Training Model Design Terrarium to Increase Teachers Special Education Competency

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A B S T R A K

Guru pendidikan khusus yang berlatar belakang non-sains ditemukan memiliki 85% di bawah standar dan lemah dalam menjelaskan fenomena lingkungan terkait konsep dan eksperimen ekosistem. Kondisi ini memerlukan upaya sadar untuk meningkatkan kualitas melalui pemodelan dan eksperimen langsung. Penelitian ini bertujuan untuk menganalisis peningkatan kompetensi guru dalam membuat terarium dengan menerapkan model pelatihan berbasis "Gagne's nine events of instruction". Metode yang digunakan adalah pre-post design, pengumpulan data menggunakan metode tes, dan dianalisis menggunakan uji Wilcoxon dengan SPSS 26. Penelitian ini dilakukan terhadap 21 orang guru Sekolah SLB. Hasil kompetensi pengetahuan guru berdasarkan pretest dan posttest menunjukkan thitung = 11,370 dan thitung = 3,092, t tabel (10-1) dengan alpha 0,05 two-tail = 1,833. Dengan demikian, penerapan model pelatihan berdasarkan perspektif pembelajaran Gagne meningkatkan kompetensi guru dalam pembelajaran materi terarium. Lebih lanjut, model pelatihan dapat memberikan pengetahuan dasar kejuruan khususnya desain terarium, meningkatkan penguasaan guru, dan motivasi. Implikasi dari penelitian ini dapat digunakan pada sekolah yang mempunyai keterbatasan ruang untuk disajikan di dalam kelas melalui mini lab berupa terarium dan bagi guru yang mengajar siswa tunagrahita. Temuan ini dapat menjadi referensi bagi guru pendidikan khusus untuk melakukan pembelajaran bermakna bagi siswa tunagrahita pada materi pembelajaran lainnya.

A B S T R A C T

Special education teachers with non-science backgrounds were found to have 85% below standard and weak competency in explaining environmental phenomena related to ecosystem concepts and experiments. This condition requires conscious efforts to enhance quality through modeling and direct experimentation. This study aims to analyze the improvement of teacher competencies in creating terrariums by applying a training model based on "Gagne's nine events of instruction". The method used is a pre-post design, data collection using test methods, and analyzed using the Wilcoxon test with SPSS 26. This research was conducted on 21 teachers from SLB School. The competency results of teacher knowledge based on the pretest and posttest show t count = 11.370 and t count = 3.092, t table (10-1) with alpha 0.05 two-tail = 1.833. Thus, the application of the training model based on Gagne's learning perspective improves teacher competencies in teaching terrarium materials. Furthermore, the training model can provide basic vocational knowledge, especially in terrarium design, improve teacher mastery, and motivation. The implications of this research can be used in schools with limited space to be presented in the classroom through mini-labs in the form of terrariums and for teachers teaching students with intellectual disabilities. These findings can serve as a reference for teachers in special education to conduct meaningful learning for students with intellectual disabilities in other learning materials.

1. INTRODUCTION

The government through the Republic of Indonesia's Cultural Development Coordinating Regulation Number 6 of 2022 concerning the National Strategy for Vocational Education and Vocational Training provides a signal that demographic bonuses must be interpreted as increasing the quality and competence of human resources. At the global level, 2030 is Sustainable Development Goals (SDGs)

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deadline (García et al., 2020; Wamsler & Restoy, 2020). Indonesia involved in the process of drafting, adopting laws and regulations a member country of the United Nations. Which is, one of Presidential Regulation Number 59 of 2017 concerning Implementation of Achieving Sustainable Development Goals (Ardwiyanti et al., 2021; Safitri et al., 2022), implementation, periodic reporting (by reviews of national voluntary). Thus, the targets for achieving the NationalVocational Education and Training Strategy, here in after abbreviated as Nastra Vocational Training, for this firstperiod will be determined within the maximum time frame of 2030 by adjusting to 17 goals with 169 SDGs achievements. Targets and policies apply to all levels of society in cities and districts in Indonesia, including teacher's students with special needs. These changes will create challenges as well as opportunities for increasing teacher competency. According to the finding in school teacher's students with special need with non-science background was to be 85% ability to mastering concepts and experiment related ecosystem materials tends to be low.

According observation result show that low teacher competence has an impact on ecosystem material taught as storytelling. Another finding is that two of special schools Harmoni Sidoarjo and Mandiri Surabaya have narrow land so they teach ecosystems without directly concrete observation of nature phenomena and direct experiment to students with intellectual disabilities (ID) Analysis from the previous study how to teach science to students with ID show that must implemented focus on student's comprehension development through inquiry and discovery learning (Apanasionok et al., 2019), modify the learning objectives, provide individual programs, emphasize functional academic, and apply the drill method to several skill materials. It also refer to national curriculum science in Indonesia that to improve student's comprehension of the human body, the natural world, and basic concepts of physical and material world around them. Science education also provides important foundation life skills for the continuation of his life, to become a vehicle for student to learn themselves and environment (Hermanto & Pamungkas, 2023; Rubini et al., 2017).

This requires a strategy to improve student achievement through teaching build on expand prior knowledge and experience of student. Engaging student with ID in science are provides a teacher explicit guidance to inquiry as scaffold student learning, need concrete materials and connection of concepts to gain deeper understanding of knowledge (Darling-Hammond et al., 2020; So et al., 2022). The concrete materials for this study to improve teacher competence through enhance skill to teach ecosystem for student with ID is terrarium. Terrarium is a container containing several plants, imitate global warming as an alternative to describe an abstract materials as live models of real ecosystem, however it may not represent all characteristics systemic of ecosystem is simple device to teach student with ID by observing plant growth and the various cycles and understand of our natural evolves (Eilam, 2012; Naezak et al., 2021).

Teacher's student with ID used terrarium to teach life cycle of plant, care of the earth, and systems interacting. There are various studies used terrarium as media or device to teach student with ID in ecosystem. Among them, this study focused on design terrarium which to teach life cycle of plant and systems interacting living and non-living things for teacher's student with ID by training model. In fact, training models base on the lens of Gagne's nine events of instruction are more likely to retain learning and remain engaged with very narrow research focus of those with implemented for disabilities (Goldberg et al., 2021; McNeill & Fitch, 2023). The first step is gaining attention in teaching very important for novice teacher focus during instruction, to wake up attention student through video clip which illustrating practical applications. The second is state objectives to motivating and tend to adopt goals that are associated with their teachers' emphases (Fortus & Touitou, 2021; Sládek et al., 2011). The third stimulating recall of prior learning to build a good learning environment is to decide how to assess what the student have learned before teach ecology (Nordlund, 2016; Puente & Kroesen, 2020). The last step enhancing retention and transfer gain from implementing design base learning including challenging task, practicing, doing exercises, and receiving feedback.

Similar research is coaching model through eight stages for science teacher to improve scientific literacy determining for teaching the science practices (Rubini et al., 2017). Pedagogic competence of teacher important to develop developing social independence and productive work skills students with ID through life skills training program model (Khoeriah et al., 2021; Knight et al., 2020). In fact, level of use environment as media for practices of teaching science for students with ID in school is a important topic of special education field, but a narrow as research finding. History shows that usually, implementation teacher teaching students with ID undertake have on influence of knowledge. The problem posed by today's vocational in school and curriculum do not require individual skills that are the subject of ecosystem. In addition teacher of students with ID exposed knowledge and practice used terrarium to teach ecosystem in a completely for attractive of students and school people. It is necessary to offer them a possibility of application in the fields of scientific and vocational interests. Teachers assessment for learning strategies through students center as their own learning and as learning resources for one another (de Vries et al., 2022; Keefe, 2020). In addition, teacher competence most closely related to students are requiredto have

good competence in carrying out learning activities have already to integrative on curricular innovation (Blömeke et al., 2022; Oudeweetering & Voogt, 2018). As a trainer, that teachers' cognitive skills described as two dimensional. Therefore, it is important to conduct a study which focusses on finding the effect of particular training model in improving the teachers' competency.

Previous research has extensively discussed the impact of training on teacher competence. Research by previous study suggests that training for teachers in public schools correlates positively with teacher competence (Muksin et al., 2023). Furthermore, research by other study also explore the effects of training on improving teacher competence in special schools, although they do not utilize the Gagne Model and do not delve into competencies in science subjects (Baran et al., 2011). Thus, it can be concluded that there is still no specific research addressing training for special education teachers in science subjects. Yet, this research is important to conduct as it can provide new references for special education teachers in their efforts to enhance their competence in teaching science subjects. Furthermore, as previously explained, teacher competence is crucial for improving student learning outcomes. Therefore, this study aims to analyze training for enhancing teacher competence through Gagne's nine stages of instruction model and determine the impact of training on improving teacher competence.

2. METHOD

The research design is pre-experimental research design through quantitative approach. The quantitative research is educational categorize which the researcher determine what to learn, seeks definite, slight question, gather of quantitative data, used analysis of statistic, also organize the question, aim variety (Creswell, J. W., John W. Cresswell, & Creswell, 2018). The research design is one group pretest-posttest through test method and without control variable the study to seek the result of the treatment by pretest-posttest method. The research method was chosen because it aligns with the objective of the study, which is to describe and determine the impact of training on teacher competence in specific locations only. This research involved twenty one teachers from subjects of this research were 21 teachers of students with ID in two special schools in the city of Surabaya and Sidoarjo, namely: SLB (special school) Putra Mandiri, and SLB (special school) Harmoni Sidoarjo. This research followed some stages as illustrated in the figure 2.1. The research began with pre-test of 21 teachers. Pre-test consisted of fifteen questions includes meaning and concept environment , component of environment, concept and kind of ecosystem, meaning and how to prepare design terrarium, kinds of terrarium, and how to deliver skill to students with ID. The second step was treatment to teachers by training model through modification the lens of nine event of Gagne's instruction focus on lecture (gaining attention, stating objectives, stimulating of prior knowledge, and presenting the content), practice (providing guided learning, eliciting performance), interactive (providing feedback and assessing performance), and transfer skill to students (enhancing retention and transfer) (Kocaöz & Yalçın, 2022). At the end of the treatment, a post-test was carried out to find mastery of the concepts and skills in making terrariums as a vocational ability for teachers.

Data were collected through test and observation. Observation was done one several indicators: stages of making a terrarium according to the worksheet, the ability to explain the interactions of living and non-living world according to the results of the designed terrarium, the accuracy of the order of layers, time required, and a beauty as a classroom decoration. Data were gathered during the period of three months. Then, data were analyzed statistically using the Wilcoxon with Statistical Product and Service Solutions (SPSS) 26 application to infer the influence of treatment given. Data collection stages are show in Figure 1.
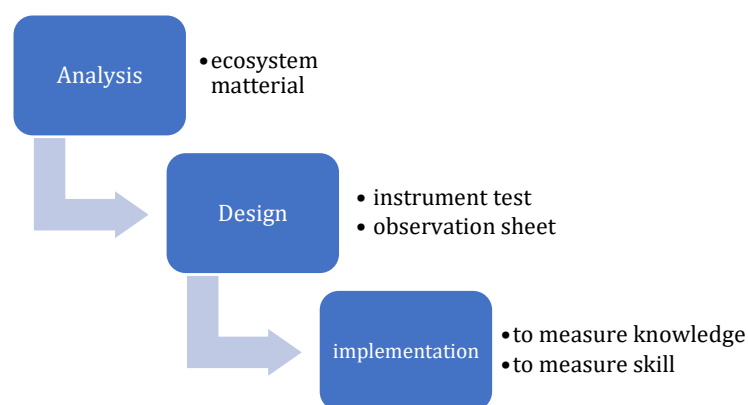

Figure 1. Data Collection Stages

3. RESULT AND DISCUSSION

Result
Implementation of Training Based-On Gagne Models

The results of treatment through training models base on modification the lens of nine event of Gagne's instruction focus on lecture, practice, interactive, and transfer skill to students. The result of the first instruction focus is lecture through gaining attention the participants of teachers by playing video marine ecosystem with link https://youtu.be/-wrUr0esoI0, to explain the objectives of instruction to the participants, stimulating by asking participants to describe the environment around the school and how to teach it to students with ID, and presenting materials 2-3 ours theoretical session to participants about environment, natural resources, and ecosystem. The results of the training model treatment for teachers of children with ID related to understanding concept by theoretical session starts with material about getting to know the environment, natural resources, ecosystems, and terrariums through lecture and interactive brainstorming. All participants were enthusiastic and understood how to know the environment, maintain and utilize the material to enrich the implementation of the learning process using concreteand innovative media. One case teacher who still had misconceptions about concepts interaction between living and non-living thing as environment.

The second step focus instruction is practice and interactive, the result is the teacher have modelling from instructor to prepare tools and materials to design open terrarium use two liters bottle and glass jar and give feedback of question about thick of layer as decorative. Instructor guide to the teacher as participant how to choose plant, moss, build layer charcoal, gravel, moss, soil, and decorate terrarium used practical worksheet and assess process to terrarium product. The fourth and fifth treatments the teachers teaching students with ID a number of 20 children, begins with introducing tools and materials, cutting bottles for open terrarium vessels, inserting materials to train their fine motor skills, and finally the process of planting in used bottle vessels. Theory of knowledge conversion show that individuals can merge, comprehend information, and exchange it into knowledge. The teacher performance related to professional competence, when professional competence increase show that teacher performance increase too and on the contrary if decrease that performance decrease too. These all aspects of treatment very important to improve the understanding of ecosystem concepts and skills of participants and have positive relationship with training models to retain and transfer knowledge. Lastly, after experiment treatment to get post-test for teachers' students with ID are obtained mean score is 89.80 at Putra Mandiri special school and at Harmoni special school obtain mean score is 78.55. The result show that teacher competency is to improve after get treatment.

The Impact of Training on Special Education Teachers' Competence

Results of pre-test showed the average of 69,83 in Special School Harmoni Sidoarjo as show in Table 1 and the average of 60,60 in Special School Putra Mandiri Surabaya as show in Table 2. In details, the result of the pre-test of 11 teacher's students with ID at Special School of Harmoni, Sidoarjo show that one of the teacher gain 50, six of the teacher achieved 67, two teachers gain 75, and two teachers achieved high score 83 from 100. The participant is a teacher at Harmoni special school Sidoarjo obtained an average score of pre-test 69.82. While the result of the pretest of 10 teachers in Special School Putra Mandiri Surabaya showed that three teachers gain 50, four teachers gain 58, one teacher gain 66, one teacher gain 75, and one teacher achieve high score is 83 from 100. In case eight teachers weak to understand about environment, ecosystem, and terrarium.

Table 1. Results of Pre-Test and Post-Test in Special School Harmoni Sidoarjo

No	Initials	Pre-Test	Post-Test
1	Teacher 1	50	67
2	Teacher 2	67	58
3	Teacher 3	67	83
4	Teacher 4	75	83
5	Teacher 5	75	75
6	Teacher 6	67	83
7	Teacher 7	83	83
8	Teacher 8	83	83
9	Teacher 9	67	83
10	Teacher 10	67	83
11	Teacher 11	67	83
	Mean	**69.83**	**86.10**

Table 2. Results of Pre-Test and Post-Test in Special School Putra Mandiri Surabaya

No	Initials	Pre-Test	Post-Test
1	Teacher 1	50	83
2	Teacher 2	50	83
3	Teacher 3	50	83
4	Teacher 4	58	100
5	Teacher 5	66	100
6	Teacher 6	58	83
7	Teacher 7	75	100
8	Teacher 8	83	100
9	Teacher 9	58	83
10	Teacher 10	58	83
	Mean	**60.60**	**89.80**

Hypothesis testing is carried to prove the relationship between training models base on modification the lens of nine event of Gagne's and teacher competency. The data analysis using the Wilcoxon signed rank test a nonparametric test and service solutions (SPSS) 26 application to infer the influence of treatment given. The hypothesis to be test as a results of the analysis of the T-test data on teacher pre-posttest results at SLB Putra Mandiri Surabaya is t-value = 11.370 > t-table = 1.833 with significance level of 0.05 obtain p = 0.000 and at SLB Harmoni Sidoarjo is t-value = 3.092 > t-table = 1.833 with significance level of 0.05 obtain p = 0.011 < 0.05 at the 0.05 significance level. This means that the null hypothesis is rejected, there is significant relationship between training models with nine stages of Gagne's to increase teacher competency.

Discussion
Implementation of Training Based-On Gagne Models
This condition related that a main component of learning is attention. Attention has a huge influence on students' hurry up response (Jacob et al., 2021). Practice of science of learning and development, the teacher start with prepare students for class and introduce materials learning is active process (Darling-Hammond et al., 2020; S. Kim et al., 2019). Learning according behaviorism theory as result new behavior. Learning objectives are classified as complexity and specificity, and learn more efficiently if active and self-direct learning (Drigas et al., 2023; Peng et al., 2021). All participant involved and understand how to build terrarium according practical worksheet. Many studies have found that modelling through guiding as scaffold to be beneficial (Dominguez & Svihla, 2023); increased students' achievement and collaboration among students with different field through Project base learning (MacLeod & van der Veen, 2020); enhanced students engaged and learning outcome (H. S. Kim & Oh, 2018); have positive impact on improve life skills of students with ID (Widajati & Mahmudah, 2022). It shows that modelling and guiding on instruction process of teacher in important for positive impact to increased understanding concepts and involving activities. The teachers' knowledge of teaching materials as a learner and agent is importance as a prerequisite that helps to get successfully with specific professional requirements (Biora et al., 2021; Karlen et al., 2023). Other studies found that teachers' knowledge and instructional quality related to teachers' professional competency (Yang & Kaiser, 2022); institutions' professional policy too impact the success professional development (Adams et al., 2023); tutoring program impact to developing competencies attitude and skills teachers (Rusu et al., 2015).

The Impact of Training on Special Education Teachers' Competence
The standard teaching of environment education is a required unsustainability as global development known for gain the success of process of environmental education. Teachers are weak in using the nature and environment for learning resources to enhanced students learning (Agbedahin, 2019; Wanchana et al., 2020). The environmental factors as learning resources directly influence to instruction processes and training transfer. While, the results of post-test showed the average of 86, 10 in Special School Harmoni Sidoarjo and the average of 89,80 in Special School Putra Mandiri Surabaya. Accordingly, teachers' attitude to pedagogical innovation to have modified by program to deliver the knowledge that principal increase students performance (Caballero & Llorent, 2022). Based on result of described of participant that a variety content design and pedagogical approaches to increase students' learning about diverse experiences of people with disabilities (Bhurtel & Bhattarai, 2023; Peiris-John et al., 2021; Reinius et al., 2022). The teacher foster the development of their professional capabilities through collaborative development and as transformative agent in changing oriented school cultures. Refer on scaffolding of Vygotsky theory that modelling of teacher to deliver skill and knowledge can be improve competency's

teachers. In addition, many research show that strategyof teacher located at Zona Proximal Development (ZPD) of support students in design learning activities and materials (Campbell-Meier & Goulding, 2021; Richardson et al., 2022). Implementation of Vygotsky theory space to explore transfer of learning that to increase participating in continuing professional development and are committed to maintaining and extending their skills and knowledge.

The implications of this research indicate that the terrarium-based training model design is effective in increasing the competency of special education teachers. The implication is the need for more training programs specifically designed to increase teachers' knowledge and skills in educating students with special needs. Research findings show that the terrarium-based approach is an innovative and effective training method in improving the competence of special education teachers. The implication is that there is a need to develop more creative and adaptive training models according to the needs and characteristics of teachers and students. In addition, this training model not only has an impact on teacher competency, but also has the potential to improve the learning experience and achievement of students with special needs. The implication is the importance of paying attention to students' individual needs and providing an inclusive and supportive learning environment. Moreover, the topic was only a small part of Science, thus it may not be applicable for other topics on Science. The further research may focus on the other topics on Science for the other type of disabilities such as deaf, visual impairment and autism. This is essential as the number of those students are also high in some special schools.

4. CONCLUSION

The research finding is a significant relationship between training model base on the lens of Gagne's nine stages of instruction and teachers' competency. Overall, teachers showed positive improvement on each stage. This is also in line with the teachers' competence in teaching the Science Subject to students with special needs. For example, teahers now are more confidence in teaching pratical skills (i.e., designing terrarium) to students with ID./ As a teacher assistance to students with intellectual disabilities through direct practice accompanied by modeling can improve skills in making open terrariums as a provision for vocational teaching to students with ID. The limitation of this study are on the number of participants and the focus of the topic. Participants were only twenty one and coming from two schools, therefore the generalization of this study might not be applicable.

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