

How to Improve Engineering Competencies for Students with Special Needs?

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Abstract. The problem of vocational education for Children with Special Needs (CSN) is not only about the service profile, spectrum relevance and competency level, but also the carrying capacity of educational facilities. In this regard, two important things are highlighted. First, the different characteristics of the design of educational facilities between regular and exceptional schools. Second, the distinctive characteristics of the design of the school facilities are extraordinary for general education (academic) and vocational education. The purpose of this study is to describe the level of suitability of the architectural design of educational facilities with the needs of vocational learning behavior for children with special needs in West Java, Indonesia. The entire research used the Education Research and Development (R & D) method of Developing the Architectural Facility Design Guide to Support the Vocational Competence of Crew Competence in accordance with the stages developed by Thiagarajan (1974) known as Four-D Model. To achieve the above objectives, then the stages of the R & D method that is done is the define, design and develop stage. Evaluation results show the infrastructure of education of Special School (SLB) Cicendo, Indonesia has met the standards set by the government, especially on aspects of land and building areas have met the standards. Most aspects of accessibility such as the basic size of space, pedestrian pathways, and doors have been met. But other aspects such as guiding lines, ram, ladders, toilets, showers, sinks, furniture and signs do not meet accessibility requirements. The conclusion is the educational infrastructure of the school in general has met the standards set by the government.

1. Introduction

Children with physical handicap and mental retardation are classified into Children with Special Needs (CSN). They go to special school called as special school. Special school aims at encouraging Children with Special Needs (CSN) to be independent so that they can continue their life. The limitations that the children have will influence their academic performance. They seem to have difficulties in adjusting to their surroundings. Thus, they need school that can support their academic activities [1].

Special education serving the needs and problems while they are studying. Students with special need are categorized into their specific conditions including (1) learner who vary in their interactions; (2) learner who vary in accessing the environment; (3) learner who vary in their learning styles and rates. Those specific conditions are re-categorized by the problems the children have. Children with behavior problem, children with visual impairment, and children with mental retardation [2]. In the



field of education, the existence of individual with special needs leads to the discussion of how they are still able to obtain education as normal individuals do. Based on the educational concept, individual with special needs refers to someone who needs special educational service and the other things that support the service so that they can develop their skills that are suitable for their potential [3].

In accordance with the educational aims for CSN, education in special school does not only deal with the aspect of knowledge but also pre-vocational and vocational programs. Vocational education can help CSN prepare themselves to face their lives; they can be more independent. The problems of vocational education for (CS) not only associate with service profile, spectrum relevance, and competency level but also educational facilities. In relation to this case, there are two things that need to be focused on. First, the difference of design characteristics between regular school and special school. Second, the difference of design characteristics of educational facilities of special school in terms of academic and vocational education.

In some developed countries, people with special needs have already been trained to have skill for their life. In America, the government provides carriers for students with special needs since they are at school age by guiding and helping the students with the carrier exploration, of course the participant of their parents are necessary here. The government also will give skill training, skill assessment, and help them get alternative jobs when they graduate. German government has prepared the regulation and provided job vacation for younger people with special needs by mapping and providing vocational education for them. Vocational education for students with special needs in Finland has changed the concept of inclusive education into vocation based education so that students with special needs can easily be accepted by the community.

Indonesia, as the developing country, has not had the same policy as the developed countries do, especially in considering and providing vocational education for people with special needs. In Indonesia, students with special needs start to receive skill training when they go to special school at the level of senior high school, reflected in the special educational curriculum.

The results of the study show there are existing guidance of the building accessibility for CSN, namely the Minister of Public Works Regulation No. 30 of 2006. However, this guideline is not comprehensive enough to regulate what is needed by CSN. This rule is not sufficiently organized to be implemented in building design. For accessibility of educational facility building, there is Permendiknas Number 33 year 2008, which also does not adequately regulate comprehensively the accessibility of education facilities and infrastructures for CSN, except for the standard of completeness. Moreover, when it comes to specialized vocational education facilities, it seems to have not been touched at all.

Research on the development of educational facility design guidelines has not been implemented by other researchers. Selection of special education as the focus of the study, because it is related to increased access to education for all. Then the problem of this study which is going to solved is how is the existing condition of vocational education facilities for CSN at SMALB in West Java? Does the architectural design of educational facilities meet the needs of vocational learning behavior for children with special needs in West Java?

2. Methods

This paper is part of research uses the method of Education Research and Development (R & D) namely Development of Architectural Facility Design Guide to Support the Achievement of Vocational Competence of CSN. Therefore, this development research is oriented towards product development where the development process is described as thoroughly as possible and the final product is evaluated. Meanwhile to describe the level of suitability of the architectural design of educational facilities with the needs of vocational learning behavior for CSN in West Java objectives, then the stages of the R & D method that is done is the define and design stage which will be presented with descriptive method.

Define stage is by analyzing vocational learning problems and educational infrastructure facilities for ABK at SMALB. The output of this stage is the description of vocational learning and facilities problem for CSN in SMALB. Meanwhile design stage is by surveying facilities vocational education for CSN in SMALB. This section produces description of Vocational education facilities condition for ABK.

This study is conducted in Bandung, with the analysis unit is a special school at the level of senior high school. The research object selection is based on the purposive consideration. That is, a special school at the level of senior high school providing vocational education for students with special needs. The subjects are children with physical and sensory disability. The data are collected using observation, content analysis, interview and documentation study..

3. Result and Discussion

3.1. Vocational educational for CSN

Education for Children with Special Needs (CSN) refers to the learning that is designed to respond the unique characteristics for Children with Special Needs. This learning cannot be accommodated by standard curriculum applied in regular school [4]. Hence, education for students with special needs is the education that serves various characteristics of students with special needs. Of course, this special education uses various approaches, strategies, and learning methods, including the educational facilities that can meet the students' needs.

Education for CSN is explained in Permendikbud No. 157 Year 2014 regarding the curriculum for special education. In general, the aim of special education is to help students with physical handicap or mental problem develop and improve behavior, knowledge, and skill as an individual or members of the community so that they can access the social, cultural, and natural interplays in the community as well as have a job or continue their school. Based on this reason, the achievements of special education include independence, social integrity, life choice, and ability to meet economic need based on age, potential, and capacity of CSN [5].

A basic thing to get the achievements is having life skills needed by individual to survive. Life skills are attributed to the process of learning. The concept of life skills in the school system is categorized into two types. Those are (1) general life skills/GLS including personal skills (self awareness and thinking skills), social skills, and (2) spesific life skills (SLS) including academic and vocational skills [6].The management of vocational learning for Children with Special needs is not easy if it does not relate to

The various and individual potential of CSN. The skills learning for CSN is divided into children with low mental retardation, normal, and severe mental retardation as well as the inhibitor complexity that is attributed to their specialty. The most fundamental functional skill learning CSN is the school's courage and strict policy to implement skill learning based on interest, talent, and needs after school life, for example job. That is, the learning that is not limited by school hour in the attempt to achieve the result of learning skill at the level of vocational independence/economic activities (advanced level). Skill learning is conducted in a real situation by activating stakeholder's role. Parent's role is also necessary to follow up the practice of skill learning in daily life, especially functional skills (self-protective ability) for children with mental retardation. The empowerment of CSN independence through skill learning -i.e. dealing with Children with Special Needs' competency and performance-needs the community's recognition [7].

The result and analysis of vocational educational facilities in a special school in Bandung is described in the following points. The types of vocation in the special school are:

1. Food and beverage program

Food and beverage refers to the lesson related to household things that is given in special school at the level of junior and senior high schools .The aim of food and beverage major is to develop students' potential so that they can have life skills and independence, especially a business in the field of food and beverage. The proposed materials include:

- How to make brownie, cookies, and coffee served in an attractive package
- How to serve drink and food with a good standard service and presentation
- How to make innovative cake and coffee

2. *Computer (IT)*

Computer skill is an extracurricular lesson, since 2009 – 2010 academic years; that the students need to take especially in special school at the levels of junior and senior high schools. The aim of computer skill is to create life skills and independence. The materials that will be taught are:

- Introduction to computer theories
- Introduction to computer parts
- How to display programs (hardware and software)
- The process of data print

3. *Automotive*

Automotive skill is a new skill provided by special school. The skill will still be developed. The materials that will be taught:

- Introduction to the basic theory
- Introduction to motorcycle/car parts
- How to wash motorcycle/car
- The process of repairing motorcycle/car
- The process of motorcycle/car assembly

The vocational education facilities in the special school can be seen in Figure 1.



Food and beverage skill



Computer skill (IT)



Automotive skill

Figure 1. The vocational activity in Cicendo private special school.

Basically, every school has educational facilities in which the needs are adjusted to the available activities or curriculum. It is not different from special school that has special educational facilities for their students. Beside its different curriculum and learning, the design of class room, toilet, and the other rooms have specialty. The class room is not only about how to create a more conducive atmosphere for studying but also -considering the needs of the students- a communicative, comfortable, and educative atmosphere. Therefore, the implementation of special accessibility to educational facilities design is needed, especially for special school.

3.2. *The facility of vocational education for CSN*

The domination of normal population over the population with special needs contributes to the lack of building design for people with special needs. In an attempt to create architectural design which is responsive and accessible for people with special needs, a comprehensive study of the architectural design aspect that can respond the perceptive, cognitive, affective, and spatial behavior aspects is needed. Environmental spatial behavior is influenced by the environmental experience stimulus. First, the information of this behavior is received by the perceptive process. Second, the information of this behavior is recognized in the cognitive process. Third, it is responded using the affection process. Finally, it is followed up through an action. Individual with special needs has different psycho-spatial process from normal individual.

In relation to the statement above, an architectural design especially the one that can be used by people with special needs has to pay attention to the environment that can be responded by human sensing. There are six environments that can be caught by human sensing. They are visual, audial, tactile, olfactual, thermal, and kinesthetic environment [8].

The condition of education infrastructure for CSN is described in the following sections:

Table 1. Condition of Cicendo.

Aspects	Provision	Result
Basic size of room	Buildings that can be used by many people at once and using the maximum base size of room	It already facilitates the need for wheelchair and "crutches" users
Pedestrian lane	• maximum slope of 7° at every 9 m • Light intensity: range of 50-150 lux • the minimum width of the pedestrian path is 136 cm for one-way and 180 cm for both directions	The slope is generally less than 7°, but it does not seem to be specially designed, especially from the parking lot. The width of the road is adequate
Guiding route	• provided for the blind by using warning and steering block texture of the steering wheel to explain the situation around the user	Guiding route is not found
Parking lot	• Disabled parking spaces are on the closest route to the building • The parking area is close to the pedestrian lane and the main door • Parking area must have free space, so that people with disabilities can use it. • Parking areas for disabled completed with special signs	Lack of appropriate parking and pedestrian line.
Door	• The gate should be easily opened and closed by persons with disabilities • The main exit / entrance door has an opening width of at least 80cm • The area around the entrance is avoid from ramp or floor height	Most of SLBN Cicendo Building are the Dutch relics, the size of the door is quite adequate
Ramp	• The maximum slope should not exceed 7° • Horizontal length should not be more than 900 cm • Ramps should be free and flat with the size of a drink 160cm • The minimum width of the ramp is 95 cm without a safety edge and 136 cm with safety edge. • Must be textured • The ramp safety edge (low curb) is 10cm • Must be equipped with handrail handle	Ramp is not found
Stairs	• Must have same sized <i>antrede</i> and <i>optrede</i> dimensions • Must have a slope of less than 60° • There is no hollow incline that can endanger the ladder. • Must be equipped with handrails on both sides • Handrails should be easy to hold with altitude 70-90 cm from the floor and free from disturbing construction elements and the edges should be rounded or deflected properly towards the floor, wall or pole • Handrails should be added in length at the end of the tip (top and bottom) with 10-15 cm. • For ladders located outside the building, the ladder should be designed so that no stagnant rainwater.	Only single storey building, no stairway

Table 1 Cont.

Lavatory	• in general, toilet is equipped with "disable" • Have enough space • Must be equipped with handrail • Put other furniture in an affordable place • The sink should use a leverage valve • The floor should not be slippery	Do not have signs for the disabled, do not have enough space, no handrail
Shower	• Should have adjusted wide and altitude seat • Equipped with handrail and alarm botton • Using a type that can be opened from the outside under emergency Conditions • Using out door openings • Free of sharp and slippery elements • leverage system faucet	No seating area, no handrail
Sink	• easy to reach • enough free space • have free space under the sink • Ruang gerak bebas yang cukup, than wheelchair user is easy to use it • Adjusted height of mirror for user • leverage system faucet	Not easy to reach, not enough free space
Furniture	• Can be use by CSN • Accessible • Safe for children • Disguise sharp corners with curved shapes • Not using hazardous chemicals	There is no spesifik furniture and equipment for CSN
Sign and markers	• Embossed or braille signs • International sign and symbol • easy to see and easy interpreted • Made from not dazzled materials	Signage is available but not embossed or braille

The evaluation shows that the educational facilities of Cicendo public special school, in general met the government standard, especially in area and the building size. The building quality such as class room, skill room, library, and the other rooms have a good quality. Most of the accessibility aspects such as the basic size of a room, pedestrian route, and doors are met. However, the other aspects such as guiding route, ramp, stairway, lavatory, shower, sink, furniture and sign have yet to meet the accessibility requirement.

4. Conclusion

The evaluation result shows that the educational facilities of Cicendo public special school, Bandung generally have met the standard that the government upholds. The building quality such as class room, skill room, library, and the other rooms have a good quality. The school provides vocational skills including food and beverage, computer (IT), and automotive program. Most of the accessibility aspects such as the basic size of the room, pedestrian route, and doors have met the requirement. Yet, the other aspects such as guide route, *ram*, stairways, toilet, washbasin, fountain, equipment and sign have yet to meet the requirement of accessibility.

Vocational skills for Children with Special Needs (CSN) have been given in special school –i.e. at the junior high school and senior high school levels. The implementation of vocational skill learning still needs improvement. Kinds of vocational skill need to be more various so that Children with Special Needs (CSN) can have a bigger chance to get various skills. In Indonesia, there has yet to be found vocational special school at the level of senior high school that specifically provides full vocation.

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