Strengthening STEM-oriented Character Education in Elementary Schools

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Abstract. The purpose of this study is to describe the implementation of STEM-oriented Character Education Strengthening education in SD 2 Kebun Lama, to describe the supporting factors, obstacles and solutions for implementing the implementation. This type of research is descriptive qualitative research. Data collection techniques through interviews, observation and documentation. The data analysis technique used was based on data collection, the researchers conducted data reduction and data presentation. Test the validity of the data using triangulation techniques and sources. The results of the study: 1) The implementation of STEM-oriented Character Education Strengthening in SD 2 Kebun Lama Langsa City has been carried out well through the learning planning stage by integrating the main character values which are elements in the character education strengthening program into the syllabus and lesson plans, the implementation of learning is carried out by inserting character values through preliminary, core and closing activities, learning evaluation is carried out by observing and writing down the results of observations into an attitude assessment journal. 2) Factors supporting implementation are supporting infrastructure, school culture and leadership, inhibiting factors: teacher knowledge about STEM and parental support still need improvement, solutions: STEM training for teachers and increasing collaboration with parents. The process of implementing Strengthening Character Education at SD Negeri 2 Kebun Lama is manifested in integration into self-development programs, integration into learning activities and character values developed by the school. Integration in self-development programs,

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1   Introduction

Education or educating is not only limited to transferring knowledge, but further from that understanding, what is more important is being able to change or shape one's character and character to become better, more polite in terms of ethics and aesthetics as well as behavior in everyday life. [1]The objectives of Indonesian National Education as described in the National Education System Law are in line with the objectives of

Strengthening Character Education, abbreviated as PPK. The purpose of PPK according to the Presidential Regulation of the Republic of Indonesia Number 87 of 2017 is to build and equip students as the golden generation of Indonesia in 2045 with the spirit of Pancasila and good character education to face dynamics of future change.

The development of a nation is closely related to the problem of education. If the Human Resources (HR) owned are qualified, it can produce good output in supporting the progress of the nation. But in reality, increasing human resources, especially in the field of education, is still experiencing many obstacles. One of them is through character education carried out by schools.

Education that develops character values in students so that they have values and character as their own character, apply these values in their lives, as members of society and citizens who are religious, nationalist, productive, and creative. Character education is a process and effort to instill and develop character values in students so that they can implement these values towards God Almighty, themselves, others and the nation and state. Through character education, it is hoped that students can apply character values about understanding but embedded values of concern for God Almighty, themselves, others, the environment, as well as society and the nation as a whole so that they become perfect human beings according to their nature.[2]

The Movement for Strengthening character education places character values as the deepest dimension of education that civilizes and civilizes educational actors. There are five main character values that are interrelated to form a value network that needs to be developed as a priority for the KDP Movement. The five main values of the national character in question are as follows:

(a) Religious

Religious character values reflect faith in God Almighty which is manifested in the behavior of carrying out religious teachings and beliefs, respecting religious differences, upholding a tolerant attitude towards the implementation of religious worship and other beliefs, living in harmony and peace with adherents of other religions.

b) Nationalist

Nationalist character values are ways of thinking, acting, and acting that show loyalty, concern, and high respect for the language, physical, social, cultural, economic, and political environment of the nation, placing the interests of the nation and state above the interests of themselves and their groups.

c) Independent

The value of independent character is the attitude and behavior of not depending on others and using all energy, thought, time to realize hopes, dreams and ideals.

d) Gotong Royong

The value of the gotong royong character reflects the act of appreciating the spirit of cooperation and working together to solve common problems, establish communication and friendship, provide assistance/help to people in need.

e) Integrity

Integrity character values are values that underlie behavior based on efforts to make himself a person who can always be trusted in words, actions, and work, has commitment and loyalty to human and moral values (moral integrity).[3]

One of the learning approaches that can involve students actively in learning learning and used as an effort to fulfill the skills of the Century 21 about thinking skills is STEM (Science, Technology, Engineering, and Mathematics). STM is a development of STEM with add arts in it. ST E M education is a learning that combines several sciences including: science, technology, science techniques, and mathematics that play a role for students in developing creativity through the process of solving problems in life. STEM Features is the Engineering Design Process (EDP). One of EDP in learning STEM is the questioning stage, the stage of imagining, the stage of planning, the stage of creating, and improving stages that unconsciously if students carry out At this stage students are doing engineering in learning (Cunningham & Hester, 2007; Lidinillah, 2017).

In general, STEM is an acronym for science, technology, engineering, and technology mathematics, namely:

Science is the study of natural phenomena involving observation and measurement, as a vehicle for objectively explaining the ever-changing nature, or Relating to nature to understand the universe which is the basis of technology

Technology is about human innovations used to modify nature in order to meet human needs and desires, thus making life better and safer, or Modify everything natural to meet human needs

Engineering (engineering) is the knowledge and skills to acquire and apply scientific, economic, social and practical knowledge to design and construct useful machines, equipment, systems, materials and processes for humans economically and environmentally friendly, or Creative applications of principle science to design or develop the framework of machines, tools of a process fabrication in making designs that have been made based on various developments such as economy and safety

Mathematics is the science of patterns and relationships, and provides language for technology, science, and engineering, or Is a science that studies regularity of patterns and their relationships.[4]

STEM is an interdisciplinary approach to learning in which academic concepts are combined with real-world learning as students apply science, technology, engineering, and mathematics in contexts that make connections between schools, communities, work, and global companies that enable the development of STEM literacy with all of these abilities. to compete in the new economy.[5]

The purpose of STEM Education according is STEM literate students, expected to have the knowledge, attitudes and skills to identify questions and problems in their lives, explain natural phenomena, design and draw evidence-based conclusions about STEM-related issues; understand the characteristic features of STEM disciplines as a form of human-initiated knowledge, inquiry and design; awareness of how STEM disciplines shape the material, intellectual and cultural environment; willing to be involved in the study of issues related to STEM as a constructive, caring and reflective citizen by using STEM ideas.

Schools that implement STEM produce student learning experiences by combining multiple disciplines (interdisciplinary, integrated, or cross-disciplinary approaches) and often include project or problem-based approaches linked to authentic or real-world contexts[6]

STEM is an approach that links and integrates STEM subjects in order to create learning based on problems of everyday life so that it can train students in applying the knowledge learned in school with phenomena that occur in the real world. The application of science is very much found in technological products and vice versa. STEM learning aims to improve STEM literacy skills. STEM literacy is not only seen as content but as skills, abilities, factual knowledge, procedures, concepts, and metacognitive abilities to gain further learning.[7]

STEM learning provides opportunities for student growth in twenty-first century skills such as collaboration, critical thinking, creativity, accountability, persistence, and leadership (Buck Institute 2018; Partnership for 21st Century Skills 2013). The use of an integrated STEM curriculum, which provides opportunities for 'a more relevant, less fragmented and more stimulating experience for learners'.[8] Real world problems are not fragmented in isolated disciplines as taught in schools and to solve these problems people need skills that cross disciplines.

Implementation of strengthening STEM-oriented character education in the education process will develop character values in students will produce students who have values and character as their own character, apply these values in their own lives, as members of society and citizens who are religious, nationalist , productive, and creative. Character education is a process and effort to instill and develop character values in students so that they can carry out these values towards God Almighty, themselves , others and the nation and state. Through character education it is hoped that students can apply character values regarding understanding but embedded values of concern for God Almighty, themselves, others, the environment, and society and the nation as a whole so that they become perfect human beings according to their nature.

In this case, schools are required to be able to shape student character through learning activities in class and outside the classroom, and have programs that are able to shape the character of students at school. The role of the school as a place for the formation of student character is considered important and has a considerable influence. Teachers are required to be able to continue to develop themselves and be able to be role models for students to form good character. Character education is an important aspect in the educational process that students receive.

Character education can be applied starting from family and school education. In family education as well as in school education, parents and teachers remain aware that it is their duty to develop a noble character. Character education should bring students to cognitive value recognition, affective appreciation of values and finally to experience

real value. Problems of character education that have existed so far, in schools for example, need to be studied immediately and alternative solutions are sought and need to be developed in a more operational manner so that they are easy to implement.

Based on initial observations, in the process of strengthening STEM-oriented character education activities at SD Negeri 2 Kebun Lama, implementation still places more emphasis on cognitive aspects than affective aspects and many activities are carried out without clear guidelines, for example every Friday before all students learn must first read the Qur'an. Plus, teachers still experience difficulties in integrating character values in learning, even though the expected character values in learning have been included in the Learning Implementation Plan. In addition, there are still students who

have not implemented the character values instilled by the school. In addition, there is still a lack of school-programmed activities aimed at forming the character of their students. Among them is the absence of extracurricular activities. These extracurricular activities, namely scout extracurriculars and computer extracurriculars, were stopped by the school.

Schools are expected to be able to shape students into individuals with good character and personality in accordance with the values and norms adopted in society, through STEM-oriented activities in learning activities or extracurricular activities, especially for students of SD Negeri 2 Kebun Lama.

2   Method

This study uses a qualitative research approach because it presents data in the form of words. The type of research used by the researcher is descriptive research. In this case, the researcher wants to know the implementation and obstacles carried out in elementary schools. The place of implementation in this research is at SD 2 Kebun Lama.

Data collection techniques in this study, through observation, interviews and documentation. The observation method is used to determine school activities related to the formation of student character, both in learning activities and non-learning activities. Interviews are used to obtain more in-depth information from sources that cannot be found through observations from principals, teachers and students. collect data in the form of documents, which include syllabus, lesson plans (RPP), and photos that can be used as data sources.

In this study, researchers used source triangulation. The sources of this research consist of primary and secondary data sources. The primary data sources are observation and interviews, while the secondary data sources are documentation. Researchers used participatory observation, interviews, and documentation. While the stages of deep data analysis begin with data reduction, data presentation, and drawing conclusions. The data reduction activity in this study was to organize the data obtained in the research process in the form of data from interviews, observations and documentation from appropriate schools. Research related to the strengthening of STEM-oriented character education was carried out, then presenting the reduced data in a table to facilitate the display of data in accordance with research needs. The final stage is drawing conclusions, where research data are concluded to answer problems in research, namely related to the implementation of strengthening STEM-oriented character education.

3   Result And Discussion

The form of implementation of strengthening character education at SD Negeri 2 Kebun Lama is realized through integration in self-development programs, integration in learning activities and character values developed by the school. The following is a description of integration in self-development programs and integration in learning activities as well as character values developed by the school. The integration of character

education in this research is through self-development and learning. In self-development includes

a) Routine Activities

Routine activities are activities that are routinely carried out by schools to instill character in students. Based on the results of an interview on Thursday, July 25, 2022 regarding routine activities carried out by the school, the principal stated "the ceremony, the dhuha prayer and the midday prayer, prepared and prayed". This is supported by the teacher's statement regarding routine activities carried out by the school in order to instill character in students, namely Monday ceremonies and other holidays, praying before and after lessons, praying in congregation, and picket together.

b) Exemplary

The purpose of exemplary activities here is an activity carried out by school principals, as well as teachers in schools that can be used as models for students. In this case the teacher acts directly as an example for students. Based on the results of the researcher's interview with the principal on July 28, 2022 regarding exemplary activities, the principal stated "Dress neatly, speaks politely, prays dhudhur at school, arrives not late, and so on". This is in accordance with the teacher's statement, that the example given to students is in the form of speaking politely, dressing neatly, disciplined and greeting.

c) Integration in Learning Activities

The implementation of character education in schools is also integrated in classroom learning activities. SD Negeri 2 Kebun Lama in its learning still uses the 2013 Curriculum. The integration of character education is carried out through the cultivation of character values in learning. In learning, the teacher had previously made lesson plans before learning as a guide for teachers in teaching. Character values that will be instilled in learning are inserted in the lesson plans and are based on the existing syllabus.

Planning for the implementation of strengthening STEM -oriented character education has been carried out by class V teachers. Based on the results of interviews and review of RPP documents made by class teachers, the following data is generated:

The first step in learning planning carried out by the fifth grade teacher is to determine the material/theme that will be chosen to be taught using the STEM approach, because not all materials are taught using the STEM approach. Next, analyze the main character values which are the key elements in strengthening character education activities. For example, to cultivate religious character can be done with love of peace, tolerance, respect for differences in religion and belief, firm stance, self-confidence, cooperation between adherents of religions and beliefs, anti-bullying and violence, friendship, sincerity, not forcing the will, loving the environment, protecting the small and isolated . Nationalist character can be done by appreciating the nation's own culture, maintaining the nation's cultural wealth, being willing to sacrifice, excelling, and achieving, loving the homeland, protecting the environment, obeying the law, discipline, respecting cultural, ethnic and religious diversity. Independent character with resilient, fighting, professional, creative activities, courage, and being a lifelong learner. The character of gotong royong with activities of respect, cooperation, inclusiveness, commitment to joint decisions, deliberation to reach consensus, mutual assistance , solidarity, empathy, anti-discrimination, anti-violence, and volunteerism. The character of

integrity is carried out by activities of honesty, love for the truth, loyalty, moral commitment, anti-corruption, justice, responsibility, example, and respecting individual dignity.[9][10]

The next step is to integrate these character values into the syllabus, lesson plans and teaching materials that will be used. Teaching materials that support character education are textbooks that are owned by each student, besides that teachers also use teaching materials adopted from the internet to develop students' knowledge[11].

The implementation of learning begins with Introduction/Opening activities containing teacher activities in preparing students psychologically and physically to take part in the learning process which can be done by providing motivation to learn, linking previous knowledge with what will be studied, explaining learning objectives or basic competencies to be achieved. , and convey the scope of the material. Based on the RPP document, the steps taken by the fifth grade teacher in the preliminary activities include: the preliminary activity shows the teacher's activity coming on time, then the value that is instilled is discipline, greeting and greeting students, then the instilled value is polite, pray a before starting the lesson activities and an invitation to be grateful for today's favors, the value instilled is religious, checking the attendance of students' attendance then the value implanted is discipline, praying for students who are sick, then the value instilled is social care, the teacher checks the completeness of the uniform , then the instilled value is discipline and responsibility, motivates students by singing the Indonesia Raya anthem, then the instilled value is nationalist, provides apperception to determine the beginning of students, relates the material to be studied and explains learning objectives, divides groups.[12]

The core activity contains student activities in the learning process to achieve basic competencies by using learning methods and media as well as learning resources that are tailored to the characteristics of students and the goals to be achieved. The learning process activities are carried out in an integrative thematic manner.[9][13]

The teacher's learning method has an effect on the formation of the character of students. The use of the right method affects how quickly students receive and adopt character education. The use of the STEM approach aims to maximize the strengthening of character education such as religious, nationalist, mutual cooperation, independence and integrity. The learning process in strengthening STEM-oriented character education can encourage students to create something new from the results of engineering. The process of engineering in STEM learning is closely related to 21st century abilities.

The closing activity shows the activities of the teacher and students making lesson summaries, reflecting to evaluate the entire series of activities and the results obtained from the ongoing learning process, providing feedback on the learning process and results, carrying out follow-up activities in the form of giving assignments and informing lesson plan for the next meeting.

Based on the results of interviews with principals and teachers, it can be concluded that the obstacles experienced by teachers in implementing character education to students include:

Some students are spoiled, which can be seen in the observation of learning activities. On several occasions students whined to the teacher and complained when a friend bothered them.

The influence of friends and the environment that is not good on student behavior can be seen during learning in class V, where there are some students who are calm, but because the friend next to them is busy, the student also becomes busy

Some students are a bit late in learning so it takes a long time to instill the values of courage, discipline and responsibility. At the time of learning, they just stay silent and do not do learning activities like other friends

Teachers have not been able to choose character values that are appropriate to the subject and sometimes cannot be an example of the selected character values. Basically, in the lesson plan, the teacher can include character values that are in accordance with the KD of the subjects being taught, but in practice the teacher has not implemented the character values that have been included in the lesson plans in optimal learning activities. [14]

In developing strengthening STEM-oriented character education in the learning process, the role of the teacher is very important. Teacher behavior that is influenced by individual, social, environmental, and policies has an impact on teacher decisions about the pedagogical approach to be adopted in learning.[15] One indicator of the effectiveness of learning applied by the teacher is student achievement. strengthening STEM-oriented character education is one of the efforts that can be made by teachers in being able to create a learning environment that provides opportunities for students to develop 21st century abilities . So that students are able to live in the times and their environment.

4 Conclusion

The implementation of Strengthening Character Education at SD Negeri 2 Kebun Lama is manifested in integration in self-development programs, integration in learning activities and character values developed by schools. The integration in the self-development program consists of: a) Routine activities consisting of ceremonial activities, praying together before and after learning, praying in congregation at the mosque, as well as class pickets and teacher pickets. b) Exemplary which consists of dressing neatly, speaking politely, arriving on time, being disciplined, praying in congregation and greeting each other. c) Integration in learning activities is manifested in the inclusion of character values in the lesson plans and syllabus which are then implemented in learning activities. d) Conditioning consisting of teachers filling empty classes with each other, giving punishments to students who violate the rules, picket activities and school hygiene, providing trash bins and displaying school rules. Character values developed at SD Negeri 2 Kebun Lama are religious values, independence, mutual cooperation, integrity and nationalism. In implementing strengthening STEM-oriented character education at SD Negeri 2 Kebun Lama, a guide is needed in the form of teaching modules to maximize character education strengthening activities to become more focused and can be continued for further research in the form of making STEM-oriented character education strengthening modules.

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