

The Curriculum of Heat Transfer in Vocational Schools for Students with Special Needs

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Abstract: The target of the learning process must refer to the national curriculum. Since each student has different potential, different techniques must be applied, especially for students with special needs (SSNs) that require special services and education when learning difficult subjects. Heat transfer is one of the crucial materials in a vocational school. However, to achieve the curriculum objectives, SSNs have limitations. Therefore, this study aims to determine the heat transfer material for SSNs in the curriculum in vocational schools (i.e. culinary department). This research used the descriptive qualitative method (i.e., literature study, interviews, and observations). The results showed that the curriculum of heat transfer was taught in grade X in vocational schools since it must become the basis for students for learning other materials in the next grades. The curriculum of heat transfer for SSNs is the same as that for general students. The difference lies in how educational services are carried out. A differentiated curriculum is one of the solutions commonly used by teachers to teach SSNs in achieving students' learning outcomes. The main prospects gained from this study are (1) to become references for practitioners, educators, and teachers to understand how to teach SSNs, (2) to give knowledge on determining the curriculum of difficult subjects for SSNs in vocational high schools, and (2) to know how Indonesian teachers solve the issue in the curriculum.

Keywords: Curriculum, Education, Heat transfer, Students with special needs, Vocational school

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1. Introduction

Vocational School is a school targeting its graduates to have skills for being applied in the industrial world (Rosina et al., 2021). The school has a vision and mission, which focuses on successful graduates getting jobs and working in industries immediately (Chuntala, 20219). The learning process of this school is output-oriented to give provision to enter the industrial world. This makes the curriculum in vocational high schools different from the curriculum in general secondary schools and Islamic schools (Maryanti et al., 2021a; Maryanti & Nandiyanto, 2021b). The learning curriculum in vocational schools mostly carries out practical activities in the learning process (Ana, 2020; Handayani, Ali, and Mukhidin, 2020a; Handayani, Ali, and Mukhidin, 2020b).

One of the important materials in vocational school is heat transfer. The materials must be contained in the vocational school curriculum in all departments.

Currently, many studies discuss curriculum (Widiaty et al., 2020; Rosina et al., 2021; Maryanti et al., 2021b; Al-Obaidi, 2021). Regarding special needs education, reports were found, starting from the development of the special education curriculum (Sutjipto, 2018), the implementation of the curriculum and its correlation to issues and policies in the special education curriculum (Mahabbati, 2014), to the 2013 curriculum for elementary schools in inclusive schools (Izzat, 2015). However, there is no information in detail for explaining and finding strategies for improving special needs students' comprehension of the specific materials. Regarding the heat transfer material, although our group discussed the strategies in the learning process for students with special needs (Maryanti, 2021; nandiyanto et al., 2020), we did not focus in detail on understanding the curriculum.

Thus, it can be concluded that until now there has been no research discussing heat transfer material in the curriculum in vocational schools, specifically for the catering department.

Based on previous studies on taking care of students with special needs (Rusyani et al., 2020; Rusyani et al., 2021a; Rusyani et al., 2021b; Rusyani et al., 2021c; Hidayat et al., 2020), here, the purpose of this study was to determine the heat transfer subject for students with special needs in the curriculum in vocational schools, especially in the culinary department. The main novelty of this study was the focus, discussing heat transfer material in the curriculum in vocational schools for students with special needs. We also focused on the culinary department since this department is one of the popular departments in vocational schools for students with special needs. Students learn heat transfer for supporting knowledge for cooking skills. However, teaching students with special needs requires specific treatment, especially when facing delivering difficult subjects. Students with special needs are students who have problems in the learning process, making them require special services and education (Maryanti, 2021). In Indonesia, students with special needs use a curriculum that is tailored to the needs of students and remains based on the national curriculum (Maryanti et al., 2021b). That is because they have the right to get a similar level of education to general students. However, most educational institutions are not able to meet the learning needs of students with special needs. Therefore, this study hopes that it can give ideas for practitioners, educators, and teachers to know about the condition in the curriculum, find and understand strategies for teaching students with special needs, and know about how Indonesian teachers solve the issue in the curriculum.

2. Method

2.1. Research literature review as a basic understanding

The focus of this research is to understand current reports discussing heat transfer material for students with special needs in the curriculum in vocational high schools. We conducted a literature study by focusing on curriculum analysis on heat transfer. To support the literature review, this study used a Scholar Google search engine with the keywords “curriculum”, “heat transfer”, and “students with special needs”. Detailed information in searching documents is explained in our previous reports (Al Husaeni & Nandiyanto, 2022; Al Husaeni et al., 2023a; Al Husaeni & Nandiyanto, 2023a; Al Husaeni & Nandiyanto, 2023b; Azizah et al., 2021).

We also conducted a field study by taking data from vocational schools that have a culinary department in West Java, Indonesia. The data from the literature review and field study were then compared with the national curriculum standards. We analyzed and compared heat transfer material in the curriculum for students with special needs and general students in the vocational school.

In short, several stages in this research procedure included: (1) the activity planning stage, (2) the

implementation stage of the research process, and (3) the evaluation stage (see Figure 1).

- (i) The first stage is the planning stage, including several activities: (a) literature study was carried out by seeking information about the structure of the curriculum, heat transfer material in the curriculum in vocational school, and heat transfer learning tools for students with special needs; (b) Field studies were conducted to find out the objective conditions of the curriculum regarding heat transfer material in vocational high schools for students with special needs, especially in the culinary arts department; (c) the activity of making research instruments is carried out with aiming the preparing data collection tools regarding the curriculum on heat transfer in vocational high schools.
- (ii) The second stage is the implementation of the research process by analyzing the national curriculum. This activity was carried out to determine the curriculum for students with special needs regarding heat transfer from the government and to compare it with objective conditions in the field, especially in vocational high schools majoring in culinary arts.
- (iii) The third stage is the evaluation stage or curriculum analysis stage, which is the activity of analyzing core competency points and basic competencies and comparing the curriculum on heat transfer from the government to that used in vocational schools.

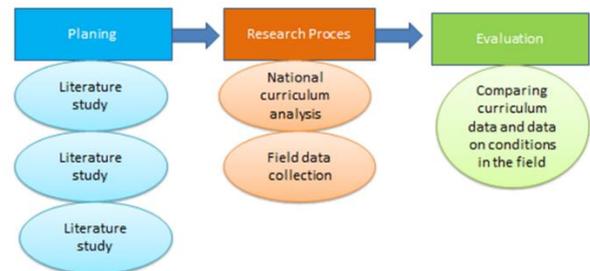


Fig. 1 Research Procedure

This study used data collection techniques, namely: interviews, observation, and documentation as well as conducting a literature study on the curriculum on heat transfer in vocational high schools. Curriculum data on heat transfer in vocational high schools were obtained by interviews, observations, and direct documentation studies in field studies, especially from vocational schools majoring in culinary arts. Curriculum data on heat transfer in vocational schools is obtained in our previous study (Maryanti & Nandiyanto, 2023).

Data analysis was carried out by presenting data in the form of descriptive analysis. Data was obtained from evaluation data analysis by comparing literature (national curriculum from the government) and field data. The results of the analysis are usually used as the basis for making lesson plans and individual learning programs for students with special needs. After that, the data was compared with the

curriculum on heat transfer in vocational schools which is used for students with special needs and general students.

3. Results and Discussions

3.1. Analysis of heat transfer in vocational high schools curriculum

The curriculum is an important part of the implementation of education, especially in vocational high schools. To achieve national learning goals, the curriculum contains a set of materials that must be achieved (Solikhah and Budiharso, 2019). One of the materials in the curriculum in vocational school is about heat transfer. Almost every time, the heat transfer material is taught. That's because the material about heat transfer is related to phenomena in the environment around students. Vocational students are prepared and formed to have the skills to be independent in their lives. In addition, it is important to study heat transfer material for the knowledge base in learning further knowledge (Maryanti et al., 2020a; Maryanti et al., 2020b; Maryanti et al., 2020c; Maryanti et al., 2020d).

Vocational high schools in Indonesia use the 2013 curriculum (Suherman et al., 2021). In the vocational high school curriculum, the curriculum is oriented to the needs of the world of work. Curriculum coordination includes the following activities: (i) The planning stage includes curriculum validation activities, syllabus preparation, learning implementation plans, academic calendar preparation, preparation of teaching materials. (ii) The implementation stages include the preparation of a learning schedule, analysis of class needs, laboratories, and practice rooms, analysis of the needs of teachers and laboratory assistants, analysis of the suitability of learning activities with the academic calendar, and implementation of classroom supervision. (iii) The evaluation stage is coordinated by the curriculum sector, including evaluation. teaching and learning activities are in the form of grid preparation, question preparation, item analysis, test result analysis, remedial programs, and enrichment programs.

The profile of graduates is influenced by the curriculum used. The vocational school prepares its graduates to have the skills to be ready to go directly into the industrial world (Hidayat et al., 2020). For example, the culinary industry prepares graduates by opening a culinary department. In the culinary department, the material regarding heat transfer is listed in the curriculum in class X (Rusyani et al., 2021c). The heat transfer material in the curriculum at the Tataboba Vocational School is closely related to aspects of the culinary industry. Some examples of the importance of heat transfer material in the culinary arts department at vocational school are related to setting the heat temperature during cooking, determining the level of food maturity, and determining the tools that are affected by the heat transfer phenomenon (Maryanti et al., 2021c).

Experimental demonstration methods and direct practice are used by teachers in most of the material in the curriculum, especially heat transfer learning materials. Subjects in the national curriculum must be studied by students without exception, including students with special

needs. Most students with special needs who attend regular schools, choose to major in food management. The reason is that culinary skills, especially cooking, are easier for them to learn. Students with special needs are easier to learn something simple, repetitive, and simple (Maryanti et al., 2020b). Activities related to catering, are often encountered in daily activities.

3.2. Analysis of science education curriculum for students with special needs in vocational high schools culinary skills competence

Every individual has the right to receive an education without exception, as well as for students with special needs (Maryanti, 2021). Along with inclusive education, the education administration must avoid discrimination against students (Suherman et al., 2021). In practice, educators should not discriminate against students because of differences in family background, physical, mental, intellectual, economic, cultural, social, and cultural limitations. Every student must receive educational services according to their needs so that their potential can develop optimally (Maryanti, 2021). So that students can live independently in the community. Students with special needs have problems in the learning process if they follow the same learning process as students in general, thus requiring special education services according to their needs to reduce or even eliminate obstacles in the learning process (Al-Rowaily et al., 2012). Through education, it is hoped that students with special needs can develop themselves and their potential optimally according to their abilities. The ultimate goal of education is to expect them to be able to live independently in the community without depending on the help of others, even if only for their own needs.

At this time, education for students with special needs is not only held in special schools. However, students with special needs have the right to attend public schools, one of which is vocational school (Hidayat et al., 2020). This is in line with the implementation of inclusive education. For students with special needs, the implementation of inclusive education in public schools provides an opportunity to participate in education with students in general. The implementation of this education cannot be separated from the modification of various components of education and learning so that students achieve achievements according to their potential (Mohajan, 2018).

Organizers of inclusive education, one of which is held by several vocational schools in West Java, Indonesia. Based on data from various information, this vocational school has accepted and has students with special needs to be able to study together with students in general. Students with special needs are free to choose majors according to their interests and talents. Most students with special needs choose to major in culinary arts. The educational services they get are the same as students in general, a sign of discrimination. This has an impact on the process of providing education and service-learning processes in the classroom. Teachers must choose a curriculum that can accommodate all student needs because teachers deal with students with special needs and

students in general in the classroom. We know that students with special needs have problems in the learning process (Maryanti et al., 2021d). So that teachers must have the ability, creativity, and innovation in designing and compiling a curriculum so that its implementation can later accommodate students with special needs, to obtain optimal performance according to their abilities (Maryanti et al., 2020a; Maryanti et al., 2020b).

Students with special needs use the same curriculum reference as students in general, especially regarding heat transfer material in vocational high schools. However, the characteristics of the obstacles that students with special needs have resulted in modifications in the learning process carried out. This is because each student has different characteristics, problems, potentials, and needs in the learning process (Maryanti et al., 2021b). Therefore, most teachers have the initiative to modify the general school curriculum to suit the needs of students, especially students with special needs (Chuntala, 2019). Student needs can be identified through assessment activities (Maryanti, 2021).

Table 1 shows the heat transfer curriculum at vocational school majoring in catering. The curriculum describes two core competencies, namely competence 3 which is related to knowledge, and competence 4 which is related to skills. The two core competencies are translated into several basic competency points which include heat transfer material. This material about heat transfer is given to class X of Applied Science subjects in vocational high schools, especially the culinary arts department.

Table 1. Heat transfer in the curriculum in vocational schools

CORE COMPETENCIES 3 (KNOWLEDGE)	CORE COMPETENCY 4 (SKILLS)
3. Understand, apply, analyze, and evaluate factual, conceptual, basic operational, and metacognitive knowledge following the field and scope of Simulation and Digital Communication, and Basic Tourism Sector at the technical, specific, detailed, and complex level, relating to science and technology, arts, culture, and humanities in the context of developing self-potential as part of the family, school, world of work, national, as well as regional and international community members.	4. Take on specific tasks using tools/equipment, understanding information, and work procedures that are commonly carried out, and solve problems following the scope of Simulation and Digital Communication, and Basic Tourism Sector. Show performance under the guidance of measurable quality and quantity following standard competencies. Demonstrate the skills of reasoning, doing, processing, and presenting effectively, creatively, productively, critically, individually and independently, collaboratively, communicatively, as well as solutely in the abstract realm relating to the development of what student learns at school and what can carry out specific tasks under direct supervision. Demonstrate skills in perceiving, readiness,

	and imitation, as well as getting used to (adaptive), proficient movements, making natural movements in the concrete realm relating to the development of what they have learned at school, and being able to carry out specific tasks under the supervision of life.
BASIC COMPETENCIES 3	BASIC COMPETENCIES 4
3.4. Analyzing the relationship between temperature and heat 3.6. Analyzing the material and its changes	4.4. Conducting research and experiments on the influence of heat on the changes in temperature, shape, and shape of objects in the tourism sector 4.6. Experimenting with material changes in the tourism sector

The results of the field study data analysis show that the curriculum on heat transfer materials used by students with special needs is the same as students in general in vocational high schools, especially in the culinary arts department. However, the way in practice is different. The heat transfer material refers to the components of the national curriculum, namely core competencies and basic competencies. Competency 3 relates to aspects of student knowledge, while core competence 4 relates to aspects of student skills. Heat transfer material is contained in core competencies 3 and 4 and is described in basic competencies 3.4, 3.6, 4.4, and 4.6.

A differentiated curriculum is used by most teachers in the heat transfer learning process. Differentiated curricula are practically created by teachers by developing curricula and adapting them to the needs of students. A curriculum that is tailored to the needs of students is a differentiation curriculum (Suherman et al., 2021). The curriculum used still refers to the core competencies and basic competencies in the national curriculum. The differences include the creation of individual learning programs. Individual learning programs are part of a differentiated curriculum. Individual learning programs are presented in a learning implementation plan program that is tailored to the needs of students and cannot be separated from the educational objectives in the national curriculum.

In the individual learning program for heat transfer materials in vocational school, the teacher adjusts the methods, media, and learning objectives based on the learning needs of students with special needs and remains guided by the curriculum from the government. To facilitate students with special needs in understanding the material presented, individual learning programs are made by the teacher. Students with special needs require special education services (Maryanti et al., 2021b). Therefore, although the curriculum material on heat transfer used is the same, development and modification in the learning process are very much needed. To facilitate students with special needs in achieving learning, the use of methods and media that are following the needs of students is required. Methods

and media that are in accordance with student needs make it easier for students to follow the learning process (Rusyani, 2021a). students with special needs can achieve the objectives of the national curriculum for science education in vocational schools, as well as students in general.

The various explanations above explain that the curriculum used by students in general and students with special needs in vocational school is the same when viewed from the core competencies and basic competencies. However, a differentiated curriculum is used by students with special needs because the curriculum is adapted to the needs of students with special needs. The difference is in the modification of the objectives of the learning process in individual learning programs. Individual learning programs are created to be a vehicle for bridging students to achieve the provided national curriculum or curriculum (Mohajan, 2018).

4. Conclusions

This study analyzes the science education curriculum in vocational high schools majoring in catering to students with special needs. Activities were carried out using a literature review. The curriculum used for students in general and students with special needs was analyzed. To achieve our goals, we did several steps in this study, including literature review, planning, research, and analysis. The research analyses show that there is no difference between the curriculum components in the core competencies and the basic competencies used. The main difference is how to make programs for teaching and learning students with special needs. The curriculum used for students with special needs is differentiated. The existence of adaptation and modification of the objectives and the learning process is important. But, the core competencies and basic competencies used are the same for general students and students with special needs. It is intended that the national goals in the curriculum can be obtained and the needs of students can be met and the potential of students can develop optimally, especially in science education. This research is expected to become knowledge for vocational schools that accept students with special needs, and this study can be an alternative in making a differentiated curriculum for students, making it one of the solutions in teaching general students and students with special needs.

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