

# Strategic Plan in Improving Students' Science Competency

Fitri Yusfi Hartini, Akbar Istiqlal, Taufani Chusnul Kurniatun

Educational Department, School of Post Graduates

Universitas Pendidikan Indonesia

Bandung, Indonesia

fitri.yusfi@upi.edu

**Abstract**—The pace of innovation in science and technology is accelerating, so it is vital that countries prepare more young talent for jobs in deep science and for many other jobs with a science dimension. In improving students' science competency, schools as a place for the educational process can formulate goals to improve the quality of education by implementing a strategic plan. This study aims to describe and analyze the strategic plan in improving students' science competency through descriptive analytical study at Junior High School in Bandung. It used descriptive method with qualitative approach. Data analysis of materials collected from interviews, observations, documentations studies and also forum group discussion. Data analysis was carried out by SWOT analysis. This study finds that the Junior High School is in 2nd quadrant, which is Aggressive; this indicates a potential position to develop. As for some strategic issues that can be used as references for school program plans, such as: 1) To involve Parents, Lecturers or science experts; 2) Science Laboratory Assistant recruitment; 3) Procurement and Maintenance of Science Laboratory Facilities; 4) Human Resource Development; and 5) To be Active in science competitions/ Olympiads.

**Keywords**—strategic plan; science competency; students

## I. INTRODUCTION

One of the determinants of the education quality as well as national development is the graduate competency standard, in which the school results graduates who will determine the direction of the progress of this nation in the future. Good quality education is a key aspect in the development of human resources quality. One of the important things in improving the quality of education is knowing the students' difficulties in learning and using the information as a basis for finding the right learning solutions [1]. Government Regulation No. 19 of 2005 Article 26 states that the standard of graduate competency in general secondary education units aims to improve intelligence, knowledge, personality, noble character, and skills to live independently and attend further education.

McAshan reveals that competence is "a knowledge, skills and abilities or capabilities that are achievable, which become part of a person being or he can satisfactorily perform cognitive, affective and psychomotor behaviors" [2]. Competence describes a person's qualifications or abilities both qualitatively and quantitatively [3]. The measurement of competence called Taxonomy of Education Objectives by

Benjamin S. Bloom which includes cognitive, affective and psychomotor domains [4]. Because competency is an integrated characteristic (i.e. new qualities obtained as a result of education combining knowledge and abilities with various characteristics of integrated educational quality) it is possible to regard it as some objectives reality of the educational process with typical complex system features, studies that imply solutions from tasks related to their representation and development [5]. Competence is classified in three types namely; 1) graduate competence, the minimum ability that must be achieved by students, after graduating from a certain level or unit of education; 2) standard competencies, abilities or minimal proficiency that must be achieved by students completing a particular subject at each level they follow; 3) basic competencies, minimum abilities that must be achieved by students in mastering concepts or subject matter given in class at certain levels of education. Thus, in a subject there are several basic competencies that must be achieved as criteria for achieving competency standards [6].

To achieve the above objectives, Indonesian students are still experiencing various kinds of obstacle. This can be seen from the results of the Program for International Student Assessment (PISA) in 2015 which shows that Indonesia is ranked 64<sup>th</sup> out of 72 countries as the member of the Organization for Economic Cooperation and Development (OECD). This number is the result of testing 15-year-old students to find out their abilities and knowledge in the fields of science, reading and mathematics. PISA assumes that a person can succeed in the modern economy not because of what he or she know, but what he or she can do with what he or she know [7].

Furthermore, the Education Assessment Center, Ministry of Education developed a national assessment system called Asesmen Kompetensi Siswa Indonesia (AKSI). In 2017, the AKSI test was conducted at the junior high school level in two provinces involving eighth grade students from 105 schools. In general, the results of the test show the eighth-grade students' reading literacy skills, scientific literacy, and mathematical literacy. In a scale of 100 scores, student literacy in these three fields did not reach 50. Of the three fields measured, mathematics literacy was at the lowest position while reading literacy was at the highest position [8].

In fact, from 2012 to 2015, science performance among 15-year-old students rose by 21 score points. This makes Indonesia the fifth-fastest improving education system among the 72 countries that took part in this comparison. The pace of innovation in science and technology is accelerating. Thus, it is important for this country to prepare more young talents for jobs in hard science and for many other jobs with a science dimension. Understanding science is important for everyone—not just scientists. Whether buying toothpaste, recycling household or talking about global warming, we are constantly bombarded by science-based claims and counter-claims. We all need to be able to separate substance from spin, identify misrepresentations and assess levels of uncertainty and trustworthiness [9].

This is a challenge for Indonesia to produce competent and qualified human resources who have competitiveness both at national and international levels. Dealing with this problem, schools as a place for the education process can formulate goals to improve the quality of education by implementing a strategic plan. Educational planning should have the following characteristics: 1) Oriented to the vision, the mission of the institution to be achieved; 2) Having a gradual and continuous program; 3) Prioritizing human values; 4) Maximizing the full potential of students; 5) Oriented in the development of human resources; 6) Using resources as carefully as possible; 7) Responsive to needs and 8) Development of educational innovation [10].

In the development of education systems, no matter where they operate, the area of planning is critical. This is the true of strategic planning - or any other form of planning in education - for all education systems but especially for education systems in developing contexts, where progress toward improvement in the provision of acceptable quality of education is a continuous and relentless struggle [11]. Strategic management is a series of managerial decisions and actions that determine long-term organizational performance [12]. Strategic management has several basic elements such as: 1) Environmental Observation: consists of two parts, namely the external environment and internal environment; 2) Formulation of strategies: development of long-term plans for effective management of opportunities and environmental threats, seen from the strengths and weaknesses of the institution. Strategy formulation includes determining the organizations mission, determining the goals that can be achieved, developing strategies and establishing policy guidelines; 3) Strategy implementation: the process of realizing strategies and policies in action through the development of programs, budgets and procedures; 4) Evaluation and control: the process through which organizational activities and performance results are monitored and actual performance compared to the desired performance.

SWOT analysis can be used as a mean for departing the strategic plan so that it produces a flexible instrument. To operate in this manner, the company must concentrate its future objectives on its strengths [13]. The results of a detailed SWOT analysis also provide valuable material for continued planning and support-generating activities. The strengths can be presented and emphasized to potential supporters. Discussion of weaknesses and threats provides useful information for

strengthening the project or plan where possible, or anticipating the effects of environmental threats [14].

A SWOT (strengths, weaknesses, opportunities, and threats) analysis of a teacher education program, or any program, can be the driving force for implementing change. A SWOT analysis is used to assist faculty in initiating meaningful change in a program and to use the data for program improvement. This tool is useful in any undergraduate or degree program. Strengths and weaknesses are revealed and adjustments to curriculum, internships, learning activities, education policies, etc., are justifiable if based on a SWOT analysis of a program. Major improvements to a program can be a direct result of using this analysis with undergraduate and graduate students [15].

The right strategic plan may explore the potential appears in the students of St. Catholic Vocational School Familia Tomohon and put the school image in a special and unique place so that it is perceived to be superior to other schools [16]. Efforts to improve graduate quality can be done well through strategic planning with comprehensive forecasting and programming, traditional participatory participation and decision making [17].

Referring to national development efforts through education as well as responding to the 2015 PISA results and AKSI 2017 as stated above, as a pilot school, Laboratorium Percontohan UPI Bandung-Junior High School conducted a school strategic plan with the intention to provide a planning document that will be used as a reference in the preparation of the program, and annual education activities especially in improving scientific competencies of students.

## II. METHOD

This study was used descriptive method with qualitative approach to describe the results of the analysis of strategic plan in improving the students' science competency. Data analysis of materials collected from interviews, observations, documentations studies and also forum group discussion with related informants at Laboratorium Percontohan UPI – Junior High School.

Data analysis is carried out through SWOT analysis to identify various systematic factors to formulate the strategy of the organization-both business and social organizations. This analysis is based on logic that can maximize strengths and opportunities, but simultaneously can minimize weaknesses and threats.

## III. RESULTS AND DISCUSSION

### A. Environmental Analysis

Environmental analysis is carried out to identify various factors that may become "strengths", "weaknesses", "opportunities" and "threats" from internal or external the environment of the Junior High School that can affect the students' science competency.

The results of the internal environmental analysis of students' science competency in Laboratorium Percontohan

UPI-Junior High School shows it has the strengths such as, (1) Educator's personnel of natural science subject are qualified, (2) The average school exam scores for the science subjects for the 2014/2015 academic year are 87.11 and (3) Located in the UPI educational environment that can support the process of conducive teaching and learning activities. Besides the weakness are (1) Laboratorium Percontohan UPI-Junior High School has no Lab Assistant, (2) Students find it difficult for reasoning with the science problem and (3) Science lab has not meet national standards yet.

The results of an external environmental analysis of students' science competency in Laboratorium Percontohan UPI-Junior High School UPI shows it has the opportunity as follow: (1) Laboratorium Percontohan UPI-Junior High School has the following educational funding sources: District, Provincial, School Operational Assistance, Life Skills Education Grant, Self-supporting Subsidies, school tuition, and supported by the school committees and parents in implementing school programs. These can support the completeness of educational infrastructure facilities (2) Has a bond of cooperation with UPI so that it can contain learning activities through facilities, human resource development, and material filling by UPI lecturers/officials to students and (3) The science and technology development policy monitored by the Ministry of Research, Technology and Higher Education is an opportunity to develop Laboratorium Percontohan UPI-Junior High School. Beside the Threats are (1) The cost of practical materials and scientific facilities of the Natural Sciences tends to increase (2) Competition of laboratory equipment and workshops with Bandung Taruna Bakti Middle School and (3) The Change of the National Curriculum.

### B. Weighting

From the results of internal environmental analysis (ALI) and external environmental analysis (ALE), a SWOT analysis can be conduct. The level of readiness of the factors is measured by means of rating and weighting, with the following results:

TABLE I INTERNAL FACTOR ANALYSIS STRATEGY (IFAS)

Strategy Factors	Weight	Rating	Weight x Rating
<b>Strength</b>			
Educator personnel Natural science subjects are qualified	0.25	4	1.00
The average school exam scores for science subjects for the 2014/2015 academic year are 87.11	0.15	3	0.45
Located in the UPI educational environment that can support the process of conducive teaching and learning activities	0.10	2	0.20
<b>Total</b>			<b>1.65</b>
<b>Weakness</b>			
Laboratorium Percontohan UPI-Junior High School has no Lab Assistant	0.20	2	0.40
Students find it difficult for reasoning with the science problem	0.10	1	0.10
Science lab has not meet national standards yet. External Environmental Analysis	0.20	2	0.40

Table 1. cont.

Total			0.90
Jumlah	1		4.25

From table I it can be seen that the strength factor value is 1.65 and the weakness is 0.90. The results of weighting for external factors are as follows:

TABLE II EXTERNAL FACTOR ANALYSIS STRATEGY (EFAS)

Strategy Factors	Weight	Rating	Weight x Rating
<b>Opportunity</b>			
Source of Funds	0.30	4	1.20
Bond with UPI	0.20	4	0.80
Science and technology development policy	0.10	2	0.20
<b>Total</b>			<b>2.20</b>
<b>Threat</b>			
The cost of practical materials and scientific facilities for science tends to increase	0.15	2	0.30
Laboratory equipment and workshop competition with Bandung Taruna Bakti Middle School	0.10	1	0.10
The Change of the National Curriculum	0.15	3	0.45
<b>Total</b>			<b>0.85</b>
<b>Jumlah</b>	<b>1</b>		<b>3.05</b>

From table 2 it can be seen that the value of the opportunity factor is 2.20 and the threat is 0.85. Whereas to find out the existence of school conditions, it is necessary to calculate the difference as follows:

TABLE III DIFFERENCE IN STRENGTHS-WEAKNESSES & OPPORTUNITIES-THREATS

Strength – Weakness	Opportunity – Threat
1.65 – 0.90	2.20 – 0.85
0.75	1.35

Based on table 3, the Strength and Weakness differences are on the axis of strength of 0.75, while the difference between Opportunities and Threats is on the axis of opportunity 1.35 so that it can be described in the following SWOT quadrant:

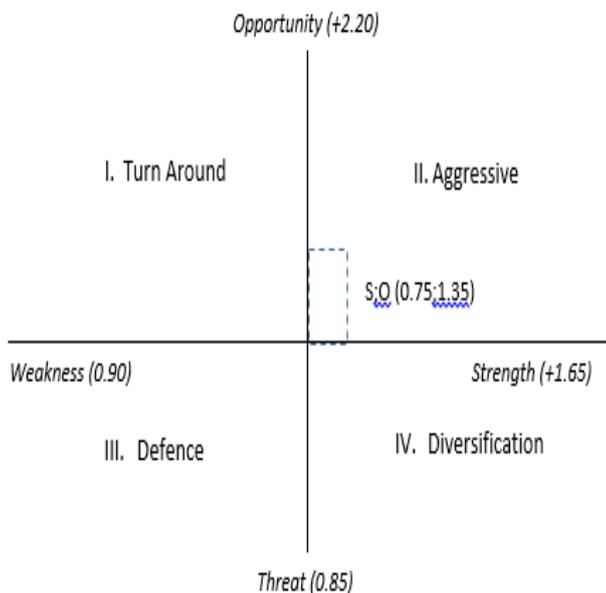


Fig. 1. Quadrant of SWOT analysis.

Based on Figure 1 above, the condition of Laboratorium Percontohan UPI-Junior High School is in the 2<sup>nd</sup> quadrant, which is Aggressive, this shows a potential position to develop. The basic strategy that can be planned is to make the best use of the opportunity, to anticipate and overcome threats, to use force as an operating capital and use it to the maximum extent possible, and to strive to reduce or eliminate the remaining weaknesses.

**C. Strategy Analysis**

The phases of SWOT analysis in a strategic plan [18] are as follows: 1) Identification of strengths and weaknesses that most influence education services in schools based on all standards; 2) Identification of vendors and threats that affect schools from the external environment; 3) Input the identification items to the SWOT analysis pattern; 4) Formulation of recommended strategies for dealing with weaknesses and threats, including problem solving, improvement and further development. The strategy that needs to be formulated to obtain opportunities is to use strength (SO strategy), strategies to overcome threats by using force (ST strategy), strategies to overcome threats by improving weaknesses (WT strategy), and to gain opportunities by correcting weaknesses (WO strategy); 5) Determine priorities for handling weaknesses and threats, formulate an action plan for carrying out the handling program.

To determine a strategy that is in accordance with the conditions of Laboratorium Percontohan UPI-Junior High School, a strategy analysis is carried out as follows:

TABLE IV STRATEGY ANALYSIS

Internal factors	Strength (S)	Weakness (W)
External Factors	<ol style="list-style-type: none"> <li>Educator's personnel of natural science subject are qualified.</li> <li>The average school exam scores for the science subjects for the 2014/2015 academic year are 87.11.</li> <li>Located in the UPI educational environment that can support the process of conducive teaching and learning activities</li> </ol>	<ol style="list-style-type: none"> <li>Laboratorium Percontohan UPI-Junior High School has no Lab Assistant</li> <li>Students find it difficult for reasoning with the science problem</li> <li>Science lab has not meet national standards yet. External Environmental Analysis</li> </ol>
Opportunity (O)	<ol style="list-style-type: none"> <li>S-O Strategy</li> <li>Opening extracurricular science</li> <li>Hold seminar/workshop activities for students with direct speakers from Parents/Lecturers/ UPI Officials who are experts in science</li> </ol>	<ol style="list-style-type: none"> <li>W - O Strategy</li> <li>Recruitment of the Science Laboratory Assistant</li> <li>The teacher applies Problem based learning and Project based learning</li> <li>Procurement and maintenance of science laboratory facilities</li> </ol>
Threat (T)	<ol style="list-style-type: none"> <li>S-T Strategy</li> <li>Special allocation funds for the Science lab facilities</li> <li>Conduct curriculum training and training for teachers</li> <li>Curriculum socialization with students and parents</li> </ol>	<ol style="list-style-type: none"> <li>W-T Strategy</li> <li>Being active in the competition/science Olympiad at the local, national and international levels</li> <li>Human Resource development as a reward for potential educators and education staff</li> </ol>

From the table 4 above, the following strategic issues can be formulated:

- Involving Parents/Lecturers/Scientists in order to improve student competency.
- Recruitment of the Science Laboratory Assistant
- Procurement and Maintenance of IPA Laboratory Facilities with separate funding allocations

- Human Resource development as rewards for potential educators and education personnel who has not continue education
- Being active in the competition/science Olympiad at the local, national and international levels

#### IV. CONCLUSION

In facing global challenges, Indonesia is in full swing with national development, one of which is in the education sector. Although the Indonesian order based on the 2015 PISA and 2017 AKSI is still below expectations. This does not mean that Indonesia does not make a better movement.

This has become a motivation for Laboratorium Percontohan UPI-Junior High School to participate in improving the quality of education, one of which is through the science competence of students. The effort is carried out from the earliest stage, namely, strategic planning to improve students' science competency.

Strategic plan analysis in improving students' science competency at Laboratorium Percontohan UPI-Junior High School shows that the condition of the school is in the 2<sup>nd</sup> quadrant, which is Aggressive, this shows a potential position to develop. As for some strategic issues that can be used as references for school program plans, such as: 1) To involve Parents, Lecturers or science experts; 2) Science Laboratory Assistant recruitment; 3) Procurement and Maintenance of Science Laboratory Facilities; 4) Human Resource Development; and 5) To be Active in science competitions/Olympiads.

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