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Identification of Training Needs to Foster a Research Culture in Indonesian Schools Davao Philippines

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Abstract. Research skills need to be possessed by students in the era of educational revolution 4.0 and society 5.0. The efforts that have been made to apply a scientific approach still have not maximized research skills for students. An independent curriculum with a new learning paradigm enables the achievement of student research skills and a research culture in schools can be realized. These skills should also be possessed by Indonesian students in other countries, including those at the Indonesian School of Davao (SID)-Philippines. Therefore, it is necessary to carry out dissemination regarding learning that can foster a research culture, through activities carried out together with teachers at SID. This step is a form of educational reform that can help teachers prepare their students to compete at the global level. A research culture can be realized through the application of the Differentiate Indirect Learning (Dif-In-Le) learning model with a Science, Technology, Engineering and Mathematics (STEM) approach. The agreed activity plan is training. However, because there was a restructuring of school principals, the activity was changed to a brainstorming with the Indonesian Consulate General in Davao attended by Filipino SID teachers. The aim of this service activity is to identify the needs of SID teachers regarding innovative learning. An innovative learning model was introduced that can foster a research culture for students and schools, namely Dif-In-Le STEM approach. As a result of identifying needs, it was found that an introduction to Indonesian culture was needed for Indonesian children living in Davao, Philippines.

Keywords: research culture, differentiate indirect learning, STEM

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INTRODUCTION

The demands of the 21st century, the education revolution 4.0 and society 5.0 are to form students to have critical thinking, creativity and innovation, collaboration and communication skills (Supena, et al., 2021; Sullivan, et al. 2021). These skills can be formed through learning activities that facilitate research activities. Independent Curriculum learning activities do not only use a scientific approach, but need to involve STEM and differentiate according to students' needs. Adapting the curriculum to the demands of this world will certainly influence the format of learning tools, learning models and learning approaches, so that teachers must have skills in preparing learning tools that are able to adapt to the research skills needs of students.

Technological developments in the era of industrial revolution 4.0 and society 5.0 have had a major impact on the world of education (Yamada, 2021). One learning model that can develop research skills according to students' needs is Differentiate Indirect Learning with a STEM approach (Rusilowati & Juhadi, 2023). This model is an integration between Differentiate Indirect Learning, Indirect Learning and STEM approaches. Differentiate Learning is a learning approach that aims to close possible gaps between high and low achieving students, thereby reducing school failure (Tobin & Tippett, 2014). For this reason, it is necessary to provide an educational context, which respects and welcomes every difference (Bostina-Bratu & Negoescu, 2016). However, the different needs of students are often ignored when teaching in the classroom (Tomlinson, et al. 2003). However, one teaching approach for all is not effective (Koeze, 2007). Differentiated learning is a combination of various effective educational theories and practices, realizing many strategies (Watts-Taffe, et al., 2012), and facilitating the various needs and differences in characteristics of each student (Heacox, 2002).

Indirect Learning is a learning strategy that

conditions students to be active when learning takes place. Teachers as models and facilitators for students. The STEM approach emerged as a result of 21st century developments and the industrial revolution 4.0. This approach has attracted much attention in recent years (El Nagdi, et al., 2028; Li, et al., 2020; Jin, 2021). This is in accordance with research results (Zhan, 2021) which show that the trend of STEM research has increased internationally in recent years. STEM is closely related to science subjects (Garzon Artaco, et al., 2020; Khodijah, 2018). The integration of STEM into science subjects is intended so that students are ready to face the reality of challenges in the future Khodijah, 2018). Implementation of science learning with the DIL model with a STEM approach requires teachers to have competence in (1) creating learning tools that integrate STEM elements into science subjects, (2) mastering science material (subject matter) that is in accordance with current developments [(Atabey & Topcu, 2021), (3) facilitating students with research activities in learning (Rusilowati, et al., 2023). It is believed that the combination of Indirect Learning, Differentiated Learning and STEM can create a research culture in schools. The research carried out by students is in accordance with their wishes, of course with the direction of the teacher as facilitator.

Information from the Deputy Principal of SID, teachers still need additional information regarding the application of innovative learning models, which can foster research skills for students. Teachers at SID must be able to teach several subjects.

Based on the situation analysis, the problems experienced by partners are: (1) teachers still need to be given insight into learning models and approaches to fostering a research culture for students, (2) teachers need to gain additional insight regarding current education in Indonesia, and (3) lack of teachers' experience in implementing innovative science learning using a STEM approach, (4) teachers need information to foster a sense of patriotism for Indonesian children living in Davao.

The aim of this service to society activity is to hold a brainstorming with Indonesian Education policy makers in the Philippines, introduce the innovative Differentiate Indirect Learning learning model with a STEM approach, and identify training needs by SID teachers for subsequent ongoing activities.

METHODS

Service activities are carried out using brainstorming and presentation methods. Participants in the activity were the head and staff of the Indonesian Consulate General of Education in the Philippines along with SID teachers. Activities are divided into three stages, namely; preparation, implementation and evaluation. Activities are carried out with the participation of partners, and carried out in participatory collaboration by the implementing team and partners, both in the preparation, implementation, and evaluation stages.

Preparatory stage

a) Preparatory activities are carried out through the following stages:
b) Coordination of the UNNES community service lecturer team with partners, Immaculate Conception University (UIC) and SID management
c) Coordinate with SID regarding training implementation. It was agreed that the training would be held offline at SID.
d) Developing STEM-based science learning innovation training materials for science teachers at SID.

Implementation stage

Implementation activities are carried out through the following stages:

a) STEM-based science learning innovation training for science teachers at SID. Activities are carried out by brainstorming and presentations. Active participation of participants, Consul General staff and SID teachers in the form of questions and answers and discussions.
b) Document needs identification activities, as a basis for sustainable activities.

Evaluation Stage

Evaluation of the sustainability of activities, carried out by partners from UIC.

RESULTS AND DISCUSSION

The results of the activities are presented in accordance with the activity design, including coordination with SID, team coordination, implementation of training, evaluation and monitoring.

1. Coordination with SID

Coordination with the Indonesian School of Davao (SID) was carried out through a coordinator appointed by the SID principal (at that time), namely Mr. Dede. The FMIPA UNNES collaboration service team with UIC Philippines then prepared material and activity designs to train Difinle model science learning innovations using a STEM approach for teachers at SID.

2. Implementation of Training at SID

The team from the Faculty of Mathematics and Natural Sciences (FMIPA), Semarang State University (UNNES) was well received by partners from UIC, Asst. Prof. Rene M. Babiera II (International Linkages and Affairs Officer, UIC, Davao City Philippines)-Figure 1. IA signing carried out on the UIC campus (Figure 2). Next, together with partners, we visited the Indonesian Consulate General (Consulate General) for the Philippines (Figure 3). The Consul General well received the delegation, Mr. Agus Trenggono and his staff. At the Consul General the team discussed the implementation of education at SID. The activity ended with an exchange of souvenirs (Figure 4).

Figure 1. Service Team from FMIPA UNNES received by Partners from UIC Philippines

Figure 2. Signing of IA between FMIPA UNNES and UIC Philippines

Figure 3. Visit to the Indonesian Consulate General in Davao City, Philippines

Figure 4. Exchange of Souvenirs from FMIPA UNNES-Consul General of the Republic of Indonesia at Philippines

From the consul general's office the team was taken to SID, the visit to SID was on June 25 2024. The principal of SID had just been replaced, and the acting KS was entrusted to Prof. Aisyah Endah Palupi. At the time of the team's visit to Davao, Acting KS SID was on duty in Manila. Based on the results of the discussion, information was obtained that the training that was still needed by

SID teachers was how to introduce Indonesian culture, to foster a sense of love for the country. Apart from that, a learning model is presented that can foster students' research culture using the Dif-In-Le model with a STEM approach. The team was then invited to visit SID, and was well received by Mr. Dede (Figure 5). The activity ended with a group photo with the SID teachers (Figure 6).

Figure 6. Team received by Mr. Dede at SID Philippines

Figure 7. Photo with Philippines SID Teachers

The aim of this service activity is so that teachers at SID have the knowledge and skills to innovate in Dif-In-Le science learning using a STEM approach and can train students in research. One form of educational reform that can help teachers overcome problems in the 21st century is using a STEM approach. This approach guides students' thinking patterns like scientists. Through STEM-based science learning, students are guided to become problem solvers, inventors, innovators, independent, logical thinkers, technologically literate, and able to connect STEM education with the world of work. It is important for teachers to implement STEM-based science learning today.

STEM approach learning encourages students to have research skills. Students can manipulate variables to obtain optimal engineering design results. The STEM approach combines two or more STEM components or between one STEM component and other scientific disciplines (Becker & Park, 2011). Collaboration in STEM learning will help students collect, analyze and solve problems that occur and be able to understand the relationship between one problem and other problems (Asghar, et al., 2012). Learning using a STEM approach directly provides training for students to be able to integrate every aspect at once (Stohlmann, 2021), carrying out authentic practice so that it can increase students' interest in learning (Beers, 2011). Learning with a STEM approach can train students to apply the knowledge learned at school to phenomena that occur in the real world. STEM has been used by many countries and is intended to improve multidimensional competencies (Kelley & Knowles, 2016). STEM can be combined with other contexts, such as social, cultural, and functional (Roberts, 2012; Eroglu & Bektas, 2016).

Activities were not in accordance with the initial plan, carried out not with training but with brainstorming, discussions and presentations. The activity was opened by the Consul General, welcoming remarks from the SID, followed by a presentation of material by representatives of the service team. Active involvement of participants in the form of discussions and questions and answers.

The existence of Indonesian children living in Davao has been going on for generations. In today's generation, many do not know Indonesian culture. This condition is of concern to the Consulate General of Indonesian Education in the Philippines. The longer they stay in Davao, the more these children need to be familiar with the culture of their own country. Indonesia has thousands of islands, and of course has various cultures that need to be preserved. Indonesian children in Davao need to be introduced to local Indonesian culture, at least the culture on the island closest to Davao, the Philippines.

As the nation's successor, we should not forget Indonesian culture. One way of preserving culture is by introducing it to children at the earliest possible age so that in the future these children can also preserve it (Azzahra, 2021). There are various ways to introduce Indonesian culture to children in

Davao, for example inviting children to get to know the national anthem Indonesia Raya, mandatory songs, regional songs, dances, traditional houses, customs, or others.

Parents play an important role in increasing children's knowledge in introducing them to culture in Indonesia. This will become a legacy for children, so that they become successors in a large family and are passed down to the next generation who will continue the legacy (Hutagalung & Ramadan, 2022). Therefore, community service can also be carried out in the area where the Indonesian community lives in Davao. So that parents can introduce Indonesian culture to the next generation.

3. Evaluation and Monitoring

Evaluation of the sustainability of activities, carried out by partners from UIC. Based on UIC's coordination with SID, it was concluded that the activities carried out by the PPM FMIPA UNNES team were able to inspire teachers to innovate in implementing learning, one of which was the Dif-In-Le model with a STEM approach, and introducing Indonesian culture through extracurricular learning. The integration of STEM into science subjects is intended to prepare students to face the reality of future challenges (Zhan, et al. 2021). In the implementation of STEM-based science learning, teachers are required to have 21st century competencies, namely (1) integrating STEM elements into science subjects, and (2) mastery of science material (subject matter) that is in accordance with current developments (Garzon, 2020, Sugianto, et al., 2023).

CONCLUSION

The results of service activities at SID Philippines can be concluded that Indonesian teachers teaching in Davao Philippines still need training related to innovative learning to be able to activate students and take a STEM approach. In accordance with the demands of 21st century skills, teachers need to equip students to be skilled in critical thinking and problem solving, creative thinking, working together with others, and communicating well. Another conclusion is the need for teachers regarding how to teach Indonesian culture to children who live in Davao, so that they get to know their homeland. Many children in Davao do not speak Indonesian, do not know Indonesian culture. Therefore, SID is responsible for introducing it, and hopes that there will be similar activities that suit SID's needs, and in Indonesian community settlements in Davao.

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REFERENCE

Asghar, A., Ellington, R., Rice, E., Johnson, F., & Prime, G. M. (2012). Supporting STEM Education in Secondary Science Contexts. *Interdisciplinary Journal of Problem-Based Learning*. 6 (2), 85-125.

Atabey, N. & Topcu, M. S. (2021). The Relationship between Turkish Middle School Students' 21st Century Skills and STEM Career Interest: Gender Effect. *Journal of Education in Science Environment and Health*, *7*(2), 86-103.

Azzahra, A. S. (2021). Mengenalkan Macam-macam Budaya Indonesia kepada Anak Usia Dini. Kompasiana.com. https://www.kompasiana.com/affrizasefia/61c08b497a6d885ecf0de022/

Becker K, & Park K. Effects of integrative approaches among science, technology, engineering, and mathematics (STEM) subjects on students' learning: A preliminary meta-analysis. *Journal of STEM Education*. 12 (5), 23-37 (2011).

Beers, S. Z. (2011). *What are the skills students will need in the 21 st century?* pp. 1–6.

Bostina-Bratu, S. & Negoescu, A. (2016). Differentiated Instruction in Mixed-Ability Groups: The Jigsaw Strategy. Proceedings of the 21st International Conference of the Knowledge-Based Organization, 22, 407-412.

El Nagdi, M., Leammukda, F., & Roehrig, G. (2018). Developing identities of STEM teachers at emerging STEM schools. *International journal of STEM education*, *5*(1), 1-13.

Eroglu, S., & Bektas, O. (2016). Ideas of Science Teachers Took STEM Education about STEM Based Activities. *Journal of Qualitative Research in Education* 4 (3), 43-67.

Garzon Artacho, E., Martínez, T, S., Ortega Martin, J. L., Marin Marin, J. A. & Gomez Garcia, G. (2020). Teacher training in lifelong learning—The importance of digital competence in the encouragement of teaching innovation. *Sustainability*, *12*(7), 2852.

Heacox, D. (2002). Differentiating Instruction in the Regular Classroom. Minneapolis: Free Spirit Publishing.

Hutagalung, R., & Ramadan, Z. H. (2022). Peran Orang Tua dalam Menanamkan Nilai Multikultural di Lingkungan Keluarga Siswa sekolah Dasar. Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini, 6(5), 4967–4991. https://doi.org/10.31004/obsesi.v6i5.2895

Jin, Q. (2021). Supporting Indigenous Students in Science and STEM Education: A Systematic Review. *Education Sciences*, *11*(9), 555.

Kelley, T. R. & Knowles, J. G. (2016). A conceptual framework for integrated STEM educations. *International Journal of STEM Education.* 3: 11.

Khodijah, S. (2018). Telaah Kompetensi Guru di Era Digital dalam Memenuhi Tuntutan Pendidikan Abad Ke-21. *Journal of Islamic Education Policy*, *3*(1).

Koeze, P. A. (2007). Differentiated Instruction: The Effect on Student Achievement in an Elementary School. *PhD Thesis*, Michigan, MI: Eastern Michigan University.

Li, Y., Wang, K., Xiao, Y. & Froyd, J. E. (2020). Research and trends in STEM education: A systematic review of journal publications. *International Journal of STEM Education*, *7*(1), 1-16.

Roberts A. (2012). A Justification for STEM Education. *Technology and Engineering Teacher*. 74(8), 1-5.

Rusilowati, A., Juhadi, & Widiyatmoko, A. (2023). A Differentiate Indirect Learning Model Using a STEM Approach to Improve School Research Culture. *International Conference ICMSE 8*.

Rusilowati, A. & Juhadi. Penerapan Model Pembelajaran *Differentiate Indirect Learning* Berpendekatan STEM Untuk Meningkatkan Budaya Riset Sekolah: Bentuk Peneguhan Kecemerlangan Pendidikan. Laporan Penelitian Terapan Kepakaran. Semarang: LPPM UNNES. 2023

Stohlmann, M. (2021). *Integrated STEM education through game-based learning*. 12(1), 2238–2242.

Sugianto, Rusilowati, A., Widiyatmoko, A., Puspitasari, D., Arifa, N. M., & Rozikin. (2023). Inovasi Pembelajaran Sains Berbasis STEM bagi Guru SD, SMP dan SMA Sekolah Indonesia Kuala Lumpur. *Journal of Community Empowerment*, 3(2), 116-121.

Supena,I., Darmuki, A., Hariyadi. A. (2021). The Influence of 4C (Constructive, Critical, Creativity, Collaborative) Learning Model on Students' Learning Outcomes. *International Journal of Instruction*, *14*(3), 873-892.

Sullivan, K., A Bray, A., & Tangney, B. (2021). Developing twenty-first-century skills in out-of-school education: the Bridge21 Transition Year Programme. *Technology, Pedagogy and Education*, *30*(4), 525-541.

Tobin, R. & Tippett, C. D. (2014). Possibilities and Potential Barriers: Learning to Plan for Differentiated Instruction in Elementary Science. *International Journal of Science and Mathematics Education*, 12, 423-443.

Tomlinson, C. A., Brighton, C., Hertbert, H., Callahan, C. M., Moon, T. R., Brimijoin, K., et al. (2003). Differentiating Instruction in Response to Student Readiness, Interest, and Learning Profile in Academically Diverse Classrooms: A Review of Literature. *Journal for the Education of the Gifted*, 27, 119-145.

Watts-Taffe, S., B P Laster, B. P., Broach, L., Marinak, B., McDonald-Connor, C., & Walker-Dalhouse, D. (2012). Differentiated Instruction: Making Informed Teacher Decisions. *The Reading Teacher*, 66, 303-314.

Yamada, A. (2021). Japanese Higher Education: The Need for STEAM in Society 5.0, an Era of Societal and Technological Fusion. *Journal of Comparative and International Higher Education*, *13*(1), 44-65.

Zhan, X., Sun, D., Wan, Z.H., Hua, Y. & Xu, R. (2021). Investigating teacher perceptions of integrating engineering into science education in mainland China. *International Journal of Science and Mathematics Education*, *19*(7), 1397-1420.