

## ES Consortium Report

A student from Osaka University

ES consortium symposium was great opportunity to clarify what Engineering Science department is. Although we normally recognized before entering university that the concept of our department is between that of Engineering and that of Science department, it is important that university students and researchers who have studied in ES department consider our department again to improve its concepts. In this symposium, we carried out a debate match to reveal advantages and disadvantage of ES department. We divided ES consortium members into two groups, which suggest ES is necessary in the future or is not necessary in the future.

In first session of final day of this symposium, each group presented their opinion about necessities of ES department. Both groups showed advantage and disadvantage by comparing ES department with Engineering and Science department in terms of curriculums. Interestingly, the concept of ES department is different with each university. For example, the curriculum of ES department in Barkley is similar with Science department but in Singapore is similar with Engineering department. Therefore, the concepts actually are broad. Although we strongly suggested that we have to learn Engineering area and Science area to invent new products, we revealed that we could not show our advantage in real society due to the broad concepts and low profile of ES department in the world.

In second session, we discussed how to show ES department to people in society. To explain to people what ES department is, we can make original lecture connected with people such as “real world project” which is already started in Singapore. Invitations of workers in company, professors in science department and even graduated people in ES department are also good to know what people demanded from ES departments.

In conclusion, we thought ES department is necessary in the future, but we should

improve curriculums and make the student consortium to connect our department with society. Furthermore, we believe that graduated people in ES department can give us new and original education. Finally, I appreciate Prof. Kawahara and Ms. Kawazu for giving me the great opportunity to share the ES concept in the world. I believed the ES Consortium gives us the good opportunity to expand the relation with ES students in the world.

## Summary of consortium

A student from Osaka University

Our team discusses the controversial point of “engineering science(ES)”.

We focused on the curriculum of ES course in each university. We found that classes in ES course are actually the combination of engineer course and science course classes, so that there are few original classes in ES course.

In addition, another problem of ES is lack of common understanding of it. Actually, during our discussing, there is a gap in the image of ES between Japanese students and foreign students.

Therefore I propose two ideas to improve ES.

First, we have to share common perception of ES with people all over the world. Specifically, we should hold an international symposium regularly and send a message to the society, “This is the engineering science”.

Second, we have to establish a new unique class of ES course. In the class, students learn the concept and examples of ES to apply to each studying and researching.

Through the consortium, I found a lot of problem of ES to be solved, but I also saw the possibility of ES to benefit to scientific breakthrough in the future. I feel so proud to learn such an interesting and potential area.

Engineering Science is a bridge between pure science and engineering.

Science focuses on finding on the new theorem which express physical law on the earth.

It is what comes out of pure curiosity or spirit of inquiry and doesn't concern about economical things.

Namely, scientists basically don't care about whether they can develop something useful for human with that new theorem or whether that theorem may result in mass destruction weapon or NOT.

On the other hands, engineering is mainly focus on developing new technology which is needed for actual product.

So engineering is fundamentally affected by economical limit or national policy.

We, Engineering Science have both sides of these engineering and science.

The first side is finding new theorem in order to overcome the problem of existent product or industrial things.

The second side is sublimate existent theorem up to real technology.

These two passes are not independent and sometimes circulate to improve each other.

This character is particularly obvious in the field of bioengineering which have experimental side of dealing organism and engineering side like mass production.

## Sum-up for International Engineering Science Consortium

Ideally, students in Engineering Science can belong to both fields, engineering and science. And they can get the opportunity related both fields.

In fact, however, students in Engineering Science feel that they learn about only engineering or only science. I think this is biggest problem.

Idea is very good, but we can't work out it.

Engineering Science is not so popular in the world. This is second biggest problem.

Most people don't know about Engineering Science.

We have to suggest some ideas for solving these problems.

At first, we may want to hold the big consortium in the world regularly.

We may also want to hold the academic conference and publish international journals.

Secondary, we have to connect the company more, and stimulate each other in our research.

We also have to work together with department of science.

My idea is that all laboratories in E.S should do the research with company and department science.

That's all my opinion.

Thank you very much for holding this consortium.

A student from Osaka University

## International Engineering Science Consortium Seminar

June 24-26, 2013

### Report

A student from University of California, Berkeley

I thought the seminar was a great opportunity to hear different perspectives from around the world about what engineering science is. I realized that this question is not trivial to answer and that each of the universities represented has a slightly different (in some cases fundamentally different) opinion of what engineering science is. While the curriculum at Osaka University is almost an extension of the engineering program, the program at Berkeley is much more theoretical and interdisciplinary, and could almost be classified an applied science program. The University of Toronto has a very structured and rigorous program that includes several core engineering and science courses, but it is very academically demanding and seems like an honors program. I do not think any of these programs are definitively better than the others, but I do think that engineering science programs across the world should collaborate to create a more well-defined, uniform engineering science curriculum. Small differences among programs are good and enable students to choose the best academic program for them; however, when programs are too different, it becomes difficult for employers and graduate schools to evaluate a student's qualifications. Naturally, the process of making different engineering science programs more uniform begins with consortium seminars such as these—in that way, I think this seminar was a great idea and a great success.

In the future, it might be better to make more concrete discussion questions and choose a debate topic that is easier for everyone to contribute to. We had plenty of discussion time, but it was difficult to stay on topic given such a broad topic. Ideally, concrete discussion questions could be chosen that naturally lead to a broad question, such as “What is Engineering Science?” For the debate, it was difficult to debate why engineering science is *not* necessary when all of us chose that major and we were in a room full of engineering science students and professors. Possibly, the debate could be rephrased so as to debate whether engineering science or engineering is more useful to society, a much more balanced question. Overall, I thought the seminar was organized and run very well, especially the excursion to Kyoto on Tuesday, the debate on Wednesday, and the party on Thursday. Ultimately, while we may forget the details of our discussions, each of us will remember eating a traditional Japanese meal, leisurely walking through Kiyomizu Temple in traditional yukata, and celebrating with students from around the world at a party with delicious Japanese food. I hope that we can continue to have meetings throughout the summer—it was a great chance to meet new students and I thought it was really great group of students.

## Engineering Science Seminar

The group I was in was from the “against engineering science” (ES) team. The points that I took away with me were firstly that every university is in a different developmental stage of its curriculum. However, regardless of university, the curriculum is geared with the idea of instilling a multi-disciplinary approach to problem solving. I believe that this is a good point and is a point that will enable ES graduates to stand out and differentiate themselves from the crowd especially during the job hunting process.

However this aspect of engineering science is not adequately publicized and therefore we have not made use of this leverage that we have over other engineers.

This seminar was a great learning experience for me. The proportion and number of local students and international students were perfect. The number of students made it easier to interact with one another and to engage in discussion. This session was extremely informative as students can find out more about engineering science courses the world over. This seminar also served as a good session for students to consider why they have chosen engineering science and what can be done to improve the course.

## Summary

A student from Osaka University

This consortium seminar among Engineering Science students was one of the greatest opportunities to discuss "What is Engineering Science(hereafter referred to as EngSci)?" with great members from NUS (National University of Singapore), KTH (Royal Institute of Technology), University of California Berkeley, University of Toronto, and Osaka University.

- About organizing a consortium seminar

I was assigned to be in charge of organizing this seminar with Thoednithi Kirati, Takuya Ashida, Hiroki Matsuda, Ryoma Kawaguchi at the first meeting. After the meeting, there had been several meetings among Osaka University students, and we had been planning from the beginning for the purpose of making the seminar a success. I think that the making process will definitely be useful to us in future.

This seminar also gave us great opportunities to communicate with students in other laboratories. Without this seminar, there might have not been such opportunities.

This time, not only Japanese students but also international students at Osaka University joined as organizers. This is also a good point because more international communications would be expected before and after the seminar.

- About the seminar itself

It was quite challenging for us Osaka University students to discuss the topic in English with fluent English speakers and summarize our opinion for a debate. This challenging work made us feel it's necessary to improve our English skills.

This time, a debate session was held on the last day of the seminar. The debate session was an idea that Teruhiko Saito suggested to us, and I think that it's a great idea because we tried to make the most use of limited time in order to win the debate. During the debate, however, we Japanese students had difficulties to give own opinions although we had prepared for it. This is because international students spoke too fast and it was quite hard to catch up with their discussion. I think that it is necessary to take it account for the next seminar.

- About our affirmative opinion about "Is EngSci necessary?"

In the debate, we were the affirmative side. We think that EngSci department is necessary in the following reason.

The reason is that EngSci has its own important role. Let us consider a definition of EngSci to see the important role. EngSci is *a department to be built to develop new*



*technology by using multiple expertise* according to a website of EngSci of Osaka University. On the other hand, Engineering is *the application of scientific, economic, social and practical knowledge in order to design, build, and maintain structures, machines, devices, systems, materials and processes*, and Science is *a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe*, according to their definition. From those definitions, it is confirmed that EngSci plays a unique role in finding out *a creative knowledge* to give a great impact on our life beyond estimation by using multiple expertise.

Here, let me give an example of how a creative knowledge has a great impact on our life. It is relativity theory by Einstein. Relativity theory has led to inventions such as atomic bomb, nuclear plant and GPS. Leaving the questions if the inventions have made our life better or not, at least it gave us tremendously great impact on our life beyond estimation. This is why I think that *a creative knowledge* has greater impact than an application. Since it is quite hard to find such *a creative knowledge*, we expect that multiple expertise help us to do that. Therefore, EngSci is necessary.

## **Summary**

A student from University of Toronto

A summary of the points raised in the consortium are as follows, along with possible future improvements.

We concluded that Engineering Science is a necessary program within the university environment. It draws from the principles of both engineering and science, this building upon both ideologies to create a stronger learning toolset. As discussed, Engineering Science is a concept that manifests itself differently across institutions around the world, but has the central goal of establishing a multifaceted approach to solving complex real world problems. Engineering Science students are expected to take both science and engineering courses at a higher level without comprise thus to open their minds to be able to approach problems with a multidimensional view. That being said, Engineering Science students are not expected to be experts of experimental, theoretical and the vast array of engineering tools and principles; rather they are expected to have a balance of depth and breath within these concepts. This allows them to think of solutions at a higher level because the student is able to encompass a vast breath of ideas when solving problems.

As also discussed Engineering Schools around the world vary differently in terms of curriculum and teaching methods. Thus different schools are at different stages of the Engineering Science principle causing this notion to be an evolving one. Thus as a further improvement on this, an international standardized committee can be established to overlook the curriculums around the world.

Other possible improvements to the program more specifically at Osaka university include; establishing better advertisement, more consortiums, better integration between students and companies ,more broader subject matter within the first two years of the program and establishments of graduate Engineering Science programs in universities around the globe.

## Engineering Science Consortium Seminar

Opinion: Engineering Science School is not necessary

1. Curriculum is almost same with those in Engineering School or Science School.
2. There is no real position of Engineering Science in Job Market.
3. Science engineering as an aspect is necessary, but maybe not really need a special school.

Advices for appealing the performance of Engineering Science School

1. Solving real problems using Engineering School way for local communities.
2. Making connection with companies
3. Making some journals, conferences, and awards for the research of engineering science.
4. Opening campus, making the local societies and high school student know engineering science.
5. Making more exchange programs like this consortium to communicate with other engineering science school around the world

A student from Osaka University

I think we could have the nice debate, we thought through what is Engineering Science. It is first time for me to think of it, I felt that Engineering Science can be improvable. We split into 2 teams and debated on necessity of Engineering Science. After that, we found problems of it. Furthermore I think next time we are needed to discuss about how to improve Engineering Science concretely.

A student from Osaka University

Those three days were very interesting time.

First I thought was that all the students who belongs to Engineering Science couldn't explain "What's Engineering Science". Everyone think Engineering Science is in the middle of Engineering and Science.

In debate, we advocate that Engineering Science is not necessary because Engineering Science don't have the exact definition, and there are no Engineering Scientists in real world. Actually, this is true.

But the important thing is that people who belong to the Engineering Science will promote the development of science. I thought “Fusion” is the key word to think about the definition of Engineering Science.

Some of ideas which can raise “Engineering Science” more is to have lectures to high school students. They will think about going to college soon, so if they know and understand about “Engineering Science” major, there will be more chances to get superior students than now. One more thing is only about “Engineering Science” in Japan. The name of the major or courses in “Engineering Science” is so difficult that high school students and citizens can’t understand about them. For example, from the name “機能創成専攻”, at least I can’t easily understand what this major is ding.

Finally, this three days were good opportunity to think about the place where I am, and what I have to do now and after I graduate.

A student from Osaka University

This seminar was an extremely enjoyable and unforgettable experience for me. I was exposed to the overwhelming hospitality and friendliness of the Japanese professors, staff, students and culture. I would definitely recommend more of such exchanges to my friends back in NUS.

The group I was in was from the “against engineering science” (ES) team. The points that I took away with me were firstly that every university is in a different developmental stage of its curriculum. However, regardless of university, the curriculum is geared with the idea of instilling a multi-disciplinary approach to problem solving. I believe that this is a good point and is a point that will enable ES graduates to stand out and differentiate themselves from the crowd especially during job hunting.

However, I feel that this aspect of engineering science is not adequately publicized and therefore we have not made use of this leverage that we have over other engineers.

This seminar was not only fun but informative and was a great learning experience. The size and number of local students and international students was just right. The number of students made it easier to interact with one another and to engage in discussion. This session was extremely informative as students can find out more about engineering science courses the world over. This seminar also served as a good platform for students to consider why they have chosen engineering science and what aspects differentiates them from other engineers.

A student from National University of Singapore

The 3-day Engineering Science Consortium was a great opportunity to exercise our critical thinking skills as an Engineering Science student, and also enhance our experience in Japan. As an Engineering Science student, I have been told that we need to have a clear definition of what “Engineering Science” really is. This definition can be different for everybody, but especially when we have employers and other people asking us about our studies, this is really important to have a clear idea of the purpose and our role in this program. This consortium provided a great way to help us develop our own opinions without being constricted to any “pre-fabricated” answer. It would be great to keep the style of the consortium for the future, and simply change the topic to another aspect of Engineering Science.

A student from University of Toronto

I thought about “What is Engineering science” for the first time. That is why this consortium was good opportunity for me to think about what we have to do. I thought that we should define the role about Engineering science.

A student from Osaka University