Incorporating a Social Implementation Program into a Manufacturing Education Program in Japan: Case Study in Collaboration with a Medical Facility

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Abstract

The College of Technology (called Kosen) is an educational program established in 1962 in Japan to train practical engineers for five years after high school [1]. The curricula of Kosen are characterized by that engineering practice and experiment programs are set from 1st grade and gradually increase as proceed of grade. After that, advanced course for two years was established. In December 2012 the academic policy was changed to bring up the practical and creative engineers who can be active in the various fields. To attain the academic policy Engineering Design Program was attempted. Recently Social Implementation Program was newly proposed instead of Engineering Design Program.

In Numazu National College of Technology (NNCT), considerations of the needs of Shizuoka prefecture’s research culture project and the success of both Brush up Project of Manufacturing Engineers and Fuji Medical Engineer Training (F-met) Project led the College’s staffs to make new curricula based on Social Implementation Program through seven years from teenager. The new curricula were applied from 2013.

Several case studies for Social Implementation Program are executed based on the new curricula of NNCT. A case study in collaboration with a medical facility is described as an example of Social Implementation Program and the effect on a manufacturing education is discussed.

Keywords: College of Technology (Kosen), Practical engineer, Practical and creative engineer, Social Implementation Program, Fuji Medical Engineer Training (F-met) Project

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1. Introduction

Figure 1 shows the education system in Japan. Colleges of Technology shown in Fig. 1 were established for the first time in 1962. At that time National colleges were 12, Public colleges were two and Private colleges were five. After that National colleges of technology\(^1\) were established more during about 10 years. At present National colleges are 51, Public Colleges are three, Private colleges are three and total 57 colleges of technology exist in Japan. In 2004 the Institute of National Colleges of Technology was newly established and 51 National colleges, which locate at over the region from Hokkaido to Kyusyu and Okinawa, belong to the Institute. Advanced course for two years was established at all colleges of technology of 57. Students who completed the advanced course get the degree of Bachelor of Engineering and students who completed College of Technology get the degree of Associate Degree of Engineering. In Japan Colleges of Technology are also called “Kosen”.

In OECD Reviews of Tertiary Education JAPAN published in 2009 [2], Colleges of Technology are explained as follows;

They provide vocational education for those between the ages of 15 and 20, with the possibility of “topping up” to a full degree. They are widely admired internationally, not only for the quality of the high-level vocational training they offer, but also for their degree of responsiveness to the needs of Japanese industry, especially the manufacturing sector. (page 16)

They are effectively planned and coordinated through the Institute of College of Technology and combine high levels of quality assurance, innovative pedagogy, attentiveness to stakeholder needs (especially employers) and a wide geographical spread. (page 25)

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1 “National College of Technology” was renamed to “National Institute of Technology” in 2014, hence, “National Numazu College of Technology” was renamed to “National Institute of Technology, Numazu College”, however, in this paper Numazu National College of Technology (NNCT) is used.
The Washington Post on October 14, 2011 [3] reported Tokyo National College of Technology in an article entitled “With workplace training, Japan’s Kosen colleges bridge skills gap”.

In this paper, first the industry of Shizuoka Prefecture, where Numazu National College of Technology (NNCT) is located, is explained by an article of Naturejobs, 2 December, 2010 [3]. Second the profiles of NNCT, especially, engineer education of NNCT, when the cooperative activities with neighboring manufacturing companies and Pharma Valley Project of Shizuoka Prefecture were executed, are expressed. Third the new curricula of NNCT, in which Social Implementation Program is thought as important based on the success of the cooperative activities, is described. Last a case study in collaboration with a medical facility is executed as an example of Social Implementation Program and the effect on a manufacturing education is discussed.

2. Industry of Shizuoka Prefecture and Profiles of Numazu National College of Technology (NNCT)

2.1. Industry of Shizuoka Prefecture


The Shizuoka prefecture shown in Fig. 2, in which Mount Fuji certified as World Heritage exists in the northern region, has long held a special place in the hearts of Japanese, as both a destination for spiritual healing and a source of some of the country’s finest produce. Yet ever since Japan opened its borders to the wider world, Shizuoka’s proximity to Tokyo and location on the main Tokaido east-west trade route has also allowed the region to benefit from an infusion of cultures of innovation and entrepreneurship from around the globe. So while the epithet “Made in Fuji Country” might once have referred to green tea and pottery, the notion has now come to mean much more. The region is now a hive of manufacturing and pharmaceutical activity—famous internationally for its car makers Yamaha, Honda and Suzuki—with a burgeoning innovation sector in pharmaceuticals, medical devices and
healthcare products. Shizuoka’s reputation as one of Japan’s most active manufacturing centers is highlighted by its regular appearance as one of the top three prefectures in Japan in terms of manufacturing output for pharmaceuticals and medical devices.

What makes Shizuoka more than just a manufacturing powerhouse, however, is the concerted support of the prefectural government and underlying “Fuji spirit” that marries technological innovation. Inspired by the fertile manufacturing and pharmaceutical culture, the prefectural government launched the Shizuoka Triangle Research Cluster Project shown in Fig. 3 to support the establishment of local and international companies and promote innovation and collaboration in the region. Shizuoka’s continued prosperity is due in no small part to this innovation cluster initiative.

Forming the three apices of the Shizuoka triangle are the areas known as Photon Valley in the west, Pharma Valley in the east, and Food Science Hills draping the foothills in between. Photon Valley was founded around the world-leading optics and electronics technology of companies in the city of Hamamatsu, which is also the base of the world-renowned technology company of the same name. In the central Shizuoka, the Food Science Hills Project aims to utilize the region’s agricultural resources to produce foods with amplified health benefits or pharmaceutical enhancements.

Exemplifying the prefectural government’s vision for the cluster initiative, however, is the Pharma Valley Project, centered around the Shizuoka Cancer Center in the region’s east. Envisaged as a health science community with the impressive state-of-the-art Shizuoka Cancer Center at its heart, Pharma Valley is rapidly becoming a world-renowned destination for medical treatment and the development of advanced therapies and pharmaceuticals. Ten years in the planning and backed by considerable prefectural funding, the center was established in 2002 on hills overlooking the lowlands of Pharma Valley, and now forms an integral part of the region’s healthcare and innovation infrastructure. It is one of the most advanced cancer hospitals in the world, serving as a model for cancer hospitals throughout Japan and a prestigious venue for advanced studies and specialist medicine.

The Pharma Valley Project also facilitates translational research on new technology—the second and third generations of a device or treatment can be developed quickly here based on direct interaction with patients. So effective is the Pharma Valley model, the project has earned designation as a “Regional Innovation Cluster Program”, making it eligible for a further round of funding for research activities from the Japanese Ministry of Education, Culture, Sports, Science and Technology.

2.2. Profiles of Numazu National College of Technology (NNCT)

Numazu National College of Technology (NNCT) was established in 1962, which was composed of Mechanical Engineering Department of two classes (80 students) and Electrical Engineering Department of one class (40 students). At present the NNCT consists of five departments, which are Mechanical Engineering, Electrical & Electronics Engineering, Electronic Control System Engineering, Control & Computer Engineering and Chemistry & Biochemistry Engineering of each one class, and three Advanced Courses (24 students) of Environment & Energy, Multi-functional Material and Development of Medical & Welfare Instrument.

After Cooperative R & D Center was established in 2004, cooperative researches for manufacturing technology were actively executed between NNCT and neighboring companies, and some of 5th grade students and advanced course students participated in the research as experimental or analytical staffs. At present some cooperative researches are being continued.

2.2.1. Brush up Project of Manufacturing Engineers in Small and Medium-sized Enterprises supported by Ministry of Economy, Trade and Industry of Japan (Three years for 2006 ~2008)

This project was newly planned by the staff of Cooperative R & D Center of NNCT under supporting by the Numazu Chamber of Commerce and Industry, and the fund of Ministry of Economy, Trade and Industry in order to brush up manufacturing engineers in small and medium-sized enterprises. A onetime executive of Toshiba Machine Company Ltd. was installed as the project leader, a head of Cooperative R & D Center of NNCT was installed as the project sub-leader and Numazu Chamber of Commerce and Industry was installed as an administrative corporation.

The programs of the project were consisted of six fundamental and applied courses and four cutting edge
courses, and much practical training time was programmed in each course. All courses were taken charge of NNCT professors and professional engineers having a lot of experiences. Table 1 shows the constitution of whole programs of the project.

Table 1. The Constitution of whole programs of the project

<table>
<thead>
<tr>
<th>Fundamental &amp; applied courses</th>
<th>Main place</th>
<th>Lecture &amp; Training</th>
<th>Trainees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial Material</td>
<td>NNCT*, NITSC**</td>
<td>L: 12 times, T: 5times</td>
<td>12</td>
</tr>
<tr>
<td>Cutting Technology</td>
<td>NNCT</td>
<td>L: 6 times, T: 6times</td>
<td>10</td>
</tr>
<tr>
<td>Measurement Technology</td>
<td>NNCT, NITSC</td>
<td>L: 7 times, T: 8times</td>
<td>8</td>
</tr>
<tr>
<td>Electric &amp; Electronic Circuit</td>
<td>NNCT, NTC***</td>
<td>L: 9 times, T: 7times</td>
<td>10</td>
</tr>
<tr>
<td>Mechanical Design</td>
<td>NNCT, NTC</td>
<td>L: 9times, T: 11times</td>
<td>10</td>
</tr>
<tr>
<td>CAD/CAM technology</td>
<td>NNCT, NTC</td>
<td>L: 7 times, T: 8times</td>
<td>10</td>
</tr>
<tr>
<td>Cutting edge courses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High speed milling of Metal Mould</td>
<td>NNCT</td>
<td>L: 3 times, T: 4times</td>
<td>6</td>
</tr>
<tr>
<td>Challenge for machining accuracy</td>
<td>NNCT, NITSC</td>
<td>T: 7 times</td>
<td>6</td>
</tr>
<tr>
<td>Grinding simulation</td>
<td>NNCT</td>
<td>L: 4 times, T: 2times</td>
<td>6</td>
</tr>
<tr>
<td>Training at company</td>
<td>5 Company</td>
<td>About 2 weeks</td>
<td>5/Company</td>
</tr>
</tbody>
</table>

* Numazu National College of Technology, ** Numazu Industrial Technology Support Center  
*** Numazu Technical College, One lecture or Training lasts 90 minutes.

Total trainees for three years (2006～2008) are about 180 engineers for fundamental and applied courses and about 50 engineers for cutting edge courses. Since these programs were assessed highly by heads of company who dispatched trainees, several programs were continued after 2009 as well by the fund from Economic & Industry Division of Shizuoka prefecture.

### 2.2.2. Fuji Medical Engineer Training (F-met) Project supported by Ministry of Education, Culture, Sports, Science and Technology of Japan (Five years for 2009～2013)

Pharma Valley Project in the eastern region of Shizuoka prefecture shown in Fig. 3 was started from 2001 by the organization which are composed of the central core of Shizuoka Cancer Center, Numazu National College of Technology (NNCT), Tokai University, 12 cities and ten or more medicines’ and medical appliances’ companies shown in Fig. 4.

The purpose of Pharma Valley Project transforms the foothills of Mt. Fuji in the eastern region of Shizuoka prefecture into the area where industries concerning medical appliances, medicines and health are concentrated and the area is prospered. By the leadership of Shizuoka Cancer Center it is attained the forwarding amount of medicine & medical alliances of Shizuoka prefecture maintains top of Japan over the recent five years from 2012. On the other hand, small and medium-sized enterprises in foot hills of Mt. Fuji, which manufacture automobile’s parts until then, wanted gradually to hope manufacture of medical appliances by the ripple of effect on Pharma Valley Project. However, in order to enable to manufacture medical appliances it was necessary that skill-up of manufacturing engineers and master of the Pharmaceutical Affairs Law must be attained.

Fortunately Fuji Medical Engineer Training (F-met) Project for five years from 2009 to 2013, for which NNCT applied in collaboration with Shizuoka Cancer Center and Pharma Valley Center, was adopted by Ministry of Education, Culture, Sports, Science and Technology of Japan. NNCT planned the whole training program of the F-met Project in collaboration with doctors of medicine of Tokai University, professionals of the pharmaceutical affairs law, medical facilities and medical appliances incorporations, and administered the Project being supported by Pharma Valley Center. Table 2 shows the constitution of two year’s programs of the F-met Project.

Several professors of NNCT take charge of instructor in some programs and coordinate internship at medical facilities, care facilities or medical appliances plant. As a result a closely cooperative relationship between NNCT and companies for trainees to belong, and also medical facilities, care facilities or medical appliances plant. For example more than 50 themes to develop are consulted with professors of NNCT and some of them are executed as the theme of Social Implementation Program by the 5th grade students or advanced course students.
The programs shown in Table 2 were executed on every other Saturday through two years at NNCT and Tokai University. Moreover, several internships were planned at medical affairs, care facilities or medical appliances plants. As shown in Table 3 total 73 trainees completed the F-met programs until now, who are 43 trainees for five years from 2010 to 2014 and 30 trainees from after 2015 to now. At present the 73 trainees are joining in the activity of Pharma Valley Project for some sake or other.

Table 2. The Constitution of two year’s programs of Fuji Medical Engineer Training (F-met) Project

<table>
<thead>
<tr>
<th>1st year</th>
<th>2nd year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical basic technology I</strong> <em>(Term : April – September)</em></td>
<td><strong>Medical basic technology IV</strong> <em>(Term : April – September)</em></td>
</tr>
<tr>
<td>Pharmaceutical affairs law &amp; its application *</td>
<td>Control application for medical equipment</td>
</tr>
<tr>
<td>Clinical medicine &amp; Clinical engineering</td>
<td>Embedded software in medical equipment</td>
</tr>
<tr>
<td>Living body measurement &amp; Medical material</td>
<td>Training for medical equipment</td>
</tr>
<tr>
<td><strong>Medical basic technology II</strong> <em>(Term : October – next March)</em></td>
<td><strong>Medical advanced technology I</strong> <em>(Term : October – next March)</em></td>
</tr>
<tr>
<td>Quality &amp; safety for medical equipment</td>
<td>Advanced medical engineering <em>(Omnibus)</em></td>
</tr>
<tr>
<td>Machining technology for medical material</td>
<td>Development of new medical equipment</td>
</tr>
<tr>
<td>Design of medical equipment</td>
<td>Analysis of new medical equipment</td>
</tr>
<tr>
<td><strong>Medical basic technology III</strong> <em>(Term : April – next March)</em></td>
<td><strong>Medical advanced technology II</strong> <em>(Term : April – next March)</em></td>
</tr>
<tr>
<td>Management of technology &amp; plant tour</td>
<td>Internship at medical affairs, care facilities or medical appliances plant</td>
</tr>
</tbody>
</table>

* Each course is constructed by 15 times of lectures or trainings. One time lasts 90 minutes.

The qualification for production & marketing of medical equipment is given to the trainee who completed the 2 year’s programs of the F-met project from Shizuoka prefecture.

Table 3. Number of trainees who completed F-met programs

<table>
<thead>
<tr>
<th>Year</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015~now</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of trainees completed</td>
<td>10</td>
<td>10</td>
<td>7</td>
<td>10</td>
<td>6</td>
<td>30</td>
<td>73</td>
</tr>
</tbody>
</table>
Although the funds from Ministry of Education, Culture, Sports, Science and Technology of Japan finished at 2013, the F-met program is being continued until now being supported by the funds from Shizuoka prefecture under strong needs from small and medium-sized enterprises in the region of foothills of Mt. Fuji.

2.2.3. New Curricula of Numazu National College of Technology (NNCT)

The curricula’s characteristics of College of Technology (Kosen) are that the programs of engineering practice and experiment are set from the 1st grade and the programs increase gradually as proceed of grade. The academic policy of Kosen when established in 1962 was to bring up practical engineers. In about 1992 the academic policy was changed to bring up the engineers who can find and solve a problem. Therefore, to achieve the policy PBL (Project Based Learning) program was adopted in the engineering practice and experiment of higher grade. In December 2012 the academic policy was changed again to bring up the practical and creative engineers who can be active in the various fields. To attain the academic policy Engineering Design Program was attempted. However, since the necessity of Engineering Design Program did not be understood thoroughly by the staffs of Kosen. Therefore, Social Implementation Program was newly proposed instead of Engineering Design Program in several Kosen.

In Numazu National College of Technology (NNCT), considerations of the needs of Pharma Valley Project and the successful results of both Brush up Project of Manufacturing Engineers and F-met Program led the College’s staffs to make new curricula based on Social Implementation Program in order to bring up the practical and creative engineers in the various fields. Figure 5 shows the whole constitution of the new curricula of NNCT applied from 2013. As shown in Fig. 5 the new curricula are characterized by Engineering basic program, which consists of Engineering basic practice of 1st grade and Mini-research of 2nd grade and Social Implementation Program, which consists of Relation between Society and Engineering of 4th grade, Research for graduation of 5th grade in Main course, Internship for four months of 1st grade of Advanced course and Advanced course research for two years.

Every year a half of about 200 graduates of main course enter industrial employment as manufacturing engineer or design engineer and about 100 graduates of the remains proceed to the next stage of education. About 30
graduates proceed to Advanced course of NNCT and about 70 graduates of the remains mainly proceed to the 3rd grade of Engineering Department of National University.

3. Case Study in collaboration with a Medical Facility—Development of Monitoring System for Watching Patient in the Sickroom applying Image Processing

At present watching a patient being hospitalized in the sickroom is commonly executed by round of nurse or a leave sensor from bed. However, a patient had already dropped from bed many times when a usual leave sensor sensed abnormal condition since a usual leave sensor can’t monitor a patient and occasionally an incorrect operation occurs. As part of Pharma Valley Project a development of monitoring system, by which a patient’s motion can be continuously watched, was required from a medical facility to reduce the above-mentioned accident. A professor of NNCT planned to execute the development as a theme of research for graduation of 5th grade student and also a concrete case study of Social Implementation Program. Three students of 5th grade in Control & Computer Engineering Department took in charge of the development for one year under the guidance of the professor.

The case study was executed based on an approval by the ethics committee of the medical facility.

3.1. Constitution of Monitoring System

Hardware

By using an infrared sensor to be able to detect a patient’s position and motion on the bed, a color picture and a distance from object can be detected even at night in a sickroom. Figure 6 shows a hardware constitution of the monitoring system developed. As shown in Fig. 6 a PC connected to Kinect for Windows monitors in the sickroom and a patient’s situation can be grasped by the application software of monitoring system.

Software

Software used is shown as follows;
OS : Windows 7
Language : C# on NET Frame Works 4.0
Library for Image Processing : Open CV
Lapper for C# : Open CV Sharp
Controller for Kinect : Kinect for Windows

Arrangement of Kinect sensor

As shown in Fig. 7 Kinect sensor is set at the position where is 0.85 m apart from bed end of foot side and 1.95 m height in order to be able to be monitored whenever a patient is laying anywhere on bed. A visual angle of the sensor can be changed within the range of 45° in vertical direction and 57° in horizontal direction by running a tilted motor. By pre-experiments it is confirmed that four situations, which a patient is laying on bed, sitting on bed, sitting at the end of bed and standing near bed, can be discriminated by this monitoring system [5][6].
3.2. Method to Identify Bed Area

First, a user clicks 1, 2, 3, 4 point at 4 corners of bed in a clockwise direction on the PC screen as shown in Fig. 8(a). The four points are stored as three dimensional data in Open CV after two dimensional data of X and Y on the PC screen based on the coordinate axis shown in Fig. 9 is combined with a depth data Z obtained by Kinect. By using different three points in four points of 1, 2, 3 and 4 shown in Fig. 8(a) an equation of plane is computed. After that four vertical vectors are calculated as shown by blue arrows in Fig. 8(b).

As shown in Fig. 8(b) four vertical vectors are calculated for four triangles to reduce the error of depth data Z measured by Kinect. After that vertical vectors are checked for all pick cells of bed area on the PC screen. Namely, when the vertical vector decided by clicked two points in 1, 2, 3 and 4 and a newly checked point coincides with standard vertical vector shown in Fig. 8(b), the newly checked point is decided as a point on bed area. After this operation is repeated for all pick cells of bed area on the PC screen, a bed area can be decided.

Moreover, to improve a precision in deep direction Z of bed area a standard line is decided as a red thin line shown in Fig. 10 which is vertical to the connecting line between point 1 and 2 and through midpoint between 1 and 2. An intersection point between a green scan line in X direction and the red standard line shown in Fig. 10 is defined as a standard depth. By shifting the green scan line over the whole bed area each standard depth is determined for all pick cells of bed area on the PC screen. By comparing each standard depth with the depth of the point decided by vertical vector above-mentioned, points of which the difference is over 20 mm are excluded from the bed area.

3.3. Method to Detect Tossing about in Bed

A posture of human during sleeping is classified into four postures, which consist of supine, facing right, prone and facing left. The four postures transfer as shown in Fig. 11. In this paper tossing about in bed is defined that one posture transfers to another posture. A method to detect tossing about in bed is newly tried since a patient tosses about in bed many times when he has a desire to urinate.

To detect tossing about in bed, the difference of background picture between Fig. 12(a) when a patient

![Figure 8. Method to identify four vertical vectors](image)

![Figure 9. Decision of coordinate axis](image)

![Figure 10. Method to improve precision of depth in Z direction of bed area](image)

![Figure 11. Transference among four postures of supine, facing right, prone and facing left](image)
is not on bed and Fig. 12(b) when he is on bed, is taken out as a map by image processing. The maximum different point in the depth data on the map is taken as representative point of human on bed. The representative point of human obtained by this method is shown by red point on Fig. 12(c). When a patient tosses about in bed, the position of representative point shifts not only in X-Y plane but also in Z direction. Since the position of the representative point in Z direction changes largely between supine, prone shown in Fig. 13(a) and facing right, facing left shown in Fig. 13(b), it can be judged that a tossing about in bed happened when the position of representative point goes over a certain value in Z direction. Considering a measuring error of Kinect and a malfunction caused by micro movement, it is judged that a tossing about in bed happens when the position of representative point in Z direction goes over 150 mm during a series of continuous 15 frames on the PC screen.

3.4. Verification of Detecting tossing about in Bed

By employing the monitoring system tests to detect tossing about in bed are executed in a sickroom of hospital. Two examples of tested results are shown in Fig. 14 and Fig. 15. Figure 14 shows PC screens tested when a blanket is not used and Figure 15 shows those tested when a blanket is used.

In Fig. 14 it is recognized that tossing about in bed occurs when PC screen is changed from ① to ②, from ③ to ④, from ⑤ to ⑥ and from ⑦ to ⑧, and at that time red letter of Turn is shown on PC screen of ②, ④, ⑥ and ⑧. On the other hand in Fig. 15 it is seen that tossing about in bed occurs when PC screen is changed from ① to ②, from ③ to ④, from ④ to ⑤, from ⑥ to ⑦ and from ⑦ to ⑧, and red letter of Turn is shown on PC screen of ②, ④, ⑤, ⑦ and ⑧.
3.5. Effect of Case Study on Manufacturing Education

This case study was executed for one year as an example of Social Implementation Program by three 5th grade students under guidance of a professor. The students expressed themselves through their experiences of the Social Implementation Program as follows;

1) Their motivation is excited by hearing directly the problem of a patient being hospitalized in the sickroom from staffs of a hospital facility.
2) It is enjoyable that three students discuss and create the constitution of the monitoring system under guidance of a professor.
3) How to use of both hardware and software for the monitoring system can be mastered.
4) It is very excited to verify detecting for a patient to toss about in bed in the sickroom and to evaluate the monitoring system made by them.

By this Social Implementation Program the students can experience hearing the need of claimant, creating the system to solve the need, manufacturing the system practically and verifying the performance of the system. The four experiences of students must be fundamentals of manufacturing.
4. Conclusions

After the Colleges of Technology (Kosen) in the education system of Japan are introduced, the process until the new curricula are established in Numzau National College of Technology (NNCT) is explained. After that the case study of Social Implementation Program is executed and its effect on a manufacturing education is discussed. Obtained results are summarized as follows;

(1) The success of Brush up Project of Manufacturing Engineers and Fuji Medical Engineer Training (F-met) Project conducted the establishment of new curricula of Numzau National College of Technology (NNCT) in which Social Implementation Program is regarded as important.

(2) Closely cooperative relationship between the staff of NNCT and neighboring companies and also medical facilities, care facilities or medical appliances plant enables to execute the Social Implementation Program. More than 50 themes are consulted with the professors of NNCT.

(3) As shown in the Case Study mentioned above, by the Social Implementation Program students can experience hearing the need of claimant, creating the system to solve the need, manufacturing the system practically and verifying the performance of the system. The four experiences of the students are the most significant items in manufacturing education in order to bring up a practical and creative engineer who can be active in the various fields.

(4) Students who graduated main course and advanced course after learning Social Implementation Program are accepted at excellent company. Some of them are active in the field of manufacturing medical implants at a medical appliances plant.

References


   http://nature.asia/shizuoka-spotlight
