement in obtaining opportunities to continue learning for people who are less fortunate in formal education. Fakhrudin & Shofwan, (2019); Komar et al., (2019) mentions several types of non-formal education that have developed in Indonesia, such as course and training institutions (LKP), community learning activity centers (PKBM), taklim councils, and study group studios (SKB).

In this context, there are two types of non-formal educational institutions that have equality programs that can be used as an alternative to formal education, namely PKBM and SKB. Even so, in reality what happens in the field in the implementation of the non-formal education process still faces challenges from a managerial perspective by applying traditional principles without sufficient effort in carrying out learning professionally and independently. This is reflected in the 2022 dapodik data which shows that in Banyumas Regency the majority of PKBM have not received official accreditation from the government. Preliminary observations also found the interesting fact that obstacles were still found starting from planning to evaluation and needs analysis which should be the main concern in the learning process so that the expected results can be achieved optimally.

On the other hand, we know that non-formal education is a hope for out-of-school children (APS) to be

able to obtain a decent education and continue the educational lag in formal education. This fact should give special attention to non-formal education providers with an emphasis on the quality of education in order to achieve good, decent and equal non-formal education standards.

Meanwhile, apart from the facts that have been outlined above, we are aware of developing issues related to the relevance of the skills and knowledge that must be possessed by the younger generation in facing global competition, such as environmental issues, health, technology, innovation and competitiveness, so that appropriate decision-making skills are of concern (Shofwan et al., 2026). Science learning can help the younger generation understand and overcome these issues; this is because science learning provides the foundation of knowledge and skills needed in increasingly complex global competition. Based on the explanation of the identification that has been described, the appropriate research question that describes the purpose of writing this article is: How the science curriculum is implemented in non-formal education institutions starting from planning, implementation, assessment and analysis of the needs of students learning in non-formal education.

METHODS

Research design

This research uses a qualitative approach with a case study design. A case study research design is used to gain an in-depth understanding of the implementation of the science learning curriculum in non-formal education, especially in Package B or Package C equivalency education (Creswell, 2013). The researcher's case study allows the phenomenon to be studied comprehensively. In addition, through the case study, the researcher can examine the practice of science teaching in depth in a real-life context, thereby clearly describing it.

Research participants

The participant sample was determined to obtain valid information using a purposive sampling technique. The researcher used this technique for several reasons, including the head of the institution, tutors who teach science subjects in both Package B and C catch-up learning programs, and participants as students currently enrolled in Package B or C learning programs. In addition, participants served as the primary source of information (primary data) for data collection. The researcher also used secondary data in this study, including references related to the theories under study. The purpose of using secondary data in this study was to strengthen or complement the primary data already obtained by the researcher.

Data Collection Techniques

The data in this study are divided into two categories: primary and secondary. Primary data was obtained directly from participants through interviews. Secondary data was obtained to support the primary data obtained from participants through documentation and observation during the research. This combination of data collection techniques is expected to yield comprehensive data and strengthen the validity of the research findings.

Data Validity & Data Analysis

Data validation in this study was ensured through source and technical triangulation. Source triangulation in this study was conducted by comparing participants' information. Technical triangulation, on the other hand, was a combination of all data collection techniques employed by the researcher to strengthen the data obtained. This was done to increase data credibility and ensure greater objectivity.

The data analysis employed the Miles and Huberman analysis model, which consists of three stages: data reduction, data presentation, and conclusion drawing. Data reduction was used to select, focus, and group relevant research data in accordance with the research objectives. Data that was less relevant was

eliminated or used as supporting data for the study. The reduced data were then presented in a systematic narrative format to facilitate the identification of patterns and relationships among findings obtained during the study. Finally, conclusions were drawn from the data to verify the findings, resulting in credible, contextually grounded conclusions consistent with the analysis of science learning implementation in non-formal education.

RESULTS AND DISCUSSION

This study examines the implementation of the science curriculum in non-formal education units by examining aspects of curriculum planning, learning implementation, and assessment conducted by non-formal education. This research provides an in-depth understanding of the equivalency education program in implementing national curriculum policies within a flexible learning structure.

Science Learning Curriculum Planning Design in Non-Formal Education

In the education equality program carried out by SKB Purwokerto and PKBM Harapan Bangsa has been carried out well in terms of learning planning. The planning that has been carried out has fulfilled the procedures set by policy stakeholders in curriculum preparation, in this case namely the Directorate General of Early Childhood Education, Basic Education and Secondary Education (Ditjen PAUD and Dikdasmen) which is under the auspices of the Ministry of Education and Culture (Kemendikbud) and implemented by educational units in 8 accreditation standards, which consist of: (1) graduate competency standards; (2) content standards; (3) process standards; (4) standards for educators and educational personnel; (5) facilities and infrastructure standards; (6) management standards; (7) financing standards and (8) assessment standards

Planning for science learning in non-formal education institutions at SKB Purwokerto and PKBM Harapan Bangsa is in accordance with the planning that should be at the initial planning stage, at this stage the tutor carries out basic competency mapping and analysis of equality education modules. Where basic competency mapping activities and module analysis can be used as a foundation in developing a syllabus which can ultimately be detailed through the preparation of appropriate lesson plans that suit the learning needs of the learning community. The following is a chart of the planning carried out by the tutor.

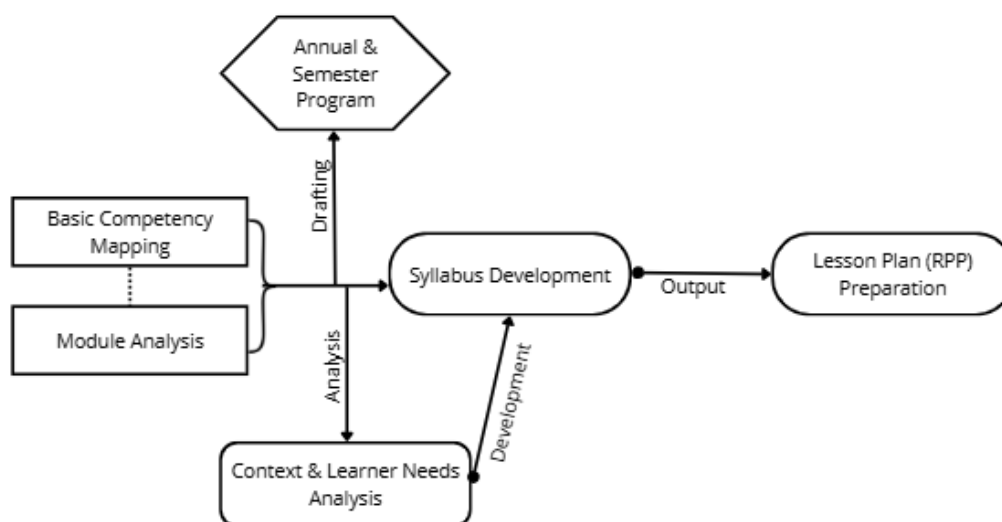


Figure 1. Flow of Preparing Equality Program RPPs

By mapping basic competencies and module analysis, tutors can analyze the content context of the material each week and can analyze learning needs that need to be considered, such as choosing teaching methods (face-to-face, tutorial or independent), assessment, time allocation or learning load in competency credit units. (SKK) and appropriate learning resources. Apart from analyzing learning needs, by mapping

basic competencies and module analysis, it can also be used as material for preparing annual programs and semester programs.

Looking at the contents of Figure 1, it can be ascertained that each institution will face different challenges related to meeting the learning needs of students, this reflects that non-formal education is inclusive (Ullah et al., 2021; Witenstein & Iyengar, 2021). So that the final result of preparing the RPP is expected to be able to accommodate learning needs. Through mapping basic competencies and module analysis, tutors will be able to determine the methods used in teaching, this is what makes the difference between formal education and non-formal education which is flexible (Ridwan et al., 2024). This means that teaching carried out by non-formal education can be done face-to-face, independently and in tutorials where each week can be adjusted to the SKK amount. The value of 1 SKK is equal to 1 hour of face-to-face contact, or 2 hours of tutorials, or 3 hours of independent learning. The time allocation for 1 hour of face-to-face contact is equal to 35 minutes for Package A, 40 minutes for Package B, and 45 minutes for Package C.

This means that teaching every week does not require face-to-face education every day like in formal education, but it should be noted that the choice of educational method cannot be chosen haphazardly or haphazardly but is based on the indicators and learning activities listed in the syllabus. Fujii, (2019); Sari et al., (2024) and Frantzeskaki, (2019) provide arguments in the results of research that has been carried out that careful planning provides significant benefits for optimal development and improvement in learning in accordance with the goals of education. However, an educator/tutor needs to pay attention again before preparing a thorough learning plan. It is necessary to pay attention and consider that the characteristics of various students need to be identified in more depth, this is because the characteristics of each individual are different, such as learning style, level of ability (cognitive). as well as the different backgrounds of students so that efforts or efforts are needed by educators to accommodate the diverse preferences of students (Goyibova et al., 2025; Langelaan et al., 2024).

Together with understanding the diverse characteristics of students, as an educator in preparing a learning plan you can pay attention that the learning in non-formal education is inclusive and differential. Ullah et al., (2021) Witenstein & Iyengar, (2021) explained that in preparing an inclusive learning plan, it means that the learning carried out is able to involve all students in carrying out the learning process with the aim of providing equal accessibility and opportunities to all students regardless of the differences and backgrounds of the students. Meanwhile, the learning plan is differentiated, which means that the learning objective is to create support and have equal opportunities to develop the potential and talents of students (Clemence et al., 2019; Putri, 2025). So that the preparation of learning plans by applying inclusive and differential principles can provide great benefits to students in equal education so that the learning carried out is effective, efficient and able to develop the talents and interests of students. Apart from planning, there are other points that non-formal educational institutions must pay attention to, namely education based on the Andragogy approach. This is based on the fact that the majority of students in non-formal education institutions are no longer in the student age group, therefore an approach is needed that suits the needs of the learning community (Covaciu, 2025).

Implementation of the Science Learning Curriculum in Non-Formal Education

The implementation of the science learning curriculum carried out by non-formal education institutions in the results of this research, namely SKB Purwokerto and PKBM Harapan Bangsa, has been carried out well, this is based on a thorough plan being prepared before implementation and ending with an evaluation or assessment of activities carried out in a structured and structured manner. comprehensive so that the implementation of learning can run smoothly in accordance with the expected objectives. The implementation of the curriculum by non-formal education institutions is by implementing the 2013 curriculum which is in accordance with the circular letter of the Directorate General of PAUD and Dikmas Number 1578/C4.3/PM/2019.

The 2013 curriculum is characterized by being holistic by combining intellectual, emotional and attitudinal aspects with the aim of not only understanding from a cognitive perspective but also paying attention to character and skills that are relevant in life (Muslim & Suci, 2020). The implementation of the 2013 curriculum specifically facilitates students in formal and non-formal education to increase understanding and also provides facilities for students to develop themselves in a complete and balanced manner so as to form good individuals and have competitiveness in the development of the world of work. Misbah et al., (2020) in his article implies that the implementation of the 2013 curriculum emphasizes competency-based learning. The competency referred to here is not only understanding the learning material but also implementing knowledge in various contexts.

In general, the structure of the 2013 curriculum in non-formal education packages A, B and C, subjects are classified into 2 parts, namely the general group and the special group. The focus of the research that has been carried out is on the Package B equality program where the general group subjects consist of: (1) Religious and Character Education, (2) Pancasila and Citizenship Education, (3) Indonesian, (4) English, (5) Mathematics, (6) Science and (7) Social Studies. Meanwhile, special group subjects consist of Empowerment subjects, and Compulsory and Elective Skills subjects. The following is table 1 of the 2013 Curriculum Package B structure and SKK weights

Table 1. 2013 Curriculum Structure Package B and SKK Weights

Subjects	Competency Credit Unit Weight (SKK)		
	Level 3 Equivalent to Class VII-VIII	Level 4 Equivalent to Class IX	Amount
General Group			
Religion and manner education			
Pancasila and civic education			
Indonesian			
English	56	27	83
Mathematics			
Natural science			
Social science			
Special Group			
Empowerment	24	11	35
Skills			
Total weight of SKK taken	80	38	118

Based on the curriculum structure in table 1 which has been determined by the government, there is no specification for the distribution of SKK scores for each subject due to the different characteristics of equal education, including differences in geography, facilities, human resources and social factors. So, in this case the equivalency education institution has the authority to distribute the SKK scores in each subject. This distribution is different from formal education, where formal education hours of lessons each week in each subject area have been regulated in Minister of Education and Culture Regulation Number 35 of 2018, whereas in equality education the number of SKKs in each subject area is distributed by the institution itself but with a note on the number of SKKs in Each level is adjusted to the total number of SKK that has been regulated.

The science learning process is carried out by equivalency education based on teaching modules provided by the government. If we analyze the teaching modules provided, the modules have the characteristics of a delivery system, which means that the teaching modules used are designed for independent learning while still paying attention to andragogical and pedagogical characteristics, where in

the learning process students are emphasized on personal responsibility to continue learning. So, equality education in science subjects, apart from growing knowledge and skills, is also used to facilitate citizens learning in 4C high-level thinking in accordance with the objectives of the 2013 curriculum (Elyana et al., 2025). Based on this, the role of tutors as facilitators of learning communities needs to analyze the characteristics of learning residents, the availability of media in equal education institutions, including facilities and tools so that the learning process can take place well

Implementation of Assessment in Equal Education

Statement made by Diaz et al., (2020) and Simac et al., (2021) that evaluation/assessment of a program that has been planned has a crucial role as an instrument for identifying success in the implementation of the program being carried out as well as material for improving the quality of the program. This is because through assessment the evaluator or actor in implementing the program can ascertain whether the objectives to be achieved are appropriate and whether the level of effectiveness of the method applied has had an impact as expected. In this case, learning evaluation has an important role and a multifaceted approach in measuring the effectiveness of an educational program and the quality of the educational program (Endo et al., 2025; Khammari & Hasnaoui, 2025)

Through this multifaceted approach, learning evaluation has played a role in accommodating various dimensions in evaluation such as learning outcomes, methods, student participation and comprehensive final program assessments that can help educational institutions understand the quality of learning carried out. In formal education and equivalency education, assessments have been carried out referring to Permendikbudristek No. 21 of 2022, both those still implementing the 2013 curriculum and independent learning by implementing formative assessments and summative assessments in the learning process.

Based on the results of interviews that have been conducted on non-formal education in the object of this research, namely SKB Purwokerto and PKBM Harapan Bangsa, the implementation of the assessments that have been carried out is in accordance with Permendikbudristek No. 21 of 2022 by implementing formative and summative assessments. Formative assessment is usually carried out by checking initial understanding which is carried out through direct questions and answers which are included in the RPP in the introductory section. This indicates that formative assessment is not used as an assessment in determining students' achievements or learning outcomes during the learning process, but formative assessment is used as an indication of students' readiness before learning activities are carried out (Akbar, 2025; Prawinugraha & Yuliawati, 2024).

By carrying out a formative assessment, the tutor at that time can also determine a differentiation strategy according to the needs of the learning community. Apart from implementing formative assessments, equality education also applies summative assessments, where summative assessments can be carried out at the end of the module or at the end of students completing one module subject. So it can be interpreted that summative assessment is used by tutors to see the understanding of competency achievements that have been received by students. However, in the summative assessment in Permendikbudristek No. 21 of 2022, it can be carried out at the end of the semester if the tutor wishes due to a lack of information regarding the achievement of competencies that have been received by students, but if the achievement information is sufficient, the tutor is allowed not to carry out the end of semester assessment.

This proves that through a good evaluation program at non-formal educational institutions and subject tutors, it can be used to ensure that the material that has been taught has been well absorbed by students, so that the institution and tutors are able to identify deficiencies and make improvements to the implementation of learning. will be done next (García et al., 2024; Putu et al., 2025).

Analysis of Citizens' Learning Needs in Equal Education

Based on the findings obtained by the researchers in this research, the needs analysis carried out by the

research object was used as (1) giving weights to the scale of interests of learning citizens related to the objectives of non-formal education; (2) materials for preparing learning programs that suit the needs of learning residents; (3) consideration of choosing the right strategy so that the educational program runs effectively and can be used to anticipate obstacles that affect the learning process.

The scale of importance carried out by non-formal education is adjusted to the initial goal of establishing equal education in the area. At the beginning, equality education provided opportunities for people who had not had the opportunity to receive formal education, so with the establishment of non-formal education or equality education, they were able to provide learning facilities to those who had not received a proper education. In terms of research objects, it can be said that the history of the establishment of educational institutions is the result of the government's concern and local community self-help so that they can obtain a decent education so that later, armed with the knowledge gained by the community, they can improve their skills and knowledge in order to improve the quality of life to be better than before (Hayat et al., 2024; Khamidah et al., 2025; Moch, 2024). Another thing is that equal education is expected to be able to provide people with access to various opportunities for better employment opportunities so that the community's economy improves

The second result of the analysis of the needs of learning residents in this research is used as material for preparing equality programs by adjusting the characteristics of the surrounding community, region and the resources they have. The aim of this is so that people are motivated and have the awareness to take part in educational programs as long as they integrate local contexts in the area in the educational process so that learning is created that is real, meaningful and in accordance with the daily lives of the learning community. It is hoped that adjusting these characteristics will open up opportunities for non-formal educational institutions to be able to encourage students to become active participants in learning, driven by scientific attitudes such as high curiosity, criticality and objectiveness (Jaikrasen & Ketsing, 2025; Yemini et al., 2025).

Finally, through appropriate and careful analysis such as strategy development, learning activities that are effective and efficient will be created while still paying attention to the characteristics of the learning community. By preparing the right strategy, the learning process becomes measurable so that it can provide a constructive learning environment for students during the learning process. Apart from that, the right strategy is able to create collaboration between students learning in non-formal education. This indicates that strategy has a crucial role in the learning process by creating active involvement of learning citizens which allows for a dynamic and inspiring exchange of ideas, knowledge and learning experiences. Through appropriate strategies in non-formal education, it is hoped that an active and empowered learning community will be created.

Based on the explanation above, it can be concluded that in non-formal education, analysis of the needs of learning citizens is the most important foundation in equality education and forms a strong foundation in achieving the vision, mission and goals of the establishment of non-formal education. By analyzing the needs of learning citizens by combining these three things, it is able to provide encouragement to learning citizens to prepare themselves to overcome the growing problems of life by improving the quality of life better in terms of education and the community's economy.

CONCLUSION

This research confirms that the learning process implemented by the non-formal education equivalency program has been effective, adhering to student-centered, inclusive principles, and an andragogical approach. One of the distinguishing characteristics of non-formal education compared to other formal education systems is flexibility, a key feature of curriculum implementation that does not compromise quality and the primary goal of science learning: a scientific approach that encourages conceptual understanding and critical and creative thinking among students. The novelty of this research lies in the fact that curriculum flexibility, when

supported by systematic planning, ongoing evaluation, and analysis of student needs, does not degrade learning quality but instead increases the relevance and impact of science learning in the non-formal education context. Curriculum evaluation, on the other hand, is used not merely as an administrative activity but also as a strategic, reflective mechanism for continuous quality improvement and strengthening public trust in educational institutions.

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