

PAPER • OPEN ACCESS

## Engineering education system between Indonesian Vocational School and Japanese KOSEN

To cite this article: A P Siswanto *et al* 2020 *IOP Conf. Ser.: Mater. Sci. Eng.* **801** 012142

View the [article online](#) for updates and enhancements.

# Engineering education system between Indonesian Vocational School and Japanese KOSEN

A P Siswanto<sup>1\*</sup>, Budiyo<sup>1</sup>, H Kasai<sup>2</sup>, S Fujiwara<sup>2</sup> and Y Mizuno<sup>2</sup>

<sup>1</sup>Vocational School, Diponegoro University, Semarang, Indonesia

<sup>2</sup>National Institute of Technology, Akashi College, Japan

\*Email: [anggun.siswanto@live.undip.ac.id](mailto:anggun.siswanto@live.undip.ac.id)

**Abstract.** International partnership has become an emerging issue in which due to globalization goals, the needs of having collaboration between countries are inevitable. Cross-continent collaborations are encouraged; however, having partners with similar cultural background is seen more beneficial. This article aims to review challenges on programme development of Vocational Education between Indonesian and Japan. Vocational Education in Indonesia has been well established for decades where students are trained in 3-year education of Vocational High School then continue to 3-year education of Vocational School at the University. Curriculum is set to be more giving practical training which can enhance skills of students in problem solving. Moreover, KOSEN is one of distinctive education systems in Japan which is an abbreviation of Japanese form “koku-ritsu-kou-gyou-KOU-tou-SEN-mon-gak-kou” which is translated as National Institute of Technology. It offers 5-year education after Junior High School which provides training and skills development for students. Programme development of KOSEN and Indonesian Vocational Education are seen to be feasible for being implemented further which can deliver more skilful graduates. Combination of skills and cultural side of graduates are expected to be positively influencing their working ethics. Comprehensive capability of graduates is linear to their competency which also increases their employability.

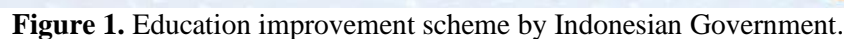
## 1. Introduction

Over decades, international partnerships have become essential in many aspects including business, industrial field, healthcare, education, environmental projects, etc. It is seen as a potential approach to achieve society welfare. The world has grown borderless in which cross-continent collaborations are common. People movement from western countries to eastern countries are normal nowadays. Further, interdisciplinary study field, multiculturalism and tri-lingual phenomenon are exposed in daily basis. The challenges which are faced by the society getting more tense with the move of modernisation.

However, these modern society results in some challenges which sometimes bring objections not only in a workplace but also in education field. Academic interactions between students and University staffs are affected by many aspects such as language, culture, common courtesy, etc. Difference in language and culture may affect the interaction due to difficulties in understanding both parties [1]. Therefore, collaborations between countries with similar cultural background could be a solution to overcome these barriers. Being as Eastern countries make Indonesia and Japan share some similar Asian cultures. In 2018, both countries were celebrating 60<sup>th</sup> year of collaboration in which many fields have been continuously developing i.e education, economic, transportation and infrastructure [2].

In order to provide insight on the bilateral collaboration between countries, especially in education field, detailed discussion is required. Figure 1 shows the prospective collaborations in Education Field by Indonesian Government [3].

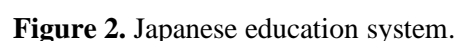




## 2. KOSEN Education System

Japan offers unique vocational education which is called as KOSEN, an abbreviation of Japanese form “koku-ritsu-kou-gyou-KOU-tou-SEN-mon-gak-kou”, translated as National Institute of Technology (NIT). Detail of Japanese Education System is presented in Figure 2 [4].

KOSEN — five-year engineering education from 15 years old. After graduating from KOSEN, most students go to advanced universities or Advanced Courses (AC) of Colleges, while the others find employment.



According to National Institute of Technology Brochure [5], there are some characteristics of KOSEN which are:

- Unified five-year education from 15-year old (Regular Course).
- Wedge-shaped education: designed to generate an upward spiral of knowledge and ability.
- Top-up two-year degree program (Advanced Course).
- More than 80% of faculty members hold the highest degree in their research field.
- Cooperation with industry through internships and other co-op education programs.
- Inter-college competitions such as Robot Contest, Programming Contest and Design Contest.
- Student dormitories available at all colleges provide opportunities for personal and educational growth.
- Positives reviews from industry and academia.
- Approximately 99% of NIT graduates seeking employment get jobs in their field of study.

Students graduating from Junior High School in Japan have possibility to continue into two different schools which are Senior High School or Vocational Study (in this case is called as KOSEN). For those who chose to enrol in Vocational School, then they will have 5-year unified education in KOSEN. Students can choose various concentrations such as Engineering, Shipping and Maritime Technology as well as Architectural Science [4][5].

In KOSEN, the education system follows wedge-shaped theory as an upward spiral which equally provide experiment phase and lecture phase. It aims to train the students to have practical skills that improve their employability. This also supported by various student activities during their time in the college such as inter-college competition in robotic, programming or design contest.

Upon completion of 5-year education in KOSEN, students can also continue to Advanced Course. This is equal to Bachelor Degree in regular education system. The purpose is to give more experience to the students and exposition in industrial application through internships and other co-op education programs.

## *2.2. National Institute of Technology, Akashi College*

National Institute of Technology, Akashi College is located in Akashi City. It is on the west side of Kobe City, one of the biggest international port cities in Japan. Akashi College is recognised as one of outstanding KOSEN in Japan. It was first founding as Akashi College of Technology on 1st April 1962, one of the first 12 technical colleges in Japan. KOSEN is also known as National Institute of Technology in Japanese Education System. Students are accepted after Junior High School to enrol in 5-year of education. After 5-year of study, graduates can either start to find jobs or continuing to higher degree via Advanced Course Program. Advanced Course is a 2-year program after KOSEN to gain a Bachelor Degree.

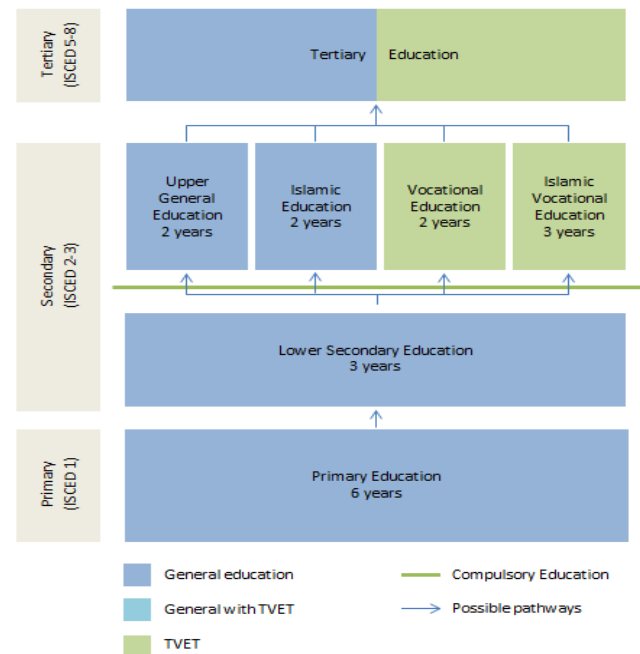
Akashi College has been home for approximately a total of 850 students and 80 lecturers in which around 160 students are accepted each academic year with 40 students in each department. General Studies subjects are given to all students where the proportion of General Studies and Specialised Subjects are changing along the grade of students. At first grade, students receive more subjects on General Studies such as Mathematics, English Language, Physical Education, etc. The higher grade of students, the less General Studies subjects received while the more Specialised Subjects are given. Akashi College has 4 departments which are:

1. Mechanical Engineering
2. Civil Engineering
3. Architecture Engineering
4. Electrical and Computer Engineering

## **3. Indonesian vocational education**

Formal education in Indonesia starts with elementary school which takes 6 years followed by junior high school and senior high school, which take 3 years, respectively. Upon completion of high schools, Indonesian students can take tertiary study in the university. Moreover, there are two types of vocational

education in Indonesia which are Vocational High School that is acknowledged as secondary education and Vocational Higher Education which is acknowledged as tertiary education [3]. These education schemes are summarised in Figure 3 as follow [6].



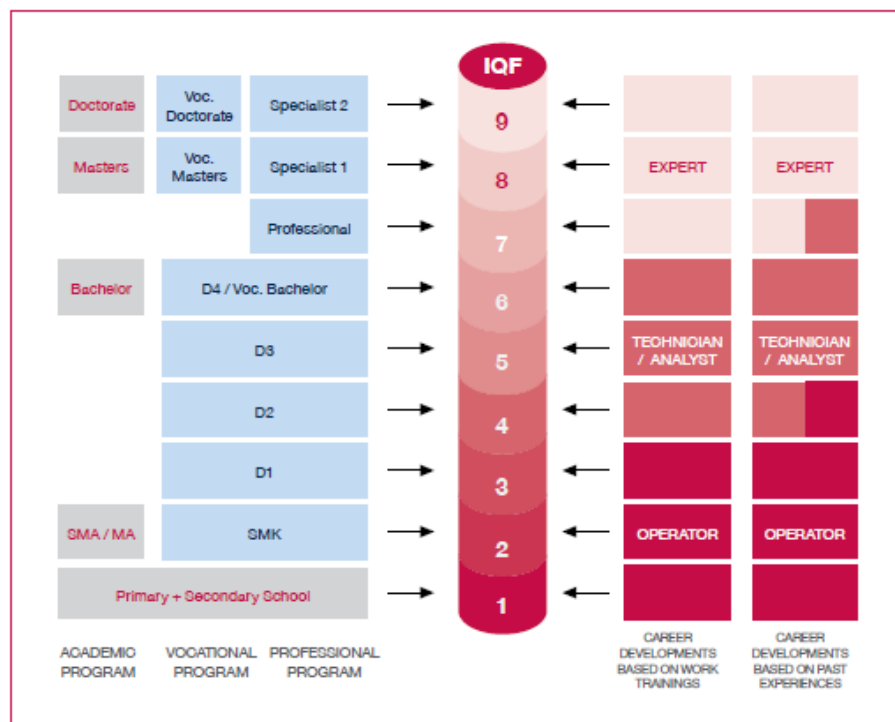
**Figure 3.** Indonesia education system.

There are several legislations which are supporting Technical and Vocational Education and Training (TVET) [6]:

1. The overall structure of the Indonesian education system including TVET is stated out in the National Education System Law, enacted in 2003. It describes all levels of education and the structure attached to each of them.
2. Manpower Act n. 13 of 2003 regulates the national training system (preparation for work).
3. The Teacher Law of 2005 and its respective regulations provide for the organisation of teacher profession and its quality.

In Indonesian education system, the formal education system can be further distinguished into the vocational focus and academic focus. This can be further explained as follow: (i) In the vocational focus, subjects are offered both for academic and practical skills. (ii) While in the academic focus, the curricula only mainly teach general subjects such as religion, math, natural and social sciences. Firstly, vocational education was initiated at the senior high school. Students in their 10th grade who prefer to continue to the vocational focus then will enter the Vocational Senior Secondary Schools (SMK) where students who prefer the general academic focus will continue to the General Senior Secondary Schools (SMA). According to the Higher Education Act, “vocational programs are offered by the varieties of tertiary institutions which consist of community academies, academies, polytechnics, advanced schools, institutes and universities” [7]. Those who are graduated from Vocational Senior High School (SMK) received trainings mostly for entrepreneurship [8].

Universities in Indonesia apart from academic focus, also offer Vocational Degrees in which the curriculum focuses more in training and soft skills developments [9]. Both focuses; academic and vocational, provide further education in undergraduate and postgraduate studies. In order to distinguish the competencies between graduates of Vocational Senior High School and Vocational Higher Education, Indonesian Qualifications Framework (IQF) is implemented which could also known as “Standar Kompetensi Kerja Nasional Indonesia” or SKKNI [7][10]. Figure 4 shows the diagram of IQF [7].



**Figure 4.** Indonesian qualifications framework.

#### 4. Synergy of Japanese KOSEN and Indonesian Vocational School

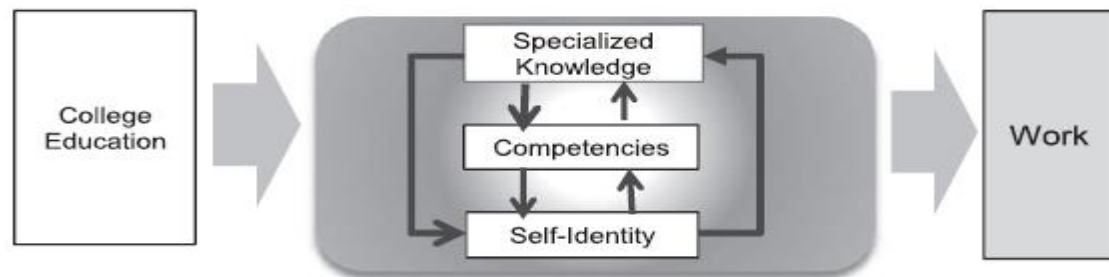
According to The Organisation for Economic Co-operation and Development [11], there are some uniqueness on Japanese tertiary education which are:

- Universities have as their aim to conduct teaching and research in depth in specialised academic subjects, to operate as “centres of learning” and to “develop intellectual, moral and practical abilities”.
- Junior colleges “cultivate such abilities as are required in vocation or practical life”, typically offering two-year sub-degree qualifications within a baccalaureate four-year bachelors degree framework. There are typically progression opportunities to university programmes.
- Colleges of technology, or kosen are institutions offering high-level vocational qualifications through teaching and related research.

These encourage further collaborations with Indonesia specifically in vocational educations. Both systems offer similar focus on developing practical skills of the graduates as well as offering opportunity for entrepreneurship. It is further suggested to follow some objectives in order to achieve the educational goals by some policies such as [12]:

- (i) an international dimension and a global perspective in education at all levels and in all its forms;
- (ii) understanding and respect for all peoples, their cultures, civilisations, values and ways of life, including domestic ethnic cultures and cultures of other nations;
- (iii) awareness of the increasing global interdependence between peoples and nations;
- (iv) abilities to communicate with others;
- (v) awareness not only of the rights but also the duties incumbent upon individuals, social groups and nations towards each other;
- (vi) understanding of the necessity for international solidarity and cooperation;
- (vii) readiness on the part of the individual to participate in solving the problems of his community, his country and the world at large.

Throughout vocational educations, it is expected that the synergy between Indonesia and Japan can be comprehensively achieved. Frameworks which are implemented by both countries can also be seen as the three layers connecting the education field and working requirement. Figure 5 illustrates the formation of network between the education field and work [13].



**Figure 5.** Formation of The Network of Three Layers of Ability.

The synergy is also expected to be beneficial not only for both countries but also for the region itself. Graduates from Vocational School in Japan as well as in Indonesia are well trained for practical skills which improve their employability. This is mutually worthwhile for the younger generations of both countries.

### Acknowledgment

Authors acknowledge Directorate General of Higher Education, Indonesia and The Ministry of Education, Culture, Sports, Science and Technology (文部科学省 Monbu-kagaku-sho), Japan for encouraging collaborations between countries.

### Reference

- [1] McKenzie R M 2010 *The Social Psychology of English as a Global Language Attitudes, Awareness and Identity in the Japanese Context*. (London: Springer Dordrecht Heidelberg).
- [2] MOFA, 2017 *Japan-Indonesia Joint Statement on Strengthening Strategic Partnership*. Ministry of Foreign Affairs.
- [3] Atsushi S 2014 *Indonesia's Development Knowledge through Japan's Cooperation For South-South and Triangular Cooperation*. Japan International Cooperation Agency. Indonesia Office.
- [4] Hayashi Y 2010 *A Guidebook for Engineering Education in KOSEN*. KOSEN Colleges of Technology Japan.
- [5] Taniguchi I 2017 *KOSEN*. National Institute of Technology.
- [6] UNESCO-UNEVOC, 2013 *World TVET Database Indonesia*, I.C.f.T.a.V.E.a. Training, Editor.
- [7] Kadir S, Nirwansyah, and Bachrul B A 2016 *Vocational Education and Technical Training in Indonesia: Challenges and Opportunities for the Future*. National University of Singapore.
- [8] Ramadhan M A and Ramdani S D 2014 *Vocational education perspective on curriculum 2013 and its role in indonesia economic development in The 3th Int. Conf. on Vocational Education and Training (4th ICVET)*. Jogjakarta.
- [9] Sayuti M 2015 *The Indonesian competency standards in technical and vocational education and training : an evaluation of policy implementation in Yogyakarta province Indonesia*. The University of Newcastle, Australia.
- [10] Howard Newby, et al 2009 *OECD Reviews of Tertiary Education Japan*.
- [11] Ishii Y 2003 *Development education in Japan a Comparative analysis of the contexts for its emergence and its introduction into the Japanese school system*.
- [12] Kaneko, M., 2014 *Higher Education and Work in Japan: Characteristics and Challenges*. Japan Labor Review. **11**(2).