Vol. 5., No. 2, August 2021, pp. 95-101 ISSN 1978-0524 (print) | 2528-6374 (online)

# Training on integrated science learning for science teachers in Nekamese District

Kadek Ayu Astiti [a,1,*], Andam Surianty [a,2]

[a] Universitas Nusa Cendana, Jalan Adisucipto, Penfui, Kupang, Indonesia
[1] kadekayuastiti88@yahoo.com *
* Corresponding Author

Received October 19, 2020; accepted April 29, 2021; published November 02, 2021

## ABSTRACT

PKM activities are carried out in partner schools in the form of training for Mathematics and Natural Sciences teachers to overcome the problems they are facing. Some of the obstacles that are being faced are that science teachers still have difficulty applying integrated science learning according to the demands of the 2013 curriculum. The targets to be achieved in the implementation of this PKM program include increasing the professional competence of teachers in implementing integrated science learning. Activities are designed in several stages, namely 1) coordinating with partner schools for implementation time, 2) providing material related to integrated science learning, 3) Mentoring for Natural Sciences teachers in designing integrated science material and 4) program evaluation. This activity was not only attended by Natural Sciences teachers in partner schools, but several Natural Sciences teachers in schools around partner schools were also joined. Participants in the activity were Natural Sciences teachers from SMP N 1 Nekamese, SMP N 2 Nekamese, SMP N 4 Nekamese, and SMP N 5 Nekamese. The participants were quite enthusiastic in participating in this activity, seen from the enthusiasm for joining the activity and dynamic discussions.

KEYWORDS
Integrated science learning
PKM activities
Teacher competence
The 2013 curriculum
Holistic education



## 1. Introduction

The 2013 curriculum emphasizes the application of a scientific approach to the learning process. The scientific learning approach includes observing, asking, trying, processing, presenting, concluding, and creating for all subjects [1]–[3]. This is in line with the ability in science, that are (1) to find out what is observed, (2) the ability to predict what has not been observed and the ability to test the follow-up to experimental results, (3) the development of a scientific attitude [4]. Curriculum development in Integrated Science learning is carried out to meet the demands of the 2013 curriculum, namely Integrated Science learning is carried out on an integrated basis [5]–[7]. Integrated science learning in junior high school is not a scientific discipline but is developed as an integrative science subject. Integrative science has the meaning of combining various aspects, and they are; the domain of attitudes, knowledge, and skills [8]. As an integrative science, education is applicative-oriented, developing thinking skills, learning abilities, curiosity, and developing a caring and responsible attitude towards the social and natural environment [9]. Integrated science should be taught as a whole, not separately, where this is in accordance with the meaning of science which studies objects and phenomena holistically. Natural science symptoms and phenomena on the object of science problems are a complete concept, not separate. This is the basis for implementing integrated science learning in schools so that the mindset of students can be holistic to solve problems in life [10]–[12]. Arif asserts that science consists of several fields of scientific study, including Astronomy, Biology, Chemistry, Geology, Physics, and Zoology, so an integrated approach is needed to avoid overlapping concepts between several fields of scientific study [13]. Substantially, science

ISSN 1978-0524 (print) | 2528-6374 (online) Vol. 5., No. 2, August 2021, pp. 95-101

can be used as a tool to develop the domain of attitudes, knowledge, and skills. Science teachers must have interdisciplinary science skills shown in science (knowledge). In fact, there are still many schools that teach integrated science subjects separately. The learning model that has been used so far is a separate learning model for both science and social studies [14]. Physics teachers are scrupulous if asked to teach biology because the material they have mastered is in accordance with the expertise and material they have taught so far.

However, there are many obstacles faced by Integrated Science teachers, one of which is the difficulty in teaching subject themes that are not the teacher's educational background. For example, an Integrated Science teacher with a biological background will find it difficult to teach physics material, especially those related to equation formulation and equation analysis on physical phenomena. Likewise, in practicum activities, many are dominated in the scientific field due to data analysis tools and techniques limitations. Although physics practicum is carried out, it is only carried out at the exploratory level, and it does not come on how to find concepts and analyze good and correct physics or chemistry problems. Likewise, teachers with a physics background will have a little difficulty in teaching biology or chemistry, which is mostly memorized. According to Agoro, integrated science learning can improve learning achievement, science process skills, and students' attitudes towards science [15]. Several factors that cause teachers to be unprepared in implementing integrated science learning in the 2013 curriculum, according to the results of Kasuma research, are; (1) the educational background of teachers; (2) teachers' understanding of integrated science learning and learning models that support integrated science learning are still limited; (3) Integrated science teaching materials used are not adequate in supporting integrated science learning and 4) teacher motivation in implementing integrated science learning is still low [5].

The conditions in the partner school, such as SMP N 1 Nekamese, show the same thing, where only two science teachers have to teach all students in the school. The two teachers are not science graduates, but one teacher with a bachelor's degree in physics and one teacher with a bachelor's degree in biology. This school has implemented the 2013 curriculum since 2015, but teachers are still experiencing difficulties in applying integrated science learning. Based on information submitted by local teachers, there is a lack of practical socialization related to integrated science application techniques (especially in terms of content). During implementing this curriculum, teachers learn self-taught related to science material in an integrated manner either through the internet or other sources. The books provided still explain the material separately (physics, chemistry, biology). The school principal, Mr. Yulius Patola, S. Pd., also said that the integrated science books provided by the government were still limited, so students were distributed the books only during science lesson hours. This condition certainly makes teachers still confused in teaching integrated science. Thus, the concept of integration in Integrated Science which is shown in Core Competencies (KI) and Basic Competencies (KD), which is one KD has combined science concepts from the fields of biology, physics, chemistry, mathematics, and engineering (MIPA), cannot achieve integrally and holistically, but the achievement is only dominant in one scientific field. One of the solutions to this problem is that science teachers should be more active in learning and sharing with science teachers with backgrounds other than their scientific fields. Thus, the way of packaging the learning experience designed by the Integrated Science teacher provides an experience for students. Learning experiences that show the connection of conceptual elements will make the learning process more effective. The conceptual relationship studied with the relevant side of the science field of study will form a cognitive schema so that children gain the integrity and unanimity of knowledge [16]. Based on a situational analysis of the problems that occur in partner schools that are being faced by Mathematics and Natural Sciences teachers at the school, it can be concluded that the root cause of the problem is that the qualified teachers are not from a science degree while the demands of an integrated science learning junior high school curriculum, so that science teachers are still difficulties in implementing curriculum expectations. Based on the causes of the problems that have been described, our PKM team wants to help solve these problems

Vol. 5., No. 2, August 2021, pp. 95-101 ISSN 1978-0524 (print) | 2528-6374 (online)

through the Community Partnership Program activities by discussing topics of material and science concepts in an integrated manner (physics, chemistry, biology). After the training is carried out, mentoring is also carried out for teachers in applying integrated science in teaching practice. Through this activity, it is hoped that the problems being faced by partner schools will find solutions and be able to improve the quality of science learning.

## 2. Method

The method of implementing this program is in the form of workshop activities by discussing material and science concepts in an integrated manner. Some of the steps taken are; (1) Coordinate with partner schools in implementing this program; (2) Determine the speaker and instructors in this program activity; (3) Carry out training activities by discussing the above topics; (4) Provide assistance to MIPA teachers in designing and implementing simple Mathematics and Natural Science practicums to be applied in the learning process. Program evaluation was carried out by analyzing the Gain-score statistic on the pretest and post-test result of Mathematics and Natural Sciences teacher's ability. The difference in the pretest and post-test results was calculated using the following N-gain formula developed by Hake [17].

$$N-GAIN = \frac{S_{Post} - S_{\Pr e}}{S_{Max} - S_{\Pr e}} x100\% \quad (1)$$

The following explains the equation formula % N-Gain is the normalized gain percentage, Spost is the posttest score, Spre is the pretest score, and the last Smax is the maximum score. Table 1 is the Normalized gain category.

**Table 1.** Normalized gain category:

| N-Gain score | Category |
|---|---|
| 0,00 < g< 0,3 | low |
| 0,3 ≤ g < 0,7 | medium |
| 0,7 ≤ g ≤ 100 | high |

The target to be achieved in implementing this PKM program is to increase the professional competence of teachers in implementing integrated science learning. Figure 1 depicts the layout of the activity plan.

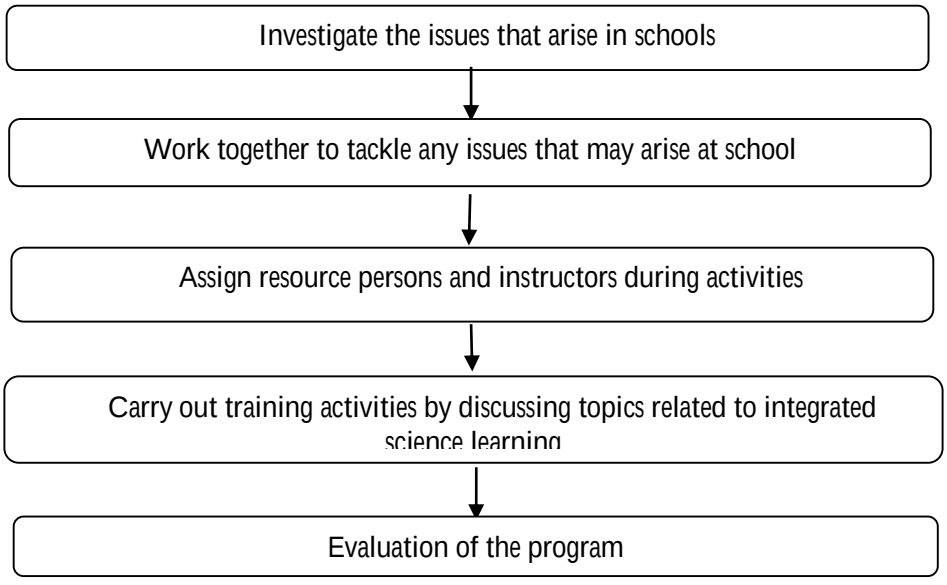


**Fig. 1.** Designing an activity plan

ISSN 1978-0524 (print) | 2528-6374 (online) Vol. 5., No. 2, August 2021, pp. 95-101

## 3. Results and Discussion

This program is carried out for five months, starting from May 5, 2020, and ending on October 5, 2020. The first thing to do is hold a meeting between the team leader and LP2M to create a common perception. Media zoom held this meeting on July 6, 2020, due to the COVID-19 pandemic, making it impossible to gather in large numbers. Then, our team held an internal meeting to divide tasks design activities to be carried out. The meetings were held several times, resulting in an agreement both in terms of tasks and the timing of the implementation of PKM activities. After coordinating with partners, the implementation time was finally agreed to start on August 10, 2020, because it coincided with teachers and students finishing their semester break. The opening ceremony was officially opened by representatives from LP2M Undana and was attended by the principal of SMP N 1 Nekamese as a partner school. While waiting for the activity to be carried out, the team carried out the process of preparing the equipment used during the activity, starting from making banners, preparing for consumption, transportation to be used, and shopping for the necessary materials. Meanwhile, the speaker prepares the material that will be given during the activation process. The agreed time between the PKM team and partners is that the activity will take place starting on August 10, 2020, in the science laboratory room of SMP N 1 Nekamese. Activities are carried out starting with opening, providing material, mentoring, and evaluating activities. This PKM activity was officially opened by LP2M, where on this occasion, the head of LP2M was represented by the head of the LP2M Undana science and technology centre, Figure 2.


**Fig. 2.** Opening ceremony and pretest implementation

After the opening ceremony was over, it was continued by giving a pretest to the participants to find out the participants' initial knowledge related to the material to be delivered, Figure 3.

**Fig. 3.** Providing information on integration models and how to apply them

Vol. 5., No. 2, August 2021, pp. 95-101 ISSN 1978-0524 (print) | 2528-6374 (online)

After giving the pretest, the material is given by the speaker. The material given is an understanding of integrated science at the junior high school level. MIPA teachers at partner schools attended this activity, and several MIPA teachers from other schools around the partner schools participated and took part in the activity, considering the material presented was very needed by local teachers. Some of the Mathematics and Natural Sciences teachers who participated in this activity were from SMP N 1 Nekamese, SMP N 2 Nekamese, SMP N 4 Nekamese and SMP N 5 Nekamese. During the presentation of the material, the participants seemed quite enthusiastic about participating in the activity, Figure 4.

**Fig. 4.** Participants discuss the outcomes of the integrated scientific learning design to mentors.

Before the activity begins, they have prepared the place for the activity and the equipment that will be used. In the process of the activity, the participants were also active in asking the speaker regarding the things they did not understand or the problems they had experienced during the teaching and learning process. Here is some of the documentation we took during the activation process on Monday, August 10, 2020, until the activity was finished, Figure 5.

**Fig. 5.** The participants are working on posttest questions.

Based on the pre-test and post-test results, it was found that the average pretest score was 60, and the post-test average was 80. This data was then analyzed and resulted in a gain score of 0.5, which was included in the medium category as shown in the following Table 2.

**Table 2.** Result of pretest and posttest

| Material | Average pretest score | Average posttest score | Gain score |
|---|---|---|---|
| Integrated Science Learning | 60 | 80 | 0,5 |

These data indicate a significant increase in understanding integrated science concepts among participants. Through this program, it appears that there is a change in teachers' understanding regarding integrated science learning. Science teachers initially applied science learning by giving physics, chemistry, and biology material separately according to the material at each grade level. This is because teachers do not fully understand the whole integrated science learning and feel unsure about implementing

ISSN 1978-0524 (print) | 2528-6374 (online) Vol. 5., No. 2, August 2021, pp. 95-101

integration. The teacher revealed this at the beginning of the activity, but after following the activity process starting from providing material, practicing integrated science concepts according to the material taught in class, and trying to present examples of integration by taking one of the materials, the teacher became more aware of the meaning of integrated science and how to apply it in the learning process. Some of the supporting and inhibiting factors in this PKM activity include the following; (1) The supporting factors. The principal at the partner school really supports this activity by seeing the various benefits obtained by the Mathematics and Natural Sciences teachers at the school run quite smoothly. There is an enthusiasm of the teacher to take part in the activity so that this activity runs dynamically and interactively according to the plan; (2) The obstacle factor, the distance where the participants live is quite far from the place of activity, and the damaged road conditions make the participants need a long time on the trip so that the time to start the activity is delayed. Because numerous partner schools had school activities that corresponded with this PKM activity, not all MIPA instructors at other schools were able to participate.

## 4. Conclusion

Based on the activities carried out, it can be concluded that this activity positively impacts partner schools, especially the science teachers, in increasing understanding of integrated science concepts (physics, chemistry, biology). Education in NTT still requires special attention, especially in integrated science learning in junior high schools. Both in terms of material and related to teaching and learning activities facilities, it is necessary to find alternative solutions to overcome existing problems and limitations. Based on what has been done and feedback from the participants, further training is needed to develop teacher skills in preparing lesson plans (RPP) by applying integrated science concepts.

## References

[1] A. Wulandari, "Implementation of the 2013 Curriculum Based on a Scientific Approach (Case Study at SD Cluster II Kintamani)," *Int. J. Elem. Educ.*, vol. 4, no. 3, p. 422, Sep. 2020, doi: 10.23887/ijee.v4i3.28172.

[2] V. Herlily, A. Anhar, Y. Ahda, and R. Sumarmin, "Application of Learning Model Learning Guided Discovery with Scientific Approach to Enhance Learning Competency Science Seventh Grade Students," *Int. J. Progress. Sci. Technol.*, vol. 6, no. 2, pp. 499–505, 2018, doi: 10.52155/ijpsat.v6.2.274.

[3] E. Istiawan, Y. U. Anggraito, and S. M. E. Susilowati, "The impact of the implementation of the 2013 curriculum on laboratory management in Wonosobo High School," *J. Innov. Sci. Educ.*, vol. 8, no. 2, pp. 123–127, 2019, doi: 10.15294/jise.v0i0.24683.

[4] A. E. Lawson, D. L. Banks, and M. Logvin, "Self-efficacy, reasoning ability, and achievement in college biology," *J. Res. Sci. Teach. Off. J. Natl. Assoc. Res. Sci. Teach.*, vol. 44, no. 5, pp. 706–724, 2007. doi: 10.1002/tea.20172

[5] S. A. Kasuma, R. Ratnawulan, and G. Gusnedi, "Needs analysis of teachers and students in the development of integrated science students books for curriculum 2013 integrated with 21st century learning process: case study in SMPN 1 solok," in *Journal of Physics: Conference Series*, 2019, vol. 1317, no. 1, p. 12168. doi: 10.1088/1742-6596/1317/1/012168

[6] C. R. Prihantoro, "The perspective of curriculum in Indonesia on environmental education," *Int. J. Res. Stud. Educ.*, vol. 4, no. 1, pp. 77–83, 2015. doi: 10.5861/ijrse.2014.915

[7] S. Rahmiwati, "The Implementation of Integrated Natural Science Textbook of Junior High School be Charged on Character-based Shared Models to Improve the Competence of Learners' Knowledge," in *IOP Conference Series: Materials Science and Engineering*, 2018, vol. 335, no. 1, p. 12076. doi: 10.1088/1757-899X/335/1/012076

[8] A. Bagnis, A. Celeghin, C. O. Mosso, and M. Tamietto, "Toward an integrative science of social vision in intergroup bias," *Neurosci. Biobehav. Rev.*, vol. 102, pp. 318–326, 2019, doi: 10.1016/j.neubiorev.2019.04.020.

[9] I. Setyowidodo, D. Yulianto, and Y. S. Pramesti, "Project based peer interaction to improve creativity and collaborative attitude of student: a mini review," in *International Conference on Mathematics and Science Education of Universitas Pendidikan Indonesia*, 2020, vol. 5, pp. 99–102. Available at: Google Scholar.

[10] E. Munastiwi, "The management model of vocational education quality assurance using 'holistic skills education (Holsked),'" *Procedia-Social Behav. Sci.*, vol. 204, pp. 218–230, 2015, doi: 10.1016/j.sbspro.2015.08.144.

Vol. 5., No. 2, August 2021, pp. 95-101 ISSN 1978-0524 (print) | 2528-6374 (online)

[11] D. Hodson, "In search of a meaningful relationship: an exploration of some issues relating to integration in science and science education," *Int. J. Sci. Educ.*, vol. 14, no. 5, pp. 541–562, 1992. doi: 10.1080/0950069920140506

[12] D. Hodson, "Time for action: Science education for an alternative future," *Int. J. Sci. Educ.*, vol. 25, no. 6, pp. 645–670, 2003. doi: 10.1080/09500690305021

[13] R. M. Arif and R. L. Agustina, "Developing a Connected Model of Integrated Science Material to Improve Students' Science Process Skill," 2017. doi: 10.2991/seadric-17.2017.41

[14] P. E. Harrell, "Teaching an integrated science curriculum: Linking teacher knowledge and teaching assignments.," *Issues Teach. Educ.*, vol. 19, no. 1, pp. 145–165, 2010. Available at: Google Scholar.

[15] A. A. Agoro and M. K. Akinsola, "Effectiveness Of Reflective-Reciprocal Teaching On Pre-Service Teachers' Achievement And Science Process Skills In Integrated Science," *Int. J. Educ. Res.*, vol. 1, no. 8, pp. 1–20, 2013. Available at: Google Scholar.

[16] G. E. Morales-Martinez, J. Trejo-Quintana, D. J. Charles-Cavazos, Y. N. Mezquita-Hoyos, and M. Sanchez-Monroy, "Chronometric constructive cognitive learning evaluation model: Measuring the construction of the human cognition schema of psychology students," *Int. J. Learn. Teach. Educ. Res.*, vol. 20, no. 2, pp. 1–21, 2021. doi: 10.26803/ijlter.20.2.1

[17] I. Junina and A. Halim, "The effect of discovery learning-based worksheet on students' metacognition skill and learning outcomes," in *Journal of Physics: Conference Series*, 2020, vol. 1460, no. 1, p. 12100. doi: 10.1088/1742-6596/1460/1/012100