Higher Education and Development in Egypt
-Exploratory case study of the perception of E-JUST students and graduates

Maiko Miyakoshi
Higher Education and Development in Egypt - Exploratory case study of the perception of E-JUST students and graduates

Maiko Miyakoshi

Supervisor: Frans Lenglet
Evaluator: Cedric Linder
## Content

1. **Introduction** .......................................................................................................................... iv
   1.1 Background .......................................................................................................................... 1
       1.1.1 Sustainable Development (SD) in Egypt .................................................................. 1
       1.1.2 Higher Education in Egypt ....................................................................................... 1
       1.1.3 Japanese International Cooperation Agency’s (JICA) technical cooperation as a solution ........................................................................................................... 2
   1.2 Objective .............................................................................................................................. 3

2. **Literature Review** .................................................................................................................. 4
   2.1 Higher Education in Science and Technology and relationship to SD ................. 4
       2.1.1 Teaching and learning about sustainable development in Higher Education .... 4
       2.1.2 Developing competencies for SD in HE ................................................................. 5
       2.1.3 HE in Science and Technology as a mean for achieving SD ............................... 6
   2.2 Higher Education in Egypt ................................................................................................. 6
       2.2.1 Issues of higher education institutions in Egypt ................................................... 6
       2.2.2 Higher education for science and technology in Egypt ....................................... 7
   2.3 Perspective of Egypt and Japan ......................................................................................... 7
   2.4 Japanese model as other type of education and the Project-Based-Learning (PBL) approach .................................................................................................................. 8
       2.4.1 Project-Based-Learning and its origin ..................................................................... 8
       2.4.2 Project-Based-Learning in Japan ............................................................................. 9
       2.5.3 Project-Based-Learning at E-JUST ......................................................................... 9

3. **Methodology** ......................................................................................................................... 10
   3.1 Purpose of research ............................................................................................................. 10
   3.2 Interviewing ......................................................................................................................... 10
       3.2.1 Arrangement of interviews .................................................................................. 10
       3.2.2 Data gathering ........................................................................................................... 11

4. **Results** .................................................................................................................................. 12
   4.1 Learning Method ................................................................................................................. 12
   4.2 Learning outcomes ............................................................................................................. 13
   4.3 Career orientation ............................................................................................................. 13
   4.4 Community orientation ..................................................................................................... 14
   4.5 Career orientation (for graduates) .................................................................................... 15

5. **Discussion** ............................................................................................................................ 17

6. **Summary and Conclusion** .................................................................................................. 20

7. **Acknowledgements** ............................................................................................................ 21
8. Bibliography .................................................................................................................. 22
Appendices ....................................................................................................................... 25
Abstract: The objective of the study is to understand the connection between higher education as a joint development project between Egypt and Japan and ESD based on students’ opinions. The research subject of the study, Egypt-Japan University of Science and Technology (E-JUST) employs educational methods centered on “Japanese style education” in Engineering education, and the Project-based learning (PBL), which is one of the methods, is focused in the study. In order to gauge how the Japanese style education or PBL have influence on students at E-JUST and how they are related to ESD, interviews with E-JUST students and graduates were undertaken. The result showed that students’ experience at E-JUST can help them attain ESD-related competencies or enhance the competencies they already have.

Keywords: Sustainable Development, Higher Education, Project-based learning, competencies, exploratory case study, international cooperation

Maiko Miyakoshi, Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala, Sweden
Higher Education and Development in Egypt
Exploratory case study of the perception of E-JUST students and graduates

Maiko Miyakoshi


Summary: While education is one of the crucial factors in the large framework of Sustainable Development (SD), expansion in Egypt in the number of university students in the past, as an outcome of a tuition free policy, was snatching away important opportunities to learn through practical experience from engineering students. This caused those students to seek a better research environment outside Egypt. In an effort to remedy this situation, the Egyptian government decided to establish the Egypt-Japan University of Science and Technology (E-JUST), which incorporated Japanese teaching methods in engineering education. The university was established in an effort to create a system in which engineering students could continue cutting-edge research and remain in Egypt, and its graduates could convey their experiences, gained at E-JUST, through their teaching when they return to their original universities as associate professors. This exploratory case study attempts to assess, through interviews, how and to what extent E-JUST is achieving its objective through the Project-based learning (PBL), and students and graduates are facing difficulties. The interview results revealed that each E-JUST graduate was trying to incorporate or reproduce teaching methods they had experienced at E-JUST in different ways at their original universities, and some of them were already implemented. It also revealed that E-JUST students had SD-competencies.

Keywords: Sustainable Development, Higher Education, Project-based learning, competencies, exploratory case study, international cooperation

Maiko Miyakoshi, Department of Earth Sciences, Uppsala University, Villavägen 16, SE- 752 36 Uppsala, Sweden
1. Introduction

1.1 Background

1.1.1 Sustainable Development (SD) in Egypt
The foundation of today’s global actions towards Sustainable Development (SD) in reviewing human conditions around the world, centering on predominantly economic and social human activities, is the notion of SD: to “meet(s) the needs of the present without compromising the ability of future generations to meet their own needs” proposed in the so-called “Brundtland report” in 1987 (World Commission on Environment and Development). In 2015, some 30 years after the report, outcomes of actions for “Millennium Development Goals (MDGs) (United Nations, 2015)” for the last 15 years were compiled, and “Agenda 2030, (United Nations, 2015)” which is expected to play the role of a driving force to push the frame work of MDGs to the next stage, was agreed on by participating nations, and goals were established and set forth by each nation. Egypt, in where the research subject of this study lies, also declared its goal as organizing an effort to tackle various levels of problems from national to international levels.
While Egyptian citizens face numbers of issues, such as population expansion, unemployment, unstable national and regional security, and a long-lasting economic downturn (The Arab Republic of Egypt, 2016), the Egyptian government identified Key Performance Indicators (KPIs) in the Sustainable Development Strategy (SDS) and goal figures for each of these three dimensions: Environmental dimension, economic dimension, and social dimension (Egyptian government, 2015). Achieving the goal requires improvement of capabilities and competencies in various levels or institutions, and also cooperation with other nations (United Nation, 2015). This research focuses on the Higher Education project done in cooperation with other nations, and tries to determine how the realization of such a project can influence the SD of Egypt.

1.1.2 Higher Education in Egypt
The very high student-to-staff ratios and a narrow curriculum are the two most significant problems that should be noted in terms of higher education in Egypt (OECD, The World Bank, 2010). According to the 2015-2016 Times Higher Education World University Rankings’ engineering and technology table, the average student-to-staff ratio for the top 10 universities is 11 for engineering and technology education (Times Higher Education, 2016). This is much lower than 30, which is the actual number of students per professor rations in Egypt for engineering and technology education (OECD, The World Bank, 2010). The high student-to-staff ratio leads the possible teaching methods to uni-directional information transmission to a large number of students. Alternatively, Teaching Assistances could take over some courses in order to decrease the teaching loads of professors. In such cases, the TAs would have less time for their own studies, and it is not uncommon that they take more...
than 5 to 7 years to complete their Master degree while continuing to work as a TA at the same time.

1.1.3 Japanese International Cooperation Agency’s (JICA) technical cooperation as a solution

In order to improve the situation as mentioned above, the Egyptian government decided to make use of a cooperative relationship with Japan. The Obeid Government (1999-2004) initiated the “Long-term Socioeconomic Development Vision (2002/03-2021/22)” (JICA, 2003). One of its seven primary goals was the “Development of human capital and an increase of employment rate (JICA, 2009).” The reform programme of the Nazif Government (2004-2011) emphasized the “development of education and science research (ibid).” Against this background, the idea of the Egypt-Japan University of Science and Technology (E-JUST) was first envisaged by the Egyptian government at the first meeting of “Japan Arab dialogue forum” held in Tokyo in 2003, which aimed to strengthen mutual understanding and enhance a cooperative relationship between Japan and Egypt (JICA, 2009). During the 2007 summit meeting of Egyptian President Mubarak and Japanese Prime Minister Abe, a formal agreement between Egypt and Japan was concluded for the establishment of E-JUST. The project started at Borg El Arab in Alexandria in 2008 (JICA, 2008). A project summary is

---

**Egypt-Japan university of science and technology (EJUST)**

Site: New Borg El Arab
Cooperation period: 13/10/2008 – 31/01/2014
Partner institution: Egypt-Japan University of Science and Technology, Ministry of Higher Education
Cooperating institution on Japanese side: Japanese Universities

Higher objective: E-JUST will sustainably produce highly qualified graduates who can lead economic and social development in Egypt, Middle East, and Africa.

Project objective:

- Stage 1: By 2009, all necessary requirements to receive the first batch of master and PhD students will be prepared (including the basic plan, organization, educational content, personnel).
- Stage 2: The foundation to be one of the top level universities among the science and technology universities in the world will be established by implementing E-JUST basic principles.

Expected outcomes:

- **Stage 1**
  1. Operating structure and operating plan of E-JUST are formulated.
  2. Overall framework of educational programme in E-JUST, and the educational programmes and equipment for the first batch master and PhD students are prepared.
  3. Grand design of campus and construction design and schedule of each facility are prepared.
  4. Qualified faculty members who have mastered educational contents, educational methods, and methods of using necessary equipment to educate master and PhD students are secured.
  5. Establishment of E-JUST and its characteristics are well disseminated to related people.
  6. Excellent students from inside and outside of Egypt are secured to a certain number as the first batch.

- **Stage 2**
  1. Research capability of E-JUST faculty members is improves in accordance with the international standard.
  2. Practical and innovative research capabilities of E-JUST students are cultivated through research-centered education.
  3. Qualified technological staffs to support research activities are secured and functioning.
  4. Cooperation between E-JUST and Egyptian industry is promoted.
  5. Management capacity of management team and executive office is improved.
  6. Transmission of information about E-JUST as an institution, its research, and its education is done towards the world actively.
provided in Table 1.

Table 1. Summary of E-JUST project

The university was established at Borg El Arab, Alexandria, and opened with the concept of Japanese engineering education (“small group, lab-centered, practical education”) in 2009. The university has three schools: ‘School of Innovative Design Engineering’, ‘School of Energy, Environment and Chemical and Petrochemical Engineering’, and ‘School of Electronics, Communications and Computing.’ The tasks that JICA determined as being within the sphere of cooperation were: management support, curriculum development, equipment instalment, initial construction of the buildings, collaboration with industries and inviting professors from Japan.

According to the information provided on the website of JICA, approximately 2,150 million yen (some 180 million SEK) in loans were made available by the Japanese government, while about 10 billion yen (some 830 million SEK) was contributed by the Egyptian government to cover the cost of constructing the university campus for the first phase. For Japan, where more than 500 billion yen is appropriated (2011-2016) into the annual budget as an ODA expense each year (Japan, 2016), the funding seems to be considered a decent amount to spend on Egypt, which is an important partner for Japan. Yet the amount of money made available by Egypt, where some 1.7% of GDP is spent for military expense (2015) (The World Bank, 2016), seems to be a great burden on the national budget. Some people would consider the amount as necessary funding for the future of Egypt, and feel grateful that the time for the nation to take education seriously as a part of national development strategy has come. But others may disagree with the expenditure and the strategy, concluding that the project is only an insufficient strategy, which cannot cope with the actual situation.

In terms of international cooperation and development aid of Japan, not many projects like E-JUST have been undertaken in the field of higher education. Also E-JUST is still a relatively new university, and as such is very much in its developing stage, and thus has not yet done follow-up research on its graduates. Accordingly, it is significant to hear students and graduates’ opinions as well, as a research project looking at students’ relationship with Education for Sustainable Development (ESD) as an exploratory case study of the university achieving its goals, and also for the future development of aid projects that are similar to E-JUST. This is the impetus to the study documented in this thesis.

1.2 Objective

The study focuses on the opinions of students who are currently enrolled in the Master programme at E-JUST, and of those graduates who have successfully completed the programme and have returned to their original universities. The study examines the opinions of these current students and graduates concerning the ways in which, and the extent to which, E-JUST is achieving its own objectives with its Project-Based-Learning (PBL) approach, whether and how the students and graduates are facing obstacles, and what recommendations they have for improving their learning conditions and experience. The following sections explore the literature on the relationships between higher education and (sustainable) development, focusing on the characteristics of ESD as they apply to higher education.
2. Literature Review

2.1 Higher Education in Science and Technology and relationship to SD

2.1.1 Teaching and learning about sustainable development in Higher Education

With the growing awareness of environmental issues and complex problems in societies today, we are under pressure to shift our sense of appropriate ways of using natural resources, and considering different ways of structuring our economies as a solution for dramatically easing the indignity of poverty. In the global context, the United Nations Environment Programme, UNEP, has established regional frameworks that connect universities in wide regions or each region, so that each new effort will be organized and shared for effective improvements (UNEP, 2016). For example, in Africa, this network developed by UNEP is playing an important role in supporting transformations of Higher Education institutions. The transformations are expected to create improvements in awareness or recognitions towards sustainable development in the future green economy among students (UNEP, 2006). Higher educational institutions should make a stronger effort to enhance an intellectual atmosphere for people who yearn to create visionary future societies. Such institutions can exercise great influence on the students. They were once producing highly skilled human and capital to support social foundations, and students willingly sought the attainment of knowledge that was needed by the societies. However, now that many economies and societies that were once aimed at by nations are teetering, the time approaches to review the role of higher education institutions. Ronald Bernet (2013) classifies different ideologies that exist within our universities, and expresses his theory that our ideas about universities are being diluted, and that universities themselves should consider ways to be more imaginative. Today students are confronted with quite complex problems. Accordingly, the required abilities that will be important for reacting to such problems, the curricula and teaching methods that will make their acquisition possible and the transformation of higher education institutions themselves are becoming the focus of attention. These necessary shifts are captured by the wide framework and worldview of ‘sustainable development’ or ‘sustainability.’ Yet many people wonder what students ought to learn in that framework in order for higher education institutions to fulfill their roles needed by the societies today. Hearing about ‘sustainability’, most students think of environmental problems that are relevant and close to their lives, or of the direction the economy is going. The most common definition of the concept of sustainable development (SD), which is also used in this study, is development that “meets the needs of the present without compromising the ability of future generations to meet their own needs. (World Commission on Environment and Development, 1987)” This definition at first seems to have a very distinct and simple meaning, yet once one steps into the world of sustainability science and tries to read its meaning, it transforms into a slippery thing. That is partly because thinking about sustainability is to look at one phenomenon from not only one aspect, but also various angles, extract multiple alternative ideas, and try to decide on ‘an answer’ that seems most plausible. Students who perceive the traditional transmission of knowledge from educators to students as the only possible way to learn feel irritated, or become helpless as they are being confronted to problems that have seemingly no correct answers. They fall into such a situation because they have never thought about how they should confront complex systems involved in sustainability, in which various fields or disciplines are interconnected with each other. In other words, the very important question of “How do we need to keep learning in order to be able to find solutions to complex problems?” tends to be too close to us and often overlooked. Nevertheless, we must acquire a way of learning that will allow us to live in societies that are facing multiple challenges in a short period of time.
In sustainability science, researchers have been modeling learning competencies that students should achieve towards SD (Adomßent & Hoffmann, 2013). The following example is one of them.

2.1.2 Developing competencies for SD in HE

2.1.2.1 ‘Gestaltungskompetenz’ by de Haan and Harenberg

‘Gestaltungskompetenz’ (‘shaping competence’) is a term used by de Haan and Harenberg (1999), meaning ‘the specific capacity to act and solve problems … through their active participation in society, to modify and shape the future of society, and to guide its social, economic, technological and ecological changes along the lines of sustainable development’ (de Haan, 2010). From 1999 to 2004, Germany mounted an educational programme related to sustainability called ‘BLK program,’ which targeted a great number of schools, educators and students. de Haan was the person who suggested the basic concepts of the program, and he reported that he found positive outcomes among students over crucial competencies for ESD through the program.

‘Gestaltungskompetenz’ comprises eight competencies to be achieved as educational objectives for sustainability (de Haan, 2006):
1. Competency in foresight thinking,
2. Competency in interdisciplinary work,
3. Competency in cosmopolitan perception, transcultural understanding and co-operation,
4. Participatory skills,
5. Competency in planning and implementation,
6. Capacity for empathy, compassion and solidarity,
7. Competency in self-motivation and in motivation others, and
8. Competency in distanced reflection on individual and cultural models.

As these competencies will be used for illustrating sustainability of the learning methods at E-JUST later in the discussion portion, it is necessary to explain each competency here. The first competency is foresight thinking. Foreseeing the movement of the times is very significant for organizations in deciding which direction to take in the future. And foreseeing the future correctly means recognizing the past and the present correctly. In brief, it is important to know how the present situation was affected by the past, and how it is going to influence the future. de Haan underlines the understanding that future can be transformed by our decisions, and that creativity and imagination are indispensable for the competency.

Second is competency in interdisciplinary work. Problems that need to be reconsidered for sustainability intrinsically have causes rooted in many factors; therefore, solving one of the causes cannot resolve the entire issue. Hence, all fields in which those causes reside need to be understood in their mutual interconnections. ‘Subject-related interdisciplinary’ and ‘problem-oriented disciplinarily’ are two important types of interdisciplinary learning. Third is competency in cosmopolitan perception, transcultural understanding and cooperation. In an enclosed environment or worldview, the factual basis for the decision to understand one’s situation and take action becomes critically limited. It even narrows the possibility of understanding others, and leaves no place for helping each other. Instead, interest and curiosity in others and willingness to learn others’ sense of value help to broaden one’s own worldview are important tools. The fourth competency is participatory skills. Participation and cooperation are crucial in seeking wider and more efficient outcomes for sustainability. Cooperation among people with different specialties or ideologies working towards a common resolution of a certain issue has a significant importance. However, it can be problematic as well, as each person or each organization may have a different perspective and
a different approach toward confronting the issues, while cooperation normally requires a degree of compromise from both sides. In order to maximize the outcome of cooperation, participants need to develop their participatory skills, which will help them to be flexible and to maintain a wholesome attitude in gaining an understanding of each other. The fifth is competency in planning and implementation. Taking action for sustainability requires pragmatic and efficient planning to produce the largest effect. Sixth is capacity for empathy, compassion and solidarity. When strong empathy and compassion are present, solidarity serves as a trail wind to problem-solving. That trail wind can be of utmost value for people when they confront the issues of sustainability. Seventh is competency in self-motivation and in motivating others. To continue making commitments to sustainability without risking one’s need to be self-motivated and encouraging others at the same time is a difficult thing to balance. To do this, de Haan states that the eighth competency is crucial: the competence in distanced reflection on individual and cultural models. The reasons for sustainability begin with an understanding of one’s own relationship and perception to the issue; by comparing the issues with other cultural models one can gain a new perspective.

As a fundamental principle of the German BLK programme, its report highlights ‘learning in meaningful context’. de Haan refers to this principle as being based on the situated learning theory. Situated learning encourages students’ active involvement in the entire learning process and experience, leading to better and longer lasting learning effects.

2.1.2.2 Principles for transformative learning
Even though there are some differences in the way each model of competencies is being expressed, there are quite a number of similarities between the competencies to be acquired for sustainability. Those can be integrated into the term ‘Transformative Social Learning’ (Wals, 2010). Transformative learning ‘occurs when a person, group or larger social unit encounters a perspective that is at odds with the prevailing perspective’ (Cranton, 2011). Wals positions ESD as “the creation of space for transformative social learning”, and states that sustainability in higher education is not ‘one of integration’ but ‘one of innovation and systemic change within our institutions that will allow for more transformative learning to take place” (Wals & Corcoran, 2005). Its aim is to encourage autonomous learning that will support us to live in our societies. Wals summarizes that such learning necessitates four transformative shifts: transdisciplinary shift, transcultural shift, transgenerational shift, and transgeographical shift (ibid).

2.1.3 HE in Science and Technology as a mean for achieving SD
This study attempts to understand the role of HE in Science and Technology as ESD which can be used in a wide range of meanings that includes campus design, leaning environment, learning method, and teaching method. Since the study’s subject is a new university that emphasizes a teaching method used in engineering universities in Japan as a higher education project to develop human capital in Egypt, it wishes to explore to what extent implementing the “Japanese model” can be related to competencies mentioned in the above section.

2.2 Higher Education in Egypt
In the previous section we examined how competencies related to sustainability and sustainable development can have a place in higher education in general. In the following section, the current issues regarding higher education in Egypt are discussed.

2.2.1 Issues of higher education institutions in Egypt
The total number of higher education institutions in Egypt is 90, 19 public universities and 20
private universities, 51 public non-university higher education technical institutes and colleges (Education, Audiovisual and Culture Executive Agenc, 2010). Since the tuition-free policy in public universities was introduced by President Nasser in 1960, tuitions are basically free. This is one of the reasons for the large student enrolment in Egypt today, resulting in a high student-professor ratio imbalance, a too heavy teaching load for professors, a deficiency of professors’ support for students, and too little time for professors to improve their own ability. In addition, there is little scope for updating programmes and courses and improving infrastructure. The out-of-date programs are increasing the gap between the graduates’ skills and the technical and other skills required by industry and society at large.

The following sections explore the literature on the relationship between higher education and (sustainable) development and in particular the characteristics of ESD as they apply to higher education.

2.2.2 Higher education for science and technology in Egypt

The challenges Egyptian higher education institutions are facing apply also to engineering education. Engineering education requires many practical skills. However, teaching is mostly focused on transmitting knowledge for memorization. Due to this tendency, Bond et al. (2012) points at a decrease in problem-solving skill among Egyptian students. One of the consequences is that Egyptian researchers tend to leave for other countries, seeking a better research environment, while the further development of science and technology research is hindered. It is against this backdrop that from 2007 to 2016 Egypt concluded an international cooperation programme in higher education for science and technology, the so-called Decade of Science (ibid), with Germany, Japan, Italy, France, and the USA.

2.3 Perspective of Egypt and Japan

The idea of an Egypt-Japan University of Science and Technology was born in the context mentioned in Section 2.2.2 above. Establishing E-JUST was proposed by the Egyptian government to the Japanese government as a part of the reform of higher education in the area of science and technology. The high order objective of E-JUST is to become “a university that sustainably provides highly skilled graduates who will lead socio-economic development in Egypt, Middle East and African countries” (Human development (JICA), 2009). The indicator of success is considered “being ranked within 500 in the world university ranking in ten years after the establishment of the university” and “sustaining E-JUST graduates’ employment rate 90% a year after graduation” (ibid). The Japanese government is expecting that the university reaching an international standard will contribute to the reduction of the “brain drain”, and that the development of researchers and research abilities will contribute to creating technical and innovative solutions for social issues (ibid). The Egyptian Ministry of Higher Education is expecting that E-JUST will be a model for Egyptian engineering universities and be a pulling power for higher education reform. Furthermore, in the Japan-Egypt Joint Statement of February 2016, the cooperation on educational partnership was agreed to be expanded to a larger scale by including the entire education sector, from primary education to higher education (Ministry of Foreign Affairs of Japan, 2016). It seems as if Egypt considers Japan’s development after the World War 2 as something of a miracle, and that it therefore should use the Japanese experience for its own development as well. Of course, it should be noted that there were many factors that allowed Japan to grow rapidly, but it is not completely realistic to conclude that the “success” can be ‘copied in a different country, with a different background, and during a different time period. Stating so here is not intended to discourage people who wish for development or a
sustainable future, but it is a mistake to assume that the implementation of a development strategy automatically flawless, “fool-proof” or incapable of failing. Accordingly, we should continue to learn from the good aspects of each other. The “wealth” in Japan was not obtained without sacrifice. When decision makers in Egypt consider policies of implementation, they should realize that there was a tremendous amount of negative impact on environment and societies throughout the course of development in any country.

2.4 Japanese model as other type of education and the Project-Based-Learning (PBL) approach

In order to achieve the objectives of E-JUST, which is to become “a university that sustainably provides highly skilled graduates who will lead socio-economic development in Egypt, Middle East and African countries” (Human development (JICA), 2009), the PBL approach is employed as a basic learning method for master degree programme in E-JUST. The utility of the PBL approach was first recognized in medical education in North America in the 1960s (Norman & Schmidt, 1992). Its extended sphere today ranges from elementary education to higher education (ibid). Despite its extensive use, there are some criticisms about the effectiveness of the approach. According to the study conducted by Strobel and Barneveld (2009), PBL is more effective in terms of long-term knowledge retention while a more conventional learning approach is more effective for short-term retention. Okano, el al. (2011) conducted a survey of student opinion on the PBL learning in E-JUST. His research results showed that students were having difficulty adapting to different learning styles (ibid). In this section, focus is going to be given to the characteristics of the PBL approach, how it has come to be incorporated into Japanese higher education, and how its reputation is growing among educators in Japan.

2.4.1 Project-Based-Learning and its origin

The PBL was born in the mid-1960s at McMaster University as a revolutionary learning approach for medical education. Many medical schools have followed the same path globally (Norman & Schmidt, 1992). In medical education, students are given a case involving a patient who shows a certain symptom, they are required to discuss a causal mechanism that produces the symptom, and subsequently work to find a solution for the patient (ibid). According to Barrow, "PBL is an instructional method in which students learn through solving problems and reflecting on their experiences (Barrows & Tamblyn, 1980). By attempting to find solutions for a pragmatic case close to reality, the medical students are expected to improve their problem-solving skills and enforce their knowledge retention. “Self-directed learning” and “enhancement of students’ interest” are extremely crucial objectives in PBL. They are intrinsic components, which are highly valuable in terms of educational methods.

An important PBL characteristic is encouraging students’ voluntary learning through their collaborative work towards finding a solution for a given project. The role of the instructor is essentially to support the problem-solving process, and not simply giving information to the students. This is a significant difference with the traditional teaching method and curriculum. In the literature review by Albanese and Mitchell (1993) about outcomes and implementations of the PBL in 1993, four critical issues were singled out for further analysis:
1. The extent to which faculty should direct students throughout the medical training;
2. The cost of PBL;
3. Weaknesses shown by PBL students in terms of cognitive processing;
4. The apparent high resource utilization by PBL graduates.

Notwithstanding that the educational approach is applied in numbers of study fields, there are still many discourses over its educational effectiveness, which need further research (Silvia, et
2.4.2 Project-Based-Learning in Japan
It was not until recently that the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) formally began to encourage higher education institutions to incorporate the PBL approach into their programmes and methods. Some universities on their own tried to practice the PBL in the areas of medical science and information technology even before the official promotion of the PBL by MEXT. They have been successfully accumulating satisfying outcomes, yet the general utility of the PBL approach is still under development.

In the proposal by the Central Educational Council (CEC), which then was formulated as the national reformation plan for the improvement of higher education in 2012, it was announced that the university curricula need to be transformed from the conventional education, which is focusing on only knowledge transmission to students, to “Active Learning (AL)”, which leads students to have higher competencies for the rapidly changing society (Central Education Council, 2012). In the next report about the national reformation plan by CEC (2014), the AL was used as a substitution for the PBL. The PBL is one of the educational methods which can lead to the AL, but not the AL itself. Hence it seems confusing to mix two similar, yet different, ideas in the educational process; however, in Japanese the meaning of the AL is the same as PBL.

There are two reasons why the PBL approach is attracting more and more attention in Japanese education (Nakayama, 2013). One is the growing sense of impending crisis due to a number of social issues and the societal expectation placed on higher education institutions to prepare young people to be more competent in such a future (ibid). The other is its potential higher learning effectiveness (ibid).

2.5.3 Project-Based-Learning at E-JUST
As mentioned above, Okano studied the relationship between PBL and the Japanese style of engineering education as E-JUST’s concept. He makes it clear that in Japanese engineering education student learning is focused around laboratories, which members’ collaborative work leads to a creation of unique culture and a practical education. Okano analyzed these characteristics from a perspective of the ‘community of practice’ as proposed by Wenger (2000), and as a final step in his action research, Okano designed a PBL course based on Kolb’s ‘Experiential learning theory’ (1984), which he observed and evaluated. In the evaluation, he mentioned significant changes in students’ learning attitudes as a result of PBL, including new perspectives, self-motivation, flexibility, presentation skill improvement, confidence in problem-solving, compassion with others, and self-reflection (Okano, 2015). These changes in students’ learning attitudes appear to overlap with the key competencies for SD mentioned in Section 2.1.2. Interviews with current students, PhD graduates, and faculty members were conducted in order to confirm that the changes Okano found through the PBL course he designed in his research are relevant to the key competencies for SD; if so, E-JUST, which employs the PBL, would be achieving its objective to cultivate human capital for future SD. The interview method is discussed in the next chapter.
3. Methodology

3.1 Purpose of research
From Okano’s research (Okano, 2015), it becomes clear that E-JUST’s PBL approach is the educational method that is expected to cultivate human capacities that are important for achieving SD in the society. It has a potential to develop human capacities to comprehend SD and implement commitments toward SD. But one should ask to what extent the students and graduates are acquiring those competencies that are said important for sustainability? In trying to answer this question, interviews were conducted to learn about the opinion of students who are currently enrolled in the master programme at E-JUST and of PhD graduates who have already finished the programme and have returned to their original universities. The survey examined (a) the perceptions of these current students and graduates of the ways in which and the extent to which E-JUST is achieving its own objectives with its Project-Based-Learning (PBL) approach, and (b) whether and how the students and graduates are facing obstacles, and what recommendations they have to for improving their learning conditions and experience. The following sections describe the survey method and its results.

3.2 Interviewing

3.2.1 Arrangement of interviews
A total of 44 interviews were conducted in Egypt in the period of 9 to 22 April 2016. Each interview took approximately one and a half hours. These interviewees consisted of 9 PhD graduates who had kindly responded to the invitation from their previous supervisors, 24 MSc and PhD students who are currently enrolled in the Master programme, and 9 faculty members (see Table 2).

<table>
<thead>
<tr>
<th>Category of person interviewed and number interviewed</th>
<th>Programmes (see Appendix 2 for detail)</th>
<th>Interview protocol (see Appendices for detail)</th>
<th>Average time for interview</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master student (N=12)</td>
<td>MTR, MRE, IEM, ERE, ENV, ECE,</td>
<td>Appendix 3</td>
<td>60 minutes</td>
</tr>
<tr>
<td>PhD student (N=12)</td>
<td>CSE, IEM, ENV, ECE, ERE,</td>
<td>Appendix 3</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Graduated PhD student (N=9)</td>
<td>IEM, ECE, MTR, CPE, ERE</td>
<td>Appendix 3</td>
<td>60 minutes</td>
</tr>
<tr>
<td>Faculty member (N=9)</td>
<td>CSE, IEM, MTR, ENV, ECE, MSE</td>
<td>Appendix 3</td>
<td>40 minutes</td>
</tr>
<tr>
<td>JICA staff/expert (N=2)</td>
<td></td>
<td></td>
<td>30 minutes</td>
</tr>
</tbody>
</table>

Table 2. Number of interviewees

With the support of E-JUST, the interview and the invitation to contribute were announced by email to all faculty members. Even though representatives of students were selected for interviews by faculties from each department, these results also include answers from students with whom the interviewer met by chance during the research and had opportunities to make interviews. The interview questions are shown in Appendix 1. The interviews with the graduates were done informally at coffee shops or formally at their home universities. The interviews with the current students were conducted at the university. Additional interviews were held with the president of E-JUST, faculty members, the leader of the Japanese project team and the president of JICA Egypt.
The questions used in the interviews were based on the syllabus of courses the students and graduates took and the descriptions about the courses obtained in advance from E-JUST. Since the interviewer had little knowledge about engineering research, the interviewer tried to understand what kind of courses they had been taking as much as possible and to relate them to the interviewees’ field of research. As far as the faculty members and the project team were concerned, questions were prepared based on the information about E-JUST through their and JICA’s homepage.

A face-to-face interview requires that the researcher creates a trustful relationship with the interviewees. Careful listening for understanding each different point of view and using flexible follow-up questions are other requirements (Rubin & Rubin, 2005). The interview was open-ended since the purpose of this research was to know how the students and graduates perceived the learning methods in E-JUST. In each individual interview a small number of personal questions were asked in order to determine basic respondent characteristics. They were followed by a number of open-ended questions soliciting their opinions. The sample was purposeful (Patton, 2015). It consisted of 24 current students, 9 graduates, 9 faculty members, and 2 JICA staff and expert. They were asked about themselves (i.e. personal characteristics, prior education, and prior work experience) and their experiences in E-JUST (i.e. what knowledge/skills they have learned and how well that fits with their current employment (for graduates), how they perceive the teaching methods and conditions, and what they assess as PBL’s strengths and weaknesses. The interviews with the president of E-JUST, project managers and the president of JICA Egypt were conducted in order to gauge their perceptions of the extent to which E-JUST is achieving its objectives, and whether there is a gap between their opinions of those of students and graduates.

3.2.2 Data gathering

The iPad’s sound recording application was used for recording the interviews. It was thought to be appropriate since it does not seem unnatural to have the iPad nearby on the table. Respondents were asked for their permission to record before the interview (see Appendix 3). After the recording, the data was transcribed using software ‘Dragon Naturally Speaking’ (NUANCE, 2016) (See transcription example in Appendix 4). Transcribing all data correctly in the same day as the interview would have been quite difficult to do in the tight field research schedule. Therefore, only a rough transcription and some essential points were written down in the field notes (see examples in Appendix 5). During the first two interviewing days, each interview was evaluated in order to determine the need for possible changes and additions in the interview process, before the next interviews (Rubin & Rubin, 2005).

Since some respondents might have felt nervous or shy to be interviewed and/or recorded, the interview started with some ‘easy’ questions. Once the respondents started to feel more relaxed, questions that required reflections of their personal opinion were posed Despite the best efforts of interviewer and respondents, no optimal accuracy could be achieved in the information gathered because the interview was undertaken in English, which was the second language for all concerned.

The collected data from the interviews were categorized for analysis, using a responsive interviewing approach (Rubin & Rubin, 2005) aiming at solid, deep understanding rather than breadth. The analysis of the interviews in answer Research Questions is presented in the next Section.
4. Results
In this section, the learning methods in E-JUST are examined based on answers obtained by each interview with current students, graduates, and faculties. Results are categorized by five main components; learning method, learning outcome, career orientation, community orientation, and career orientation (for PhD graduates).

4.1 Learning Method
Students and graduates were asked to present their opinions about the learning method employed by E-JUST. Question A-1 was not limited to PBL at E-JUST, but it was asked to have their overall opinions about education method at E-JUST. In Question A-2 was asked in order to calculate the percentage of students and graduates who had worked in a group project, and Question A-3 was asked in order to assess the advantages and disadvantages of learning through projects through students’ opinions.

*Question A-1:* Tell me about what you like about education method at E-JUST.

<table>
<thead>
<tr>
<th>RESEARCH ORIENTED</th>
<th>AVAILABILITY OF EQUIPMENTS</th>
<th>CLOSE GUIDANCE FROM SUPERVISORS</th>
<th>LEARNING IN DIFFERENT CULTURE</th>
<th>PRACTICAL EXPERIENCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MASTER STUDENTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>PHD STUDENTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>5</td>
<td>4</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>GRADUATES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>12</td>
<td>10</td>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>

The result for Question A-1 suggests the learning methods that are perceived as the best E-JUST features. It appears that the learning method which is most positively regarded by students and graduates is “Research oriented” learning. The reason for this seems to be closely related to the fact that most of them did not have much time to focus on their own research at their home university as they had told me. Hence having now at E-JUST more time for research is most appreciated.

*Question A-2:* Are you working on or in a group project for a specific course/PBL/your research?

![Students' group work experience](image)

The response to Question A-2 illustrates that some 70% of the current students and graduates are experiencing or have experienced working in collaboration with their colleague through either the PBL course or their own research and preparations for conferences during their academic years. There was a small difference between current students (58%) and the PhD
graduates (55%). The PBL course is a course mainly provided to master students in the beginning of their programme. According to the interviews with faculty members who are in charge of designing the whole programme in each department, contents or focus of each PBL course vary depending on the departments and professors. Some departments focus more on developing tangible project outcomes, while others emphasize developing knowledge on the use of the provided equipment. Most of interviewees showed very positive opinions about the experience they had during the PBL course, while some of them pointed out some disadvantages as well, in response to the next question.

*Question A-3:* What do you think is the advantage/disadvantage of learning through projects?

<table>
<thead>
<tr>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
</table>
| MASTER STUDENTS | Gaining technical knowledge on how to use equipment.  
| | Team work experience |
| | Supervisors may have different ideas about PBL course. |
| PHD STUDENTS | Enhance students’ abilities to work in groups.  
| | Gives freedom to manage their own ideas and to be creative. |
| | Takes long to time to adapt themselves to the new learning method.  
| | Dependence on students. |
| GRADUATES | Develop abilities to research and use tools.  
| | May cause unevenly distributed work load. |

The table above shows the perceived advantages and disadvantages of learning through projects. Since the PBL course has not been experienced by the students in their home universities, there were many students who expressed their positive appreciation or excitement for the new experience in the course. However, the new kind of experience brought students or even faculties new kinds of difficulties in adjusting to the different method.

From the students’ perspective, some enjoy the freedom of being creative on their project, the experience of working in a team and of gaining knowledge they wish to acquire during the PBL course. At the same time, some say that because the new method requires time or prerequisite courses to adapt, there is the risk that work load can be unevenly distributed among colleagues or that students may fail if they are not self-motivated.

From the faculties’ perspective, the concern seems to be related to the question to what extent faculties can adapt to the new teaching method in which students become the center of learning process.

### 4.2 Learning outcomes

Interviewees were asked questions to assess how they saw the difference between their learning outcomes in E-JUST and in other universities.

*Question B:* Do you think you are learning more or better with the learning method in E-JUST than the methods used in other universities?

Since the content of the answers to this the tended to resemble the responses to Question A, many interviewees hesitated to repeat the same answers or suggested that the answers had been already given. Therefore, the number of answers obtained for Question B is quite limited. The answers from PhD graduates were so few that they are not reported here.

### 4.3 Career orientation

Questions were asked of students and graduates to see how they recognize the influence of their experience in E-JUST on their career perspectives as future professors.

*Question C:* Do you think your experience in E-JUST has changed your view about future career?
A large number of PhD students showed a desire to continue their own research and develop more knowledge. Prior to the question above, interviewees were asked about their intentions after having received their final degree at E-JUST. Presumably E-JUST is based on the purpose of preventing an outward flow of highly qualified human resources from Egypt. Thus, students who are accepted to the programme in E-JUST are granted scholarships that allow them to concentrate on their research, expecting to learn in an internationally high level higher education institution, and to bring their E-JUST experience back to their home universities. Accordingly, most of the answers from students were expected to be “going back to home universities”. However, betraying such an expectation, it is interesting that many interviewees showed a desire to study abroad for further research. Among the Master students 5 students out of 12 showed such intention.

In this context, it should be a valuable thing that students develop interests within their research area, and develop the self-confidence that they can do more with their research. Yet if there is not a means to link their motivation towards research with formulating or implementing resolutions for social issues in Egypt, it seems a matter of course that they seek better opportunities abroad. When that happens, it is hard to say that the original goal – development of human capacity in science and technology in Egypt by cooperation between two countries – was achieved. Of course, the willingness of students to pursue further research opportunities is merely their hope, and it should not be immediately interpreted as their actual plan. They only expressed their hopes honestly understanding the fact that students who are granted a scholarship from MoHE have an obligation to return to their home university and continue to work as an associate professor at least for two years. It is critically important, while many students had strong desires to continue their research in a good research environment outside the country, some of them also emphasized their intention to transfer the experience and knowledge gained studying at E-JUST to the students in their home universities. This may indicate that they have developed a strong sense of responsibility to convey their experience at E-JUST to their future students.

### 4.4 Community orientation

Students and graduates were asked to answer questions on the relationship between their specialization area and the future development of society in Egypt. Question D-1 was prepared intending to assess students’ capacity of “foresight thinking”, and D-2 was asked to know to what extent students have actual opportunities to connect their research with real industrial development or social issues during their academic years.

**Question D-1:**
Do you think your study area/focus is important for future society of Egypt?
If yes, please tell me why.

<table>
<thead>
<tr>
<th># Yes</th>
<th>Rationale (Examples)</th>
</tr>
</thead>
</table>
| MASTER STUDENTS (12) | 7 | People need to be more aware of the issue of waste water.  
Energy saving will be very important for the future of Egypt. |
Egypt has to be a producer of technology, not only a user of technology produced outside of the country. My project will be able to provide products that are needed and useful to be used in a clean environment. The importance of my study is teaching and creating good students. I am not hoping so much to realize my devices as commercial products.

My research is very important to reduce costs for movements of cranes.

While students and graduates who gave positive answers regarding the importance of their study area for Egyptian society showed great enthusiasm to their research, the total number of interviewees who answered “Yes” to the question is decreasing as the degree level becomes higher. The decrease of number “Yes” responses may suggest that ‘higher degree’ students become more aware of the problems they have to face when implementing their research in the real life conditions.

**Question D-2:**
Are you working with people outside the university (people in the community, industry, government)?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PBL</strong></td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td><strong>Research</strong></td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>4</td>
<td>12</td>
</tr>
</tbody>
</table>

The result to the Question D-2 showed that a relatively small number of people answered that they are working with people outside the university. The PhD student who answered that he collaborated with people outside the university for PBL course is the same student who did work with local people for his research. Among the interviewees who answered “No” to this question, there were two students who expressed irritation with the difficulties of identifying opportunities to implement their research project in industries in Egypt. One of them also mentioned that this situation in Egypt is one of the reasons for hesitating to continue pursuing a PhD at E-JUST.

In Question D-1, students and graduates were asked to what extent they perceive their study area as something important for or relevant to the future society of Egypt. A certain number of interviewees explained the importance of their study areas. And next in Question D-2, the question was asked to what extent such interviewees’ passion is embodied in actual work with people outside the university. In short, the answers reveal that embodying their research in real collaborative arrangements with industries or communities is quite difficult to do at this moment in Egypt.

### 4.5 Career orientation (for graduates)

The last question of the questionnaire was reserved for graduates who already achieved their PhD at E-JUST and are currently teaching as associate professors at their home universities.

**After having returned to your home university, how useful do you consider your experience at E-JUST?**

- I like more to provoke students to come up with ideas that are not taught by me, sometime they come ups with ideas I've never taught about, the interaction gives more creativity to the course environment.
- I'm trying to transfer my knowledge and learning method I learned at E-JUST to my home university. Currently teaching undergraduates, and trying to change course specifications, examination methods, and others.
- When I prepare examinations, I try to give students opportunity to write creative answers incorporating materials I covered in lectures.
• I tried to build a research team with students to implement PBL. PBL needs to be used at my home university to give students opportunities to discuss and express their thoughts/plans. But there is lack of facilities, only 40% of his undergraduate students doing PBL. Trying to renew his lab through funds by collaborating with professors in other institutions.

• In my teaching - there is more students’ contribution. students make field studies to collect data, analyze the data, and come up with solutions.
  • Also, for my research, I am able to do research myself with global/wider perspective. I can work on new research direction all over the world.
  • Many other professors who studied abroad, in Europe, teach through projects. So it was not difficult to do projects in my class.

• I make experimental works during my courses - in the previous year, there was no experimental works in the course before. Financial resources are limited, but my colleagues and I are doing our best using limited equipment.

• Learning by doing - is still hard to implement and organize the concept because it is my first semester, but I am preparing.

• My university highly evaluates productivity, so my teaching method employing PBL is well evaluated.

From their answers listed above it can be seen that graduates in their own different environments are trying out the different means they had experienced at E-JUST, including: promoting students’ participation, learning through actual observations and experiments and working on projects in a team. Also it is crucial to note that some universities are very positive about letting the returned graduates implement PBL courses even though the actual numbers seem still quite small.
5. Discussion

This study, based on the interviews, was the author’s first experience of this kind of research. In hindsight, it can be said that the study’s ambitions were not sufficiently matched with the time and resources available. However, it should be remembered that the study was meant to be exploratory. That is, it set out to discover indications how and to what extent a new Egyptian university with a novel approach (PBL) was able to link higher education to the sustainability and sustainable development challenges the country and the world are facing. The study did not attempt to provide definitive or generalizable conclusions about ESD in Egyptian higher education. Within these limitations, the research results imply that indeed ESD is becoming a reality.

The first main research question in the present study dealt with the extent to which E-JUST is achieving the objectives that it has been aiming for since its founding. According to the interview with the Japanese project leader, the aim of E-JUST is to cultivate educators who can develop human capital, and who can provide graduates with knowledge that will prepare them to solve pragmatic issues in industries, as well as practical experience which can be applied immediately to in response to demands placed on them after graduating and entering the industrial world. Such human capital is expected to be in strong demand by the Egyptian industries in order to shift to a higher industrial and productive level in the future. Accordingly, E-JUST is expected to make contributions to this goal by sending qualified engineers from universities where E-JUST graduates teach by incorporating educational methods as characteristics of Japanese engineering education in E-JUST, and providing its students with opportunities and learning experiences that are significantly different from those offered in other public universities.

In order to achieve this objectives, E-JUST established a basic policy of incorporating a promising Japanese education, centering on PBL, experiments, and practical experiences. This study focused on one of the elements: PBL.

According to the survey results, the students consider that PBL provides them with knowledge and experiences they would not have acquired in their home universities. They expressed a high level of satisfaction overall. Also, based on their responses to the interview questions, some indicated connections with eight competencies which are crucial for ESD (as discussed earlier in the literature review of ESD competencies), as detailed below.

- **Competency in planning:**
  
  In the PBL course at E-JUST, students are required to complete writing a research proposal, do experiments and observations, write research results, present and publish a paper – all the steps which are unfamiliar to them as they acquire a large amount of new information in a period of three months. Many students point out the limited time that is available for all this as a downside of the PBL course. Yet, by virtue of the fact that all of them have overcome the difficulty of working on pursuing Master’s Degree in two years and a PhD in three years, which should require them even a greater planning and implementing ability, it can be assumed that they have the ability or they have developed that ability during their study at E-JUST.

- **Competency in empathy:**

  In response to a question regarding the contents of projects each student has worked on during the PBL course, some of them had clear objectives when pursuing answers to the kind of technical or systematical innovation that would be useful for improving people’s living conditions. This seems to indicate that students have worked on their project with empathy. A student who had tried to establish a device to support the difficult body movements of a girl in a nursing home, related how he had been constantly considering
the situation of the girl during his research. This attitude towards research seems to be reflected in his own research as a PhD student.

- Competency in reflecting:
  Many students who have taken lectures from Japanese professors, and who have been to Japan were appreciative of the enjoyable opportunity to experience a different culture. Since some graduates expressed that they often talk to their students about their experience in Japan, it can be assumed that they have gained a new perspective about their home country, which they would not have had if they had not had opportunity to study in Japan.

- Competency in motivation:
  In response to the question regarding their career orientation, interviewees expressed strong desires to continue their research ideally in the best environment. Some of them expressed the desire to continue further research involving students in their home universities or collaborating with E-JUST or other universities in Egypt and other countries.

- Competency in foresight thinking:
  They had clear opinions about the significance of their own study area for a future environment and society. However, many said their technical knowledges cannot be commercialized or utilized yet in Egypt due to economic and technological issues.

- Competency in participation:
  Some voiced a desire to work on solving issues in a local community for their own research. But there were also several obstacles for them to do so. It appeared to be hard for them to find partners who are willing to collaborate with student researchers, even though a few students managed to collaborate and acquire information from their partners.

The foregoing discussion provides some indication of the extent to which E-JUST has instilled important ESD-related competencies among its students. However, the study cannot really determine to what extent those competencies are directly related to the specific E-JUST learning. Most E-JUST students are students who have satisfied certain criteria to be accepted to E-JUST and receive scholarships from MoHE. They, therefore, can be assumed to be more ‘excellent’ than others. Their ‘excellence’ can be also seen from the fact that many of them have been Teaching Assistants, a position being reserved for a few ‘high performance’ graduates. With such students as the subjects of our study, it should not come as a surprise that they display the competencies they do. They may have been displaying them even before coming to E-JUST. However, it could also be that the learning methods at E-JUST have reinforced those pre-existing competencies or have allowed these to emerge during their E-JUST residency.

Determining any causal relationship between E-JUST’s PBL and the acquisition of ESD-related competencies would require a much more profound and longer research exercise. It should examine in greater detail the subjective perceptions of students and graduates while contrasting them with their objectively assessed learning outcomes.

The second main research question inquired about the obstacles or difficulties students are confronting and coping with in the E-JUST environment.

- PBL course
  The major problem students perceive with respect to the PBL course was that it takes time for students to get used the new method and that they have to consume so much information in such a short period of time. Since their learning had been shaped by other,
probably more traditional, learning theories in their home universities, adapting to the PBL which focus on practical experience requires certain amount of time. During the interviews, some students responded that there should be a preparatory course for the PBL course. Also other students expressed the wish to have a better relationship between the course and their research. The PBL course is a very significant first step of the entire programmes at E-JUST, providing the students with practical experiences in each specialization and to make use of the experiences in their teaching after their graduation. However, there seems to be some points to be considered for improvements.

**Time restriction and inflexibility in course selection:** In terms of the entire programmes provided at E-JUST, the largest obstacle students face is the limited period of time seems to be too short for properly covering all the required content. In addition, some students indicated that they feel a lack of flexibility in selecting course. They are given some choices for their elective courses, but they do not necessarily find courses they wish to take for their research. Moreover, students are obliged to take courses which they already have taken in their home universities. This finding suggests that greater flexibility in course selection is needed.

**Delay in equipment delivery:** Many students expressed their disappointment about the slow delivery of devices due to the long process they have to go through in order to get necessary equipment. Thus, it is suggested that the efficiency in delivering requested devices needs improvement.

**Lectures focusing on theory:** The PBL is a new method not only for students, but also for some faculty members. Among the faculty members who contributed to the interview, many of them had attained their PhD abroad or had studied or worked in Japan. Therefore, they had experienced PBL or a learning method that is similar to PBL, even if it was not called so. Those faculty members seemed to be very familiar with the method. However, it seems that there is no unified notion of PBL among them. Some students showed dissatisfaction with the fact that some courses were no different from conventional teaching, which only transmits theory. This study does not allow to draw immediate conclusions from this finding. Yet, if the real reason for student dissatisfaction lies in a situation in which the students expect to have the opportunity for practical experiences through which they can learn more productively, but they are not given that opportunity, then some improvements must be made. It seems that the current practice of sending E-JUST faculty members to Japan for training, is too limited in this respect.

**Lack of collaboration with industries:** While relatively only a small number of students have successfully managed to collaborate with industries, there were many students who had tried to incorporate that concept, but their efforts had not materialized. Several students mentioned a lack of a trust relationship between higher education institutions and industries in Egypt.

**Lack of usability of research results in Egypt:** Students who expressed their desire to study abroad answered that they feel their current research is not needed in Egypt at this moment. They also argued that Egypt needs to improve its educational system and governmental policy regarding research.
6. Summary and Conclusion

E-JUST is a university which opened only less than ten years ago. The entire institution and its components, such as the campus, the number of students and faculties, and the number and characteristics of the departments, are planned to expand gradually in next few years. In establishing the university, the Egyptian government has placed its hope and expectations that the development of higher education level human capacity in engineering will be enhanced by cooperating with the Japanese government.

This study has attempted to understand how at the present stage of E-JUST’s development, its learning methods are perceived by the students and graduates, how the methods are influencing their research and their future teaching methods, and how their experiences at E-JUST are utilized after their graduation. By exploring the findings, the study has tried to assess how and to what extent the competencies that the students and graduates say they have acquired are associated with competencies that are strongly related to sustainability and sustainable development.

The study has identified a number of instances in which students and graduates appear to acquire or to have acquired competencies relevant for sustainability and sustainable development. However, the study could not clearly define exactly how and at which stage those competencies can be attained, because the study subjects were limited to E-JUST students and graduates. The study also reveals that the learning methods or experiences at E-JUST (including PBL) are reflected in teaching methods used by of the graduates who have returned to their universities of origin. Therefore, it can be expected that over time the E-Just experience and methods will have the hoped for spill-over effect, and that gradually throughout the country the competencies of graduates will become increasingly imbued with sustainability and sustainable development considerations and practical skills.
7. Acknowledgements
I would like to profoundly thank my supervisor, Dr. Frans Lenglet for his guidance, as I had very little academic knowledge regarding education. He motivated me to think deeper throughout my research. Discussions with him taught me how pleasurable widening my own knowledge can be. I regard it as fortunate to have met a model whom I respect from the bottom of my heart as a researcher as well as a person.
I am also hugely grateful for everyone at E-JUST, Professor Ahmed El-Gohary, the president of E-JUST; all the faculty members, current students, graduates, and all the JICA project team for having understood and cooperated in my research. Especially I would like to thank Dr. Amr Eltawail and Dr. Matsushita for providing generous support during my visit to Egypt.
Lastly, I thank my friend, Herm, and my family members for always being supportive of me. This research was not possible without their kind and loving support.
8. Bibliography


Human development (JICA), 2009. *Arab republic of Egypt: Pre-Assesment of Egypt-Japan University of Science and Technology establishment project*, s.l.: s.n.


Appendices

Appendix 1: Interview Questions
Appendix 2: Acronyms for Departments
Appendix 3: Interview protocol
Appendix 4: Transcription example
Appendix 5: Field notes example
Appendix 1: Interview questions

Questions for both current students and graduates:

**METHOD - the extent to which and why the students/graduates liked the education methods at E-JUST. To assess the extent to which they liked or appreciated the education method in E-JUST, and the reasons for their appreciation.**

<table>
<thead>
<tr>
<th>For current students:</th>
<th>For graduates:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tell me about what you like about the education method at E-JUST.</td>
<td>Tell me about what you liked about the education method at E-JUST.</td>
</tr>
<tr>
<td>Tell me about what you do not like about the education method at E-JUST.</td>
<td>Tell me about what you did not like about the education method at E-JUST.</td>
</tr>
<tr>
<td>Why? Can you explain in more detail what you like(d) or don’t (didn’t) like?</td>
<td></td>
</tr>
<tr>
<td>In what way are these education methods different from the methods you were familiar with in your other university or in secondary school?</td>
<td></td>
</tr>
</tbody>
</table>

**LEARNING OUTCOMES**

To assess the extent to which students/graduates believe that their learning outcomes are/were influenced by the education method used at E-JUST. And to assess the extent to which they perceive the differences between learning outcomes in E-JUST compared with other universities.

<table>
<thead>
<tr>
<th>For current students:</th>
<th>For graduates:</th>
</tr>
</thead>
<tbody>
<tr>
<td>How well or how badly, do you think, you are learning at E-JUST?</td>
<td>How well or how badly, do you think, you were learning at E-JUST?</td>
</tr>
<tr>
<td>Do you think you are learning more or better with the learning method in E-JUST than the methods used in other universities?</td>
<td>Do you think you learned more or better with the learning method in E-JUST than the methods used in other universities?</td>
</tr>
<tr>
<td>Do you think that your learning style has changed while studying in E-JUST?</td>
<td></td>
</tr>
<tr>
<td>If yes, in what way did your learning style change?</td>
<td></td>
</tr>
<tr>
<td>If no, why didn’t your learning style change?</td>
<td></td>
</tr>
<tr>
<td>How good or how bad do you think the change in your learning style is?</td>
<td></td>
</tr>
<tr>
<td>Why do you think this is good or bad?</td>
<td></td>
</tr>
</tbody>
</table>

**CAREER ORIENTATION**

To assess the extent to which they believe that through the E-JUST method they are being prepared for future employment and career.

<table>
<thead>
<tr>
<th>For current students:</th>
<th>For graduates:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you think your experience in E-JUST has changed your view about future career?</td>
<td></td>
</tr>
<tr>
<td>If yes, please describe why you believe that your experience in E-JUST has changed your view about your future employment and career.</td>
<td></td>
</tr>
<tr>
<td>If no, please describe why you believe that your experience in E-JUST has not changed your view about future employment and career.</td>
<td></td>
</tr>
</tbody>
</table>

**COMMUNITY ORIENTATION**

To assess how they have developed their collaboration, systems thinking, and interdisciplinary work competency.

<table>
<thead>
<tr>
<th>For current students:</th>
<th>For graduates:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are you working with people outside the university?</td>
<td>When at E-JUST, did you work with people outside the university?</td>
</tr>
</tbody>
</table>
If yes, please describe the ways you are working with people outside the university. | If yes, please describe the ways you have been working with people outside the university.
---|---
**Probe:**
Is this part of your project or is this for other reasons? Please describe. | **Probe:**
Was this part of your project or was this for other reasons? Please describe.

### Questions for graduates only:

#### CAREER ORIENTATION

After having returned to your home university, how useful do you consider your experience at E-JUST?

**Probe:**
What was useful? And why?
What was not useful? And why?

Did you talk about your experience in E-JUST to others (students or colleagues)?
And what did you tell them?
What were their reactions like?
How did you feel about their reactions?

When at E-JUST, were you involved in joint research with Japanese universities, or did you study in Japan?
If yes, tell me about your experience of being involved in joint research.

**Probe:**
What did you like or dislike about it?
What did you learn from the joint-research with Japanese universities or studying in Japan?

### Questions for faculty members only:

#### LEARNING METHOD

In what way is the learning method at E-JUST different from the method used in other universities in Egypt?

Why do you think E-JUST employs such learning method?

What are the E-JUST method’s strengths?
What are the E-JUST method’s weaknesses?

#### LEARNING OUTCOMES

What differences do you see in the learning outcomes of students at E-JUST in comparison with students at other universities? (Be as specific as possible).

**Probe:**
Are the learning outcomes at E-JUST better or worse than at other universities? Why or why not?

Do you think the students’ learning style has changed while at E-JUST?
If yes, in what way has the learning style of the students changed, while at E-JUST?
How do you appreciate this change in learning style? As something positive or something negative?
If no, why do you think that there has not been change in their learning style?
How do you appreciate this lack of change in learning style? As something positive or negative?

#### CAREER ORIENTATION

To assess the extent to which the faculty believes that the students have developed a sense of connection to the wider society.

Do you think that E-JUST students have developed an orientation towards employment and career that is different from students in other universities?
If yes, what is so different about their employment/career orientation in comparison with students at other universities?
If no, why not?

#### COMMUNITY ORIENTATION

Do students work with people outside the university through group projects?
Do you think they like it?
If yes, why do they like it?
If no, why don’t they like it?
What do you think they learn (or have learned) from collaborating with people outside the university?

THE ROLE OF FACULTY MEMBERS IN IMPLEMENTING THE E-JUST METHOD
Do you think projects for students are well prepared?
If yes, what is so good about these projects?
How do the students benefit from these projects?
If no, what is not so good about these projects?
How do the students not benefit from these projects?
How easy or difficult was it (or is it) to design courses that include these projects? Please, be specific.
To your knowledge, what are the differences between PBL in Egypt and in Japan?
Why these differences?
What have you learned yourself by teaching in the master programme in E-JUST?

Questions for administrators:
What is the role of E-JUST? What outcomes do you expect from students?
How do you evaluate E-JUST when compared to other universities?
How can the learning method of E-JUST can be disseminated to and in other universities in Egypt?
## Appendix 2: Acronyms for Departments

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Corresponding expansion</th>
<th>Schools</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRE</td>
<td>Department of Mechatronics and Robotics Engineering</td>
<td>School of Innovative Design Engineering</td>
</tr>
<tr>
<td>IEM</td>
<td>Department of Industrial Engineering and Systems Management</td>
<td></td>
</tr>
<tr>
<td>MSE</td>
<td>Department of Materials Science and Engineering</td>
<td></td>
</tr>
<tr>
<td>ERE</td>
<td>Department of Energy Resource Engineering</td>
<td>School of Energy, Environment and Chemical and Petrochemical Engineering</td>
</tr>
<tr>
<td>CPE</td>
<td>Department of Chemicals and Petrochemicals Engineering</td>
<td></td>
</tr>
<tr>
<td>ENV</td>
<td>Department of Environmental Engineering</td>
<td></td>
</tr>
<tr>
<td>ECE</td>
<td>Department of Electronics and Communications Engineering</td>
<td>School of Electronics, Communications and Computing</td>
</tr>
<tr>
<td>CSE</td>
<td>Department of Computer Science and Engineering</td>
<td></td>
</tr>
</tbody>
</table>

(Resource: http://ejust.edu.eg/main/schools/school-of-innovative-design-engineering)
Appendix 3: Interview protocol

Research on students’ experience in E-JUST

Thank you very much for making time available to answer my questions today. My name is Maiko Miyakoshi (or Salwa in Arabic). I am currently taking a master programme in Sustainable Development at Uppsala University, Sweden, and I am trying to work on my research project focusing on students’ experience in E-JUST. Since I had been working as a JICA volunteer in Hurghada almost a year ago, I was very interested in how the cooperation in education between our countries, Egypt and Japan, may foster future sustainability of Egyptian society. Hence I decided to do my research on E-JUST and try to gain students’ perspectives on their own experiences in E-JUST.

In order to sketch an overall picture of what you think and feel about your experiences, I have prepared a number of questions and I invite you to respond to these questions. For some of the questions, you will simply answer a Yes or a No. For other questions, I invite you to tell me your personal experiences and opinions. I may also ask some additional questions to understand more details.

As you can imagine, I need to record our conversation since I am going to transcribe all the answers and analyze them. I can assure you that your answers will not be divulged to anyone else. I will give a copy of my thesis to E-JUST as a result of this research, but no one will be able to identify your responses in the thesis.

Before we start, I wish to obtain your agreement on three points:

1. Do you agree to that I make a recording of our conversation?
2. Do you agree I can use your answers to my questions, provided they are written anonymously, so that nobody will be able to connect any of your answers to you personally?
3. Do you agree to that I take your telephone number, e-mail address and skype name (for later follow-up)?
Appendix 4: Transcription example

(After introduction)
Interviewer: Thank you for giving me your permission to record our interview. Now we start recording. First of all, could you tell me your name, which programme you are enrolled, which year you are, sex (male or female), age, previous university history, and previous employment history?
Student A: My name is XXXX. I am female, I studied XX at XX university and worked there as a TA for 3 years.
Interviewer: You are from XX. It is really beautiful there.
Student A: Thank you.
Interviewer: And you are studying in XX department at E-JUST right now. Could you tell me about what you like about the education method at E-JUST?
Student A: Sure. There are many aspects I like about the education method at E-JUST. First, it is research oriented. Second, E-JUST has defined programme - two years for master programme and three years for PhD programme. In my home university, it requires much more years. [Abridgement of statement since it included some personal information] Also, E-JUST has much funds, and devices, labs for research are well provided. Another important aspect is experiencing different community; for example, I am learning from Japanese supervisor. It is also important that E-JUST has funds for conferences and attracting excellent professors. I think it is also nice that we study in a small community because we can have better communication when the number of people is small. And there is one more thing. In my home university, main concern is undergraduate students, but in E-JUST it is not like that, Master students and PhD students can get many instructions from supervisors.
Interviewer: I see. Thank you for telling me many important aspects about education at E-JUST. Now could you also tell me about what you do not like about the education method at E-JUST?
Student A: There is nothing I do not like.
Interviewer: That is great. Then in what way are these education methods different from the methods you were familiar with in your other university or in secondary school?
Student A: I think my answer to the question would be the same with the answer I already told you earlier.
Interviewer: Okay. So let’s move on to next question. Are you working on or in a group project/PBL/research?
Student A: I worked with my group of three colleagues during PBL course in 2010, September, it was the best experience for me at E-JUST. I was a new students and had little knowledge of doing research and projects. But after I took PBL I learned a lot of them.
Interviewer: Can you tell what the project about?
Student A: It was about indoor positioning system. We published paper about this project. It was my first published paper, it was remarkable.
Interviewer: That is wonderful. What did you like about the project?
Student A: I liked working in a team, I liked my supervisor since we could communicate with him anytime, and I also like distribution of tasks.
Interviewer: Well then what did you not like about the project?
Student A: It consumed a lot of time for experiments, writing reports, and etc. I think more credits should be given to the PBL course.
Interviewer: It was time consuming. What do you think is the advantage of learning through projects?
Student A: It gives you freedom to manage your own idea and be creative. I was happy to work with my colleagues. When we got good results from the project, I was much happier than having good grades.
Interviewer: What do you think is the disadvantage of learning through project?
Student A: It is all up to you. It is all depended on students. fortunately, my colleagues were very hard worker. We all worked hard.
Interviewer: Do you think you are learning more or better with the learning method in E-JUST than the methods used in other universities?
Student A: Absolutely yes, I learned a lot and better than my home university.
Interviewer: Do you think that your learning style has changed while studying in E-JUST?
Student A: Yes, at home university, we are given textbooks and teachers teach us answers of questions for exams, it is rare to experiment and do projects, there is no practice and it is not required to make a lot of efforts to search for information, professors say everything, I just understand what professors say.

Interviewer: Thank you. Now let me ask you about your future. Do you know what you are going to do in the future?

Student A: I have multiple choices, but I feel that I have ethical obligation to go back to my home university and try to transfer the method I leaned here in E-JUST. Maybe after two years in my home university, I may try to continue my research in other countries.

Interviewer: Do you think your experience in E-JUST has changed your view about future career?

Student A: Yes, usually research has very little weight, publication is limited to national journal or conferences. Major part of professor’s duty is teaching, they don’t focus on high quality research, or supervising Master/PhD students for high quality dissertations. so yes, E-JUST affected me to have a better image of how professors should be.

Interviewer: How do you think you can develop new teaching method in your home university?

Student A: I was told that I will have a wide range of freedom on how I teach my students, and the topic I teach. But I will not affect the whole system. As an individual, I will be able to use new technology and methods, but it will be very difficult to affect the entire system. Usually for professors who are old enough to be a department chair, it is very difficult to change their mind. In Alexandria university, Cairo university, Ainshams university, they have a lot of professors coming from university abroad, they have very high quality learning experience. It is different from local universities where most of professors have PhD from the same universities. They don’t have experience in international community or latest technology, so it will be much difficult for me. But I will be able to do something in a small scale.

Interviewer: Are you working with people outside the university? Community, industry, government?

Student A: In XXX university, I did joint research and published paper with professors there.

Interviewer: Do you think your study area/focus is important for future society of Egypt?

Student A: Yes, of course, as you may have noticed, Egypt use a lot of technology that are produced outside of Egypt. We have to move on, not only user of technology, but also technology producer.

Interviewer: Is there anything that can hinder its development?

Student A: Learning system in Egypt starting from pre-school, we need a lot of improvements in education system from early education. Also we lack funds, much of our income go to military, army, police, but for learning we have very limited money for education. We should teach students how to be creative, we should provide them with new technology and develop learning techniques. Some schools do not even have computers.

Interviewer: Thank you so much for your very interesting answers and thoughts. I really wish your best with your PhD programme.
### Appendix 5: Field notes example

<table>
<thead>
<tr>
<th>XXX (Name of interviewee)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010 – MSc</td>
</tr>
<tr>
<td>2015 – PhD</td>
</tr>
<tr>
<td>XX (age), graduated from XX university 2009</td>
</tr>
<tr>
<td>○ Devotion of professors, tools available anytime, small number of good students</td>
</tr>
<tr>
<td>☒ Everyday new rule, needed to be patient</td>
</tr>
</tbody>
</table>

Group work – PBL, research, and workshop
PBL – inspired his teaching method, now using the same concept at his home univ.
– ‘learning by doing’
Still hard to implement and organize the concept because it is his first semester but he is preparing and started working with his student for graduate project.

Learning better?
Dedication of professor
Learning by doing
Capability of applying the knowledge

Learning style?
Publication during course project → created opportunities for him to study outside of his study area

Cooperation with people outside?
Collaborated with undergraduate student from Alexandria university

He is trying to make his exam style different to let student think creatively using knowledge based on his course materials.