

TEACHING SCIENCE COURSES FOR GIFTED STUDENTS IN INCLUSIVE SCHOOL

YUYUS SUHERMAN*, RINA MARYANTI, J. JUHANAINI

Departemen Pendidikan Khusus, Universitas Pendidikan Indonesia,
Jl. Dr. Setiabudhi no 299, Bandung, 40154, Indonesia

*Corresponding Author: yuyus@upi.edu

Abstract

The purpose of this study was to determine the teaching process of science subjects for gifted students in inclusive schools. The subjects of this study were 15 gifted students in an inclusive school in West Java, Indonesia. We collected data and analysed using observation, interviews, and tests to get information for qualitative and quantitative results. Comprehensive counselling was also used to support the analysis. The results showed the increases in the student learning outcomes. There are some gifted students who experience underachiever. However, when science learning methods and media were used, improvements in the students' ability can be obtained. In addition, the findings of this study are that not all special intelligent children have to be treated with high learning outcomes. This is due to the incomplete and ineffective student learning methods to improve students' ability, making the students to get less than their actual abilities.

Keywords: Education, Gifted student, Inclusive school, Science, Teaching.

1. Introduction

Science is studied in every educational level [1]. Studying and understanding every material in science is very important because this material relates to phenomena occurring in the environment and daily lives [2]. In addition, the material taught at each level of education is a prerequisite for understanding the material to be studied further. In the elementary school education curriculum in Indonesia, natural science subjects consist of three materials, namely physics, chemistry, and biology [3, 4]. There are several studies that discuss natural science subjects in elementary schools. However, until now there has been no research that discusses the analysis of the learning outcomes of special intelligent students in natural science subjects in inclusive schools.

The novelties of this research are the teaching process to gifted students. The student is one of the students with special needs. Students with special needs are students who have different characteristics from students in general, so they need special education and services [2]. Most people assume that students with special needs are students who have only physiological function disabilities. However, as the paradigm changes from a medical view to a social view, gifted students (known as special intelligent students) are students with special needs because they need special education and services. If educators provide wrong services and education or students' needs are not met, it results in the ability of students being shown to be below than their potential, or we often call them underachievers. In addition to the subject, the novelty of this research is about the place of research in inclusive schools. Inclusive school is one of the schools that is considered to be able to facilitate and serve all the needs of students in the learning process. However, not all schools can provide facilities and services according to student needs.

Therefore, the purpose of this study is to determine the learning outcomes of special intelligent students in science subjects in inclusive schools. The subjects of this study were gifted students at an inclusive school, in West Java, Indonesia. This research uses descriptive quantitative method. We used data collection techniques through observation, interviews, and tests. To determine student learning outcomes, we conducted a test with pretest and posttest activities. The results showed an increase in student post test results. In addition, a small number of special intelligent students have abilities below their potential. This is caused by educational services that are not in accordance with the needs of students. If the needs of students are not met and educational services are not in accordance with the needs of students, it will result in students' abilities being below their potential.

2. Theoretical Framework

2.1. Curriculum design for Science in Indonesia

The curriculum is a collection of plans, objectives, learning materials, and even teaching methods that are used as guidelines by teachers to achieve the ultimate goal of learning. There are many reports discussing curriculum development [5-14]. There are several functions of the curriculum, namely: (1) The function of adjustment is the curriculum has the nature of being able to adapt to changes that occur in an environment that tends to be dynamic. (2) integration function Curriculum is able to become an educational tool that can form complete and integrity individuals in society. (3) Differentiation Function the curriculum is an

educational tool that pays attention to service to each student where they have their respective differences that deserve to be appreciated. (4) The function of preparation is as an educational tool; the curriculum serves to help prepare students to be able to go to the next level of education and be ready to live in society if these students do not continue their education. (5) Selection Function The curriculum facilitates students by giving them the opportunity to choose learning programs that match their interests and talents. (6) Diagnostic Function The curriculum functions to understand and direct the potential of a student so that he can continue to explore his potential and improve his weaknesses.

For students, the curriculum serves to help them understand the material and carry out the learning process easily, so that learning targets can be achieved [2]. In addition, students are also expected to get new experiences that can be a provision in their lives later. In the curriculum for gifted children, the function of a differentiated curriculum is very important. This is to serve the diversity that occurs and unique characteristics.

In the Indonesian curriculum, science in elementary schools consists of several combinations of physics, chemistry, and biology. Table 1 describes the natural science materials contained in the fifth-grade elementary school curriculum. The curriculum is divided into 2 basic competencies covering aspects of knowledge and skills. Table 2 describes the materials studied in class V in natural science subjects in Indonesia.

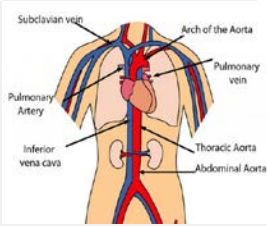
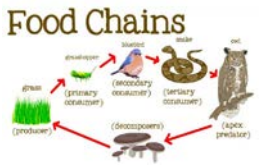

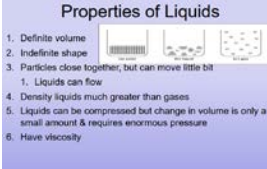
Table 1. Competency in Indonesian Curriculum regarding science subject [15]

Core competencies (Knowledge) Section 3 in Indonesian Curriculum	Core competencies (Skills) Section 4 in Indonesian Curriculum
3. Understanding knowledge factual and conceptual with how to observe, ask and try based on taste want about him, creature God's creation and activities, and objects which he found at home, in schools and playgrounds.	4. Presenting factual knowledge and the child is healthy, and in action reflecting the child's Behavior faithful and noble.
3.1 Describing the means of locomotion and function in animals and humans and how to maintain health human locomotion.	4.1 Creating a simple model of the tool motion of humans or animals.
3.2 Describing the respiratory organs and function in animals and humans and how to maintain health human respiratory organs.	4.2 Creating a simple model of the organ human breathing.
3.3 Describing the digestive organs and function in animals and humans and how to maintain health human digestive organs.	4.3 Presenting works on concepts digestive organs and functions animal or human.
3.4 Describing the organs of blood circulation and its function in animals and humans and how to maintain circulatory health human.	4.4 Presenting works on organs blood circulation in humans.
3.5 Analysing the relationship between ecosystem components and food webs in the environment around.	4.5 Creating works on concepts food web in an ecosystem.

Core competencies (Knowledge) Section 3 in Indonesian Curriculum	Core competencies (Skills) Section 4 in Indonesian Curriculum
3.6 Applying the concept of displacement heat in everyday life.	4.6 Reporting observations about heat transfer.
3.7 Analysing the effect of heat to changes in temperature and existence of things in life daily.	4.7 Reporting experimental results the effect of heat on objects.
3.8 Analysing the water cycle and impact on events on earth and survival of living things.	4.8 Creating works on schematics water cycle based on information from various sources.
3.9 Grouping material in daily life based on constituent components (substances) single and mixed).	4.9 Reporting observations properties of mixtures and components constituent in life daily.

Table 2. Subjects delivered to students.

No.	Topics	Illustration	Reason
1	Human movement tools [16]		<ul style="list-style-type: none"> i. As a basic knowledge of the concept of the body's own organs organ ii. As a provision of knowledge to adapt to the surrounding environment iii. As a requirement to understand the next material at a higher level of education
2	Human respiratory organs [17]		<ul style="list-style-type: none"> i. As a basic knowledge of the concept of the body's own organs organ ii. As a provision of knowledge to adapt to the surrounding environment iii. As knowledge in order to maintain health related to respiratory organs - As a requirement to understand the next material at a higher level of education
3	Human digestive organs [18]		<ul style="list-style-type: none"> i. As a basic knowledge of the concept of the body's own organs organ - As a provision of knowledge to adapt to the surrounding environment ii. As knowledge in order to maintain health related to the digestive organs

No.	Topics	Illustration	Reason
			iii. As a requirement to understand the next material at a higher level of education
4	Human circulatory organs [19]		i. As a basic knowledge of the concept of blood circulation itself ii. As a provision of knowledge to adapt to the surrounding environment iii. As knowledge in order to maintain health related to respiratory organs iv. As a requirement to understand the next material at a higher level of education
5	Food chains in the ecosystem [20]		i. As a basis for knowledge of the surrounding environment ii. As a provision of knowledge to adapt to the surrounding environment iii. As knowledge in order to protect the environmental ecosystem iv. As a requirement to understand the next material at a higher level of education
6	Heat transfer [21]		i. Useful for everyday life ii. As a requirement to understand the next material at a higher level of education
7	Liquid properties [22]		i. Useful for everyday life ii. As a requirement to understand the next material at a higher level of education

2.2. Gifted students

Historically, giftedness was defined as having a high intelligence (IQ). Gifted children naturally have distinctive and different characteristics from normal children. In giftedness someone in Indonesia is ha! which is relatively new, only a few people understand so that often parents and teachers treat gifted children the same as other children, as a result, many children's talents "evaporate" just like that. The characteristics of gifted children include several important domains, such as the intellectual-cognitive domain, the emotional perception domain, the motivational domain and life values, the activity domain, and the social relations domain. However, it should be noted that not all gifted children always show or have all of these characteristics [2].

Gifted children are those who are identified by professional people, as children who have outstanding abilities, or are high achievers. These abilities, both potential and actual, include general intellectual abilities, special academics, creative and productive thinking, abilities in one field of art, and psychomotor. The problem of educating gifted children is how to identify them. Identification starts from the concept and definition of gifted children. Furthermore, the identification procedure takes place in two stages, namely screening and screening. Gifted children adopt "to be like everyone else" and deliberately hide their abilities. They tend to be more sensitive to the issue of social comparison. They are not only looking for friends, but friends who can share ideas, feelings, worries, secrets, as well as success. Gifted children advance in some domains but tend to put others down. An important goal of educating gifted children is to meet specific educational needs in an "inclusive" setting. The main reason for this goal is the same as in the context of special education for children with disabilities. Regular schools with an inclusive orientation are an effective tool to combat discrimination, and create an "open" society, building an inclusive society [23].

2.3. Inclusive school

Inclusion means the acceptance of all children without exception in the curriculum, environment, social interactions and school concepts. Inclusion provides a broader intellectual and practical foundation for practice in schools and elsewhere with special needs in a regular school environment, creating adequate service support to ensure special and general education services [23]. Inclusion is a comprehensive approach to educating children in all their uniqueness while advocating a comprehensive, systematic and coordinated service network. Inclusion provides a valuable experience for children to face society, where they ultimately live. In addition, it is important for teachers to provide opportunities for regular class children to learn about the uniqueness of children and learn to build relationships with them. Most importantly, all children must have a place and be accepted in the regular class.

Historically, the struggle to realize inclusion was driven by the fact that education for all (EFA) was not really targeted at all. Even though everyone has the right to education which is guaranteed by the Universal Declaration of Human Rights. Children with disabilities are a group that has been deprived of their fundamental rights.

Pedagogical principles are applied to each child allowing practitioners in the early years to make an assessment of the child's needs. The content of the curriculum and the way teachers are trained and selected are important factors in the development of the educational process. But education is not a technical issue, not an expert issue, but a human process in which teachers are the core agent, and they have a lot to say and do. If it goes back to the law, those who are entitled to special education are all citizens who have the potential for intelligence and or special talents, without exception. Therefore, it is understandable if the question arises, have special education services designed to touch all gifted citizens, from children, adolescents to adults [2].

Inclusive schools are one of the schools that are required to provide education for all children. This means that every child must receive educational services according to their needs. Every school member is implanted with the concept of inclusive education, where discrimination must be eliminated, and everyone respects differences.

3. Method

This study focused on teaching natural science grade V in elementary schools to gifted students. The participants were 15 students with special needs (gifted students) from inclusive schools in West Java, Indonesia. Students' information about several aspects of ability in various subjects was obtained from observations and interviews with teachers. This data is then used to develop research instruments. In addition, student capacity analysis was carried out by analysing all the information obtained and identified using a score scale of 0 (cannot do anything), 1 (less), 2 (good enough), 3 (good), and 4 (very good). Table 3 shows the pretest post test instruments used in science subjects regarding biology, chemistry and physics.

In this study, the students' ability level was evaluated by giving 10 questions. Each question has a score of 15 so that students get a maximum score of 100 if students answer all questions correctly. Equation (1) for calculating the score is:

$$\text{Total Score} = \frac{\text{number of questions answered correctly}}{15} \times 100 \quad (1)$$

Table 3. The pretest post test instruments.

No	Theory	Pretest	Posttest
1	The concept of knowledge of human locomotion		
2	Skills in practicing the concept of human locomotion		
3	The concept of knowledge of the respiratory organs		
4	Skills to do practice about breathing		
5	Digestive organ knowledge concept		
6	Digestive organ knowledge concept		
7	Circulatory knowledge concept		
8	Skills to do practical about blood circulation		
9	Ecosystem knowledge concept		
10	Miniature making skills		
11	Concept of heat transfer knowledge		
12	Skills to do practical work on heat transfer		
13	The concept of knowledge of the effect of heat on other objects		
14	The concept of knowledge of the properties of liquids		
15	Skills to do practicum about the properties of water		

There are several procedures for teaching activities in this study, namely: The first stage of preparation, at this stage the activities of preparing a lesson plan that are tailored to the needs of students The formulation of comprehensive counselling activities is carried out at this stage. Next is the implementation stage, at the beginning of this stage we conducted a pretest for 30 minutes, we taught natural science subjects and comprehensive counselling activities for some time, and at the end of the teaching we carried out evaluation activities with posttest activities. In addition, information on students' understanding of the teaching process along with pretest and posttest, observations, and interviews was collected.

4. Result and Discussion

4.1. Student demographics

Academic achievement is a child's learning outcomes that reflect the motivation to learn, as well as their responsibility towards the task. Especially for gifted students. Gifted students are students who have intelligence above average [24]. Learning outcomes are a global index to identify the progress of children who show high performance compared to peers [25].

Table 4 shows the academic achievements of class V elementary school, which were nominated by gifted children, namely: ANRH, MZB, RAY, and RA. All students have scores above the average (80.4). But judging from the subjects varied. ANRH (score = 90.8) is excellent in Islamic religion, civics, English, Mathematics, Social Studies, and Sundanese languages. The score is above the highest average score (90.8). MZB (score = 90.0) excels in Islamic religion, Civics, English, Mathematics, Science, Social Studies, and English. The score is above the average of the highest score (90.8). RAY (score = 88.6) excels in Indonesian language, Mathematics, Social Studies, English, and IT computer. The score is above the average of the highest score (90.8). The interesting point is that RA (score = 87.3) excels in Mathematics, Social Studies, sport, Islamic religion, IT computer, and Arabic language. The score is above the highest average score (90.8), but the Science and Sundanese language lessons are below the average score (80.4).

MRNF (score = 93.8), MHS (score = 90.3) WRW (score = 90.2), YPZM (score = 90.8), MTFM (score = 87.1), and MP (score = 85.5). Their performance is above average. But judging from the subjects varied. MRNF excels in Civics, Indonesian, Mathematics, Social Studies, and English. The score is above the average of the highest scores. MHS excels in language lessons. Arabic scores above the highest average score. WRW excels in Islamic religion and stands out in Civics, Social Studies and Arabic with scores above the highest average. YPZM excels in Indonesian lessons and stands out in social studies and English with scores above the highest average. MTFM excels in SBK, scores above the highest average, stands out in other subjects (cores above average). An interesting point was shown by MP, excelling in Indonesian language lessons. The score is above average, the highest score, and stands out in other subjects with the fact that the score is above average. But the mathematics score is below average.

AGM (91.1), FZZ (90.3), MAGD (89.7), DAPA (85.3) and MZ (84.9). Their achievements are above average but judging by the variety of subjects. AGM excels in Civics, Indonesian, Natural Science, Social Studies, Sundanese, and English. The score is above the average of the highest scores. FZZ excels at Sports, and IT computer. The score is above the average of the highest scores. MAGD excels in Mathematics, SBK, and Arabic. The score is above the highest average value. DAPA, excels in Civics, Indonesian and art and culture, the score is above the highest average score, but the Sundanese language scores below the average, even science scores below the lowest average score.

Table 4. Student demographics.

No.	Students	Subject											
		Islamic	Civic	Indonesian	Math	Social	Sundanese	English	Art and Culture	Sport	IT	Arabian	Science
1	ANRH	90.8	90.8	90.8	90.8	90.8	90.8	90.8	80.4	80.4	80.4	80.4	80.4
2	MZB	90	90	90	90	90	80.4	90	80.4	80.4	80.4	80.4	90
3	RAY	80.4	80.4	88.6	88.6	88.6	80.4	88.6	80.4	80.4	88.6	80.4	80.4
4	RA	87.3	80.4	80.4	87.3	87.3	80	80.4	80.4	87.3	87.3	87.3	80
5	MRNF	80.5	93.8	93.8	93.8	93.8	80.5	93.8	80.5	80.5	80.5	80.5	80.5
6	MHS	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	91	90.3
7	WRW	90.2	91	80.5	80.5	91	80.5	80.5	80.5	80.5	80.5	91	80.5
8	YPZM	80.5	80.5	90.8	80.5	91	80.5	91	80.5	80.5	80.5	80.5	80.5
9	MTFM	87.1	87.1	87.1	87.1	87.1	87.1	87.1	91	87.1	87.1	87.1	87.1
10	MP	91	91	85.5	80	91	91	91	91	91	91	91	91
11	AGM	91.1	92	92	91.1	92	92	92	91.1	91.1	91.1	91.1	92
12	FZZ	90.3	90.3	90.3	90.3	90.3	90.3	90.3	90.3	92	92	90.3	90.3
13	MAGD	89.7	89.7	89.7	92	89.7	89.7	89.7	92	89.7	89.7	92	89.7
14	DAPA	85.3	92	92	85.3	85.3	80	85.3	92	85.3	85.3	85.3	82
15	MZ	91.1	85.3	85.3	91.1	85.3	85.3	91.1	91.1	80.5	80.5	91.1	80.5

Table 4 emphasize that no one outperforms their peers in all aspects. Children only excel in certain aspects. The implication is that teachers must provide learning opportunities at every advantage. Gifted children do not always achieve high achievements. Giftedness does not always guarantee the success of education and productivity of gifted children. This is related to risk and pressure [24]. The pressures faced by gifted children are; (1) the feeling of having to be a perfect and intelligent human being, (2) the desire to be very creative, (3) the concern to be admired because of his appearance and popularity [16].

The determinants of gifted children whether they will achieve high or low achievement (underachievement), are home, school and peer support. In the context of grade V, children who were nominated as gifted children, had scores above the highest average score, but there were indications that they were classified as underachievement, especially RA(87.3) class V, science and language scores. Sundanese is below average (80.4). Even though they excel in PJOK and Arabic, their scores are above the highest average. The same thing is shown by MP (85.5) V, whose Mathematics score is below the average (81.0), even though it excels in Indonesian, its score is above the highest average score. The interesting thing is shown by DAPA (85.3) V, the Sundanese language score is below the average (79.7) and even IPA is below the lowest average score, even though it excels in Civics, Indonesian Language and art and culture, the score is above highest average score.

4.2. Analysis of research data

Data analysis of the results of this study shows that the results of the research on statistical test data have different interpretations. The results of implementing comprehensive counselling on natural science subjects have an influence in increasing students' knowledge levels. Although, the average posttest score for each student has decreased, but it is still within the range of the same level or categorization. This is because gifted students sometimes have abilities below their potential [26].

The fact that the results of the analysis stated that in general teaching activities were quite effective in increasing the understanding of natural sciences for gifted students in class V. The overall average score of students still experienced an increase of 0.25%. This is caused by methods and media that are in accordance with the needs of students so as to create effective educational services and according to the needs of students. Educational services that are effective and in accordance with the needs of students can increase the potential of students with special needs [27].

Table 5 shows the change in the average level of giftedness from mildly gifted to moderately gifted and some even skyrocketed to profoundly gifted level. In fact, even though the score (post) achieved by each fifth-grade elementary school gifted child has decreased compared to the initial (pre) score, the class average has also decreased. Even though the score has decreased, the quality and overall score average results have improved. This is what the average statistic doesn't read. As a result, descriptive quantitative data analysis is required. The average score achieved by all gifted children increases, so it is certain that the reading statistics are not significant. However, the results of the individual analysis, provide an interesting perspective where there are several children who have decreased scores. Changes that can be interpreted as the impact of natural science teaching activities are very clear. Although there are some students' posttest scores that have decreased, they are still in the categorization range in the same range. In addition, the overall average value of the post-test continued to increase.

Table 5. Recapitulation of the average score and changes in the level of gifted children

Subject	Initial score	Initial level	Final score	Final level	Note
ANRH	90.08	Moderately gifted	90.07	Moderately gifted	No change
MZB	90	Moderately gifted	91.02	Profoundly gifted	Increase
MAGD	89.07	Moderately gifted	89.04	Moderately gifted	No change
MTFM	87.08	Moderately gifted	87.04	Moderately gifted	No change
MP	85.04	Mildly gifted	86.07	Moderately gifted	Increase
MRNF	93.08	Profoundly gifted	92.02	Profoundly gifted	No change
FZZ	90.02	Moderately gifted	89.08	Moderately gifted	No change
MHS	90.02	Moderately gifted	92.07	Profoundly gifted	Increase
WRW	90.02	Moderately gifted	89.07	Moderately gifted	No change
DAPA	85.03	Mildly gifted	87	Moderately gifted	Increase
AGM	91.01	Moderately gifted	91.08	Profoundly gifted	Increase
RAY	88.06	Moderately gifted	86.08	Moderately gifted	No change
YVJM	90.08	Moderately gifted	91.02	Profoundly gifted	Increase
RA	87.03	Moderately gifted	86.06	Moderately gifted	No change
MZ	84.09	Mildly gifted	86.07	Moderately gifted	Increase
Average	89.07		89.32		

From this perspective, it can be interpreted that the change in the level category is an indicator of the impact (effectiveness) of teaching activities using comprehensive counselling on the learning outcomes of children with society in natural science subjects. A total of 7 students or 46.7%, student learning outcomes have increased levels (Moderately gifted). In addition, the average score of the students' posttest increased by 0.25%. This is because gifted students are students with special needs who need special education services. They need special methods and services in the teaching process [28].

Another unique finding is that there are some students who have decreased scores at the time of the posttest. It is possible that sometimes gifted students do not want to show their identity or talent so that the value of the learning outcomes obtained is not in accordance with their abilities. This is what is called an underachiever, a condition where students' abilities appear to be inconsistent with their potential [29]. In addition, these changes are a separate note. In a short time, the changes that occur are not statistically significant. This is because the aspects that affect the academic achievement are very complex. There is an optimization of the roles of teachers, counsellors, parents, communities that have an impact on individual changes for mild-level gifted children into the moderate category; even profound and maintaining at the same level does not decrease (degradation) is an indicator of the context of success for all in the academic aspect (gifted children). The participation of parents, teachers, and other educators has an impact on increasing student achievement [30, 31], especially in natural science subjects.

5. Conclusion

This study discusses the process of teaching natural science subjects to gifted students in inclusive schools. The subjects of this study were 15 gifted students in an inclusive school in West Java, Indonesia. Qualitative and quantitative methods were used in this study. We carried out data collection techniques through observation, interviews, and tests. Comprehensive counselling is used in natural science teaching activities for gifted students. Pretest and posttest were conducted to determine student learning outcomes. The results show that student learning outcomes have increased. There are some gifted students who are underachievers. However, when science learning methods and media are used in accordance with student needs, this is because each student is unique and has different abilities and needs in the learning process. Methods and media affect student learning outcomes. In addition, the findings of this study are that not all special intelligent children have high learning outcomes. This is due to the non-fulfilment of student learning needs which results in students' abilities that appear to be below their actual abilities.

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