Cultivating Peace Engineering
in Four Different Approach

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Abstract—To cultivate conscientious peace engineers, much discussion about the effective ways to foster creative collaboration and empower innovative ideas are needed. In this study, we devised and carried out four different ways to educate engineers. Then, we compared the significance and social impacts of each method. First, a blog and website were used as a means of indirect practice of peace engineering. 3 years of providing high tech engineering knowledge through blog 'Studying Engineers' and reached countless would-be-engineer readers and teachers. 'Eti' delivered foreign start-up business news and held interviews with venture capitalists and CEOs. In doing so, readers interested in tech-based start-up attained high-end financial trends. For direct practice, two social organizations were used to foster various volunteer activities and offline meetings. Students with different majors gathered at 'Young Engineers Honor Society' further promoted engineering activities, and 'Engineer's Imagination' for would-be-engineers. The infrastructure of the group had the driving force for regular activities. Furthermore, they promoted fervent exchange of their expertise knowledge. Analyzing different ways could help engineering students learn, and help each other in order to grow into engineers that practice peace engineering in the future and appreciate the large social impacts it can bring.

Keywords—Peace Engineering; Education; Engineer students; South Korea

I. INTRODUCTION

In South Korea, a lot of the engineering related, high technology information is explained in English, and it is a widely shared hardship for students or outsiders of the academy who are not familiar with English to access and understand the information. In addition, the increasing educational gap between Seoul and rural areas has widened, with students in rural areas significantly lacking access to engineering education. Engineers do not have many opportunities to interact with students with other majors or to think about how society needs engineering.

The problems described above are why university students should practice Peace engineering. You can post your knowledge in Korean so that anyone can see it, visit a local school, open an engineering experience class, or hold a major presentation. It can also create synergistic effects by networking with other students or students of the same field of interest.

To foster responsible peace engineers, much discussion about the effective ways to educate peace engineering from a college student's point of view is in great need. For this reason, we classify the methods by indirect and direct approach.

II. METHOD

A. Method1. Indirect approach

A.1. Studying Engineers (Blog)

1) High tech engineering knowledge
The blog "Studying Engineers" not only provided high tech engineering knowledge to the public, but also explained the material in a descriptive way so that any foreigner of the academics could understand easily.

2) College class materials explained
In addition, latest research results and engineering class materials which are mostly in English were translated into Korean and explained in an elaborate manner. Engineering students as well as students majoring in pharmacology and medicine engaged as writers, so that the blog covered broader areas of academies.

3) Donation
All profits generated through the increase in blog subscribers were donated to donation organizations related to engineering education.

A.2 Eti (Website)

1) Writing Eti news

1.1) Hot 7
Every week, under the name 'Hot7', writers chose seven of the week''s most influential startups, investments, and technology trends. This article mainly referred to

foreign news sources such as TechCrunch and others. Articles were written in Korean. Students who worked as writers of Eti come from various backgrounds, such as electrical engineering, computer engineering, mechanical engineering, design, and so on.

1.2) Individual report

Aside from Hot 7, writers occasionally wrote individual articles in depth about topics they were interested in to post on the website. So far, articles have been written under various themes such as blockchain, self-driving car, VR/AR, etc.

2) Networking

2.1) Technical-based club meetings

At Seoul National University, Eti organized an offline event where a number of technology-based clubs gathered together for networking. Students who were interested in starting businesses and high-end technology as well as professors participated. Entrepreneurs who were interested, and senior employees who had already started businesses joined in to galvanize the event.

2.2) Interviews with venture capitalists and CEOs

Venture capitalists who were interested in the works of Eti sporadically met with the website. Also, Eti interviewed the CEO who graduated from Seoul National University.

B. Method2. Direct approach

B.1. YEHS (Young Engineers Honor Society)

1) Networking

1.1) Study group

In the name of YEHStudy, students of the same field of interest gathered together to conduct the study. During the vacation, one student would part-take as a teacher, and other students to learned about the topic.

1.2) Seminar with senior members

Communication between graduates and students was also active. An annual Senior Seminar, where about 10 graduate senior members of each field each gave lectures and career advice to junior members. Depending on the specific career path area, juniors were able to select which senior members to meet and speak to.

1.3) Regular Seminar

YEHS holds three to four regular seminars a year. Any members of YEHS can volunteer as the speaker of the seminar to time to talk about lecturer's profession. Discussions are actively held after each lecture. The speaker consists mainly of graduates, with more depth and professional seminars.

1.4) Open Seminar

Open seminars are open events where outsiders of the YEHS could participate. Usually, professors, CEOs, and executives of numerous companies were invited to part take.

1.5) Workshop

The workshop was held one or two times a year during vacation. In these workshops, participants visit companies or invite speakers. As an engineer, people were divided into several teams to discuss about the topics that are worth worrying about and brainstorm the path in which YEHS should move forward.

2) Social contribution

2.1) Major briefing session

For high school students who were not familiar with each major in college, YEHS conducted 'Major briefing session'. Engineering students from various departments visited high schools to explain their major in detail and held group interviews with students.

2.2) Junior Engineering Classroom

YEHS visited elementary schools in rural areas and educated engineering by putting science kits together.

B.2. Engineer's imagination (Club)

1) *Social contribution for high school students*

1.1) Engineering Frontier Camp

In every vacation, four or five times, the Engineering Frontier Camp was held for high school students who were interested in engineering. The camp involved mentors from every major of Seoul National University's engineering department, and about 80 high school students participated in each camp. Students chose the major they were interested in and participated in the camp with the chosen mentor of the department. The camp was held in the campus of Seoul National University.

1.2) Engineer's Dream Magazine

Four times a year, the club published magazines about engineering for high school students. High school students could access it offline and read it easily on the Internet. The magazine covered a number of subjects, about engineering classes, campus life, and the field of engineering.

III. RESULT

A. Indirect approach

1) Advantages of Indirect approach

Indirect approach, which included managing a blog and a website had various characteristic advantages.

Owing to the essence of the media, it was possible to communicate actively through comments. In addition, quick information updates were available, breaking the economic and geographical limitations of the readers. Thus, people could easily access the material through Internet browsing and the blog and the website enabled a wide range of accessible readers.

2) Limitations of the Indirect approach

There was limitation timewise because members of the website/blog managing team were all engineering students who were already almost always faced with plentiful of tasks. As a result, it was difficult to recruit new writers, an obstacle to producing plenty of articles from various fields.

A.1. Studying Engineers

The blog provided high-tech engineering information in blog format, on Korean-based portal sites, which are represented by Naver. It explained not only the engineering material, but also Calculus, General Chemistry, General Biology, General Physics, Programming Basics, and so on. In 3 years, about 300 articles were posted on the blog, and a total of 1,542,178 visits were counted. On average weeks, about 15,000 visitors were counted. Analyzation of the visitors of the blog showed most of the readers were in their early 20s, predictably university students who are trying to learn college material and got to internet to obtain more information.

1) Advantages

Since the blog was operated in the most popular search engine in Korea, the the inflow of Korean readers was very active. Plus, through the "neighboring" blog function, other study blogs with similar theme could exchange information more openly.

2) Social impact

The blog articles were shared at various Internet study cafes, where many people with same areas of interest join online to learn about specific topics. Moreover, teachers of high school and even medical graduate school referred to them as an in-depth lesson material. Difficult university materials were explained for anyone to read and understand, and the fact people from that information-sharing sites shared and referred to the blog's articles support this claim.

A.2 Eti

For the website "Eti", news of start-up companies all around the world were summarized every week and translated into Korean. Occasionally, topics like blockchain autonomous cars were covered extensively. It also constantly held meetings with the CEO of venture-backed startup and other startup companies to conduct interviews. Moreover, it hosted offline networking event in Seoul National University (SNU) where technology-based clubs gathered and played networking. To increase Eti's accessibility, the text was recorded and produced as a podcast.

1) Advantages

The website also increased its accessibility by using various media such as podcasts as well as written editorials. Not only university students, but also adults like entrepreneurs and CEOs of start-up companies took interest in the website.

2) Social impact

The website vitalized the foundation of technology-based startups. Through activities such as interviewing technology-based start-up companies and listening to the CEO's stories, it provided students who were trying to start a technology-based business invaluable information about starting their own company. It also held events for networking among students and entrepreneurs. Students from various departments, not only engineering college students but also college of arts gathered to break the boundaries of their academies and think of their ideas about start-up companies. Also, networking was made possible mostly with those who had participated in technical-based club meetings previously. Through the network, students could meet someone who worked in the real business world and hear about the actual atmosphere of working for one's own company.

B. *Direct approach*

1) Advantages of Direct approach

Through organizations like YEHS and Engineer's Dream, students with common interest gathered together. These societies were financially supported by certain foundations like the National Academy of Engineering of Korea(NAEK) and the Seoul National University's Office of International Affiars(OIA), which led to systematic, continuous and regular activities.

2) Limitations of the Direct Approach

Since the size of the organization was quite large, it was difficult to actively engage in activities during the semester. Only a small percentage of the total member remained active, since all the activities were done purely voluntary.

B.1. YEHS

Young Engines Honor Society (YEHS), is organization composed of engineering students. It was founded by the National Academy of Engineering of Korea (NAEK), a renowned and exclusive engineering corporate body. Since YEHS's establishment in 2005,

it focused on nationwide networking and social contribution of engineering students.

Engineering students from approximately 20 different universities in South Korea constitute YEHS. Letter of recommendation from the dean of each school's engineering department is needed to apply for the membership of YEHS. Students from all over the nation gather to discuss different engineering areas. Networking between engineering college students has various learning and hobbies, and networking between university students and graduates is also active through seminars. In terms of social contribution, it held countless briefing sessions in which young engineers explain what their major is about, for high school students. Members also go all over the country to educate engineering materials at local children's center.

1) Advantages

Members communicated in a relaxed atmosphere with no hierarchical relationship, which is common upon most Korean societies or clubs. Thus, communication on engineering issues could occur more actively. Also, members could broaden their views about the world through interacting with students from other parts of the nation. During regular seminars, fervent discussions were actively held after each lecture. Through open seminars, it promoted not only YEHS members but also outsiders to engage in engineering discussions.

2) Social impact

Through social contribution activities, engineering education was promoted to high school students as well as elementary school students. In fact, in Korea, there were many cases where students chose their a university major without knowing much about each major. The YEHS's social contribution activities offered these students an accurate and detailed understanding of the numerous majors of engineering department, thus supporting and teaching them more about the prospect of each major.

Networking between various majors and engineering students at various regions of the nation was made possible. In addition, there was active network between engineers already in society and engineering students attending school. In effect, members of YEHS got together and founded engineering-based start-up companies; "Home of the day" (providing a self-contained shopping platform on the Internet), "Polaroid" (manufacture company for detailed location tracing hardware for VR devices), Open Survey/Korea Credit Data (company specialized in collecting and analyzing big data)

B.2. Engineer's imagination

Engineer's Imagination is a student body from engineering department of Seoul National University. It was founded to teach engineering to high school students by publishing monthly technology related magazine and providing information or an interesting introduction to engineering. During vacations, it operated engineering camps for high school students. So far, more than 2,000 high school students have participated in the camp which is held inside the campus of Seoul National University, and many of those students have gone on to become engineering students themselves. It educated the students more about the future of engineering and their possible career paths as engineers.

1) Advantages

Through the club's Engineering Frontier Camp, college engineers could educate directly to high school students and discuss engineering. High school students who participated in the camp got along with the teaching material and plan their careers as engineers.

2) Social impact

High school students could plan their life of being an engineer and think about what they could achieve, and what their goals were through frontier camps.
Through club activities, high school students could visit labs and take engineering related lectures. This experience became a crucial part in their future decision of choosing what university and what major to apply for. The majority of the students who participated in the camp entered engineering major. Furthermore, there were many cases in which the high school students of the frontier camp continued to keep in tough even after entering different universities and majors.

IV. CONCLUSION

Peace engineering is no longer a remote terminology. It is a principle that engineering students must constantly strive to practice after graduation. The various examples presented in this paper suggest greatly about how engineering students can strive to become engineers who actively interact with society and practice responsible Peace engineering. Some of the activities described above are limited to certain regions of South Korea, and there are activities where a nationwide range of university students gather. Each method has clear advantages and disadvantages, as this analyzation reveals. Students around the world are trying to practice Peace engineering in different ways, and they should actively share the various methods so that engineering students can learn them. By comparing various methods, the findings of this paper will play a role as a milestone in choosing the appropriate peer-engaging approach in a particular environment