Sustainable Development at University: 
*Comparison of Students’ Knowledge, Awareness and Actions*

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<tr>
<td>SD</td>
<td>Sustainable Development</td>
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<tr>
<td>ESD</td>
<td>Education for Sustainable Development</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<td>UNCED</td>
<td>United Nations Conference on Environment and Development</td>
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<td>UNESCO</td>
<td>United Nations Educational, Scientific, and Cultural Organization</td>
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<td>DESD</td>
<td>Decade of Education for Sustainable Development</td>
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<td>UNLD</td>
<td>United Nations Literacy Decade</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>IUCN</td>
<td>International Union for Conservation of Nature</td>
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<td>WWF</td>
<td>World Wildlife Fund</td>
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<td>INTECOL</td>
<td>International Association of Ecology</td>
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<td>IUBS</td>
<td>International Union of Biological Sciences</td>
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<td>MDGs</td>
<td>Millennium Development Goals</td>
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<td>EFA</td>
<td>Education for All</td>
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<td>EMS</td>
<td>Environmental Management System</td>
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<td>HIG</td>
<td>University of Gävle</td>
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Abstract

After the Rio United Nations Conference on Environment and Development, the need of sustainable development obtained recognition from the vast majority of countries and organization. Human society entered a new development period. More and more people know about sustainable development. Education for sustainable development is a concern for the world where university can make a contribution. Students who are the majority in a university, their knowledge, awareness and action will play an important role to promote sustainable development.

The purpose of this thesis is to study if there is any difference in students’ knowledge and awareness on sustainable development in university, based on the comparison between freshmen and seniors. Through the comparison, this will explore if students’ knowledge and awareness is influence to their action. This thesis does a literature review to understand deeply about sustainable development and explores students’ knowledge, awareness and actions of sustainable development through questionnaire.

The analysis of data from the questionnaire indicates that their knowledge and awareness influences their actions. The freshmen and seniors have difference in knowledge and awareness. Knowledge of students on sustainable development appears to have increased slightly during years study. However, as the knowledge increased, there is not much difference in their knowledge and awareness of sustainable development. Based on the different degree of knowledge and awareness, seniors appear to do better than freshmen in their actions.

Key words: university, sustainable development, education, freshmen, seniors
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1 Introduction

1.1 Background

1.1.1 Sustainable Development

Peace and development are two eternal themes in the world (Mayor & Binde, 1999). Amounts of issues have intimate connection with human being, such as hunger, poverty, disease, ecological disruption, cultural problems etc. Therefore all the countries across the world pay attention on which approaches would be the development path. Then sustainable development was proposed in 1972 at the United Nations Conference on the Human Environment in Stockholm (UN, 1972). According to the report of the World Commission on Environment and Development, sustainable development was defined as ‘development that meets the need of the present without compromising the ability of the future generations to meet their needs’ (UN, 1987). This concept has obtained a broad consensus in the international community.

The definition of sustainable development can understand as economy, society, resource and environmental protection must be coordinated development that is an inseparable system. Sustainable development states human actives are not only for achieving economic development goals, but also protecting the necessary resource, such as atmosphere, freshwater, oceans, land, forests, environment and other natural resources, in order to give the future generation sustainability of life and work. The core of sustainable development is to develop, but both economic and social development requires strictly controlling the population, increasing the population quality, environmental protection and sustainable use of resources (UN, 1987). The international community attaches great importance to sustainable development. The specialized United Nations agency and other agencies make an ongoing effort together for sustainable development through intergovernmental agreements. As a new concept and development model, sustainable development strategy aroused widespread attention once introduced to the world (Glenn & Gordon, 2002). It is almost two decades since the 1992 Rio United Nations Conference on Environment and Development (UNCED) strategy for sustainable development has been formally proposed. During these twenty years, most of the countries and regions and international organizations set up preconditions for their sustainable development strategy in the 21st century based on "the Rio Declaration on Environment and Development" and
"Agenda 21\(^1\) and other programmatic documents. From the announcement of "Rio Declaration" by the United Nations World Conference on Environment and Development in 1992 on Rio de Janeiro to the "Johannesburg Declaration" concept of sustainable development by World Summit in 2002, concept of sustainable development have been used all over the world (Tahir, 1999). During all this time, people’s consciousness gradually improved, and they realize education is an important part to help to promote sustainable development.

### 1.1.2 Education for sustainable development

In 2002, the World Summit was held by the United Nations in Johannesburg in South Africa due to a global concern on Sustainable Development. At the meeting, heads of states unanimously adopted the 57th United Nations General Assembly Resolution No. 254 (UNESCO, 2005). From 2005 to 2014, this period was identified as "Decade of Education for Sustainable Development" (DESD), which means education is an indispensable component to achieve sustainable development (UNESCO, 2005). United Nations Educational, Scientific, and Cultural Organization (UNESCO) was designated to lead "Decade of Education for Sustainable Development" to carry out the activities and help organizations to develop "the United Nations Decade of Education for Sustainable Development (2005-2014) International Plan of Implementation (UNESCO, 2005)". The United Nations have suggested the governments around the world to integrate ideas of DESD with all relevant education strategies and action plans in their countries (Cotton et al., 2007). As the lead agency of decade bill, UNESCO has been requested by the United Nations to provide advice for other relevant international organizations, governments, non-governmental organizations and other related personnel to draft international implementation scheme (UNESCO, 2005). It always remembers the relationship between the sustainable development of education and the current important task of international education, especially the United Nations Literacy Decade (UNLD) World Education Forum in Dakar Framework for Action adopted (UNESCO, 2010).

### 1.1.3 Sustainable development in university

United Nations Secretariat has published the indicators for sustainable development. Plenty of organizations are encouraged to work for the environmental protection and

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\(^1\) Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment.
enhance the public concerns for the future development (Bartelmus, 2008). University is one of educational institutes involved to make a contribution to sustainable development and increase the awareness of stakeholder on social, economic and environmental issues. The university works its positive attitude and determination through the sustainability planning, policies, objective, target and other approaches.

Nowadays education plays an important role in promoting sustainable development in the university, for example, strengthen the integration of sustainable development in each subject, interdisciplinary studies, and curriculums. University is a place for the students to gain knowledge. University would promote sustainable development to students and enhance students’ awareness and knowledge on the sustainable development through the education. Thus, as one of the stakeholders of university, students would have action competence on how to promote the sustainability of university. When students understand the sustainable development and have knowledge on this area, they would be aware of the reason why to promote sustainability. Also they would have some practical on promoting. What’s more, they could extent the ideas on sustainable development in their daily and even in their future career in the society.

1.2 Research purpose

There are many stakeholders of university, such as faculty, staff, students, suppliers etc. As the majority of people of university, also the stakeholder of university, students play an important role in supporting sustainable development in the university.

Students’ knowledge and awareness affect their actions, may play a positive role, leading their action on promoting sustainability in the university, or even helping them to have a more positive lifestyle for sustainable development in the future. University is a place of knowledge promotion, for students to gain knowledge. Students shall gain knowledge, build value, as well as improve their awareness through the education. (Sammalisto, 2007) Therefore university promote the sustainable development through the policies, planning, curriculums, activities, training and other approaches in order to enhance students’ awareness on this area. (Lozano & Peattie, 2007; Hungerford, 1994) During the studies, students’ knowledge and awareness is expected to be developed logically. However, the result might be different. This is worthwhile to study and the reason why this research to launch.
The purpose of this thesis is to find out is there any difference of students’ knowledge and awareness on sustainable development in university, based on the comparison between the freshmen first year students and senior third year students. Senior students have been taught more than the freshmen, and might have more chance to engage sustainable development in university. Through the comparison, this thesis aims at exploring students’ knowledge and awareness influence to their actions.

1.3 Research questions

For finding out the disparity of the students’ knowledge and awareness on sustainable development, the authors design the questions to study. The following are the research questions lead the authors to study across the whole research.

- Has students’ knowledge and awareness on sustainable development increased during their studies?
- What’s the difference of the actions between freshmen and seniors based on their different knowledge and awareness?

1.4 Research scope

The research scope is defined with the following main aspects. Firstly, there are many approaches for the university to promote the sustainable development, and many ways for students to get the information and knowledge about sustainable development, for example, from the media and websites. But education is the main mission of the university, as well as the relationship between the student and university is closed. Secondly, this study took place at the University of Gävle in Sweden. The study takes this university as an example to do the research, compares the freshmen with the senior students in University of Gävle. However, this does not mean the cases in university of Gävle is unique or special, it maybe common in other universities. The reasons why we choose University of Gävle as the case to study are that this university received an environmental certification under ISO 14001 in 2004, and the certification is renewed in 2007 and 2010. And the faculty of engineering and sustainable development has unique laboratory resources in some particular areas, such as indoor climate technology, wind tunnel technology (Hig, 2010). Also, we study in this university almost a year then we know about it to some degree, and it is convenient for us to get information from students. Thirdly, this study selects the students as the research object. University has lots of stakeholders, has internal and external connections with the society and environment. But this thesis just emphases on the students, a main stakeholder of university. Because
students the large part of the university, can be seen as the customers of the university, or even can be seen as the products of the university. From the beginning of entering the university to graduation, this is the period for the students to be taught. Their knowledge and awareness are expected to be improved during the studies, as well as to be used in their future life and career, or even have influence on their families, friends and communities. This is like a way to spread the knowledge. Last but not least, the study conducted on four three years bachelor programs in the university instead of all the disciplines. All these four programs are expected to have some information of sustainable development of University of Gävle within its EMS.

1.5 Thesis outline

This chapter presents the background of sustainable development, education for sustainable development and sustainable development in university. Also mentions the problem, purpose and scope of this thesis.

Chapter two, Literature review
The definition from different aspects of sustainable development, the four main meeting of sustainable development and the dimensions of sustainable development is discussed. In this chapter we also review education for sustainable development and the action competence.

Chapter three, Methodology
The setting of this thesis and the choices made for data collection are described in this chapter. So that it can help reader understands how the data was collected and how the conclusion was reached.

Chapter four, Result
This chapter, the data collected through questionnaire will be presented.

Chapter five, Discussion
In this chapter, we will analyze the data from result. Reader can find the discussion which directs him or her into our conclusion. Also this chapter will point the result of our study to see whether freshmen and seniors have differences of their knowledge, awareness and actions.

Chapter six, Conclusion
This chapter presents the conclusion of thesis based on the other five chapters. We intend to think out a conclusion in order to answer our research questions.
2 Literature review

2.1 Background of sustainable development

Why can sustainable development, which is a new developmental concept, create general concern in the international community and get acceptance in the vast majority of countries in just a few decades? This is result from the profound background of sustainable development. In other words, it is an urgent need from human self-development.

2.1.1 Four significative meeting on sustainable development

Sustainable development as scientific thinking from formation to maturity can divided into four stages by four reports which published by the United Nations and other international organizations.


In 1980, International Union for Conservation of Nature (IUCN), the United Nations Environment Programme (UNEP) and World Wildlife Fund (WWF) jointly published “World Conservation Strategy: Living Resource Conservation for Sustainable Development” (IUCN, UNEP & WWF 1980). The strategy emphasize the management of human use on the biosphere should make it not only fulfill contemporary people maximum benefit, but also maintain the capability to meet the needs of future generations and systematically expounded the concept of sustainable development.

In 1987, World Commission on Environment and Development published our common future report. It discusses the concept of sustainable development. Sustainable development was defined as ‘development that meets the need of the present without compromising the ability of the future generations to meet their needs’ (UN, 1987).

recognization from the vast majority of countries and organizations. Human society entered a new development period.

### 2.2 The perspectives of sustainable development

Just in few years the concept of sustainable development becomes a popular idea in world. Whether national leaders or majority of researchers, they have been accepted the concepts and methods of sustainable development and rapidly introduced into the planning, regional governance and global cooperation sphere. Cause the study from different perspectives; different scholars from different countries on sustainable development had different understanding as well (Pawtowski, 2008).

Sustainable development can be seen as win-win interaction civil society and culture, legitimate business and economy and government. However, vacuum does not have this social interaction according to the discussion on sustainable development in the Philippine Agenda 21. From Figure 1, different dimensions of sustainable development are easily visible. They contain human being, polity, economy, culture and nature, etc. But to these, we need to separate society as a special one. Society can be known as the compositive result of reciprocities of the activities of economy, polity and culture. (CADI, 2002) For example, the population is a development issue. Just can deal with it from the perspective of community, not only from polity alone, or the economy alone, or culture alone. And the three main dimensions are described as follow. Also some other perspectives are mentioned.

![Diagram of Sustainable Development](image)

Figure 1. (CADI, 2002)
2.2.1 The social, economic and ecological perspective—three main dimensions

Figure 2 shows three main dimensions of sustainable development, which includes Economic development, Community development and Ecological development. According to Figure 2, firstly, rapid population growth brings a serious impact to world economic stability and development (Jackson & Roberts, 2000). In order to satisfy need of the increasing population, human have to acquire food by some predatory ways, such as over-grazing, over fishing and heavy use of fertilizers to increase yields. As a result that ecologic balance was damaged. That will cause a lot of economic problems, such as decrease of crop yield and prices rising. These economic problems inevitably lead to poverty and other social problems. This vicious cycle seriously imperil to human social development.

Secondly, after industrial revolution human created enormous material wealth by progressive technology. The acquisition of this great wealth is including two aspects. On the one hand human piratically exploit and use natural resources, which generate the development model of high consumption and high investment. On the other hand it produces high-value consumption lifestyles and the mode of production of private ownership on pursuit of high profit. Those will exacerbate the results of shortage of resources, ecological destruction and environmental pollution (ibid).

Again, the old international order resulted in the unequal distribution of worldwide wealth. It leads to some developing countries more poverty. However these developing countries in order to develop their economies and get rid of poverty, they will exploit and consume non-renewable natural resources and energy blindly; also they will ignore environmental pollution and ecological damage during the productive processes. This developmental model impacts not only on economic stability of developing countries, but also the global economic development. In addition, nuclear weapons, biological weapons and arms race from two superpowers during the Cold War make people's environment in threats of war even destruction. All above factors make human clearly understand actual condition, for peoples own survival and development they must control population, change the traditional model of production and consumption patterns. That could ensure social development and economic contacts fairly, maintain world peace as well. Human as part of biosphere, its natural attribute determine people only survive and develop in a balanced ecosystem. However, human activities such as environmental pollution, over deforestation, soil erosion, soil desertification, ozone layer thinning and disappearance of
species will directly affect the ecosystem’s balance. So after human explore and master ecological rule, we know it is urgent to take the sustainable development road to maintain our own development.

Figure 2 Community development, economic development and ecological development
Source: Pinfield, 1997

**The social dimension**

In 1991, the World Conservation Alliance (INCN), United Nations Environment Programme (UNEP) and the World Wildlife Fund (WWF) jointly published “Caring for the Earth: A Strategy for sustainable Living”, it is proposed definition of sustainable development as: "Improving the quality of human life while living within the carrying capacity of supporting ecosystems " (IUCN, UNEP, WWF, 1991), and made 9 principles of sustainable human basic survival. These nine principles emphasize the human produce mode and lifestyle must maintain a balance with the Earth’s carrying capacity and protect the vitality of the earth and biological diversity. Meanwhile, they proposed 130 actions programs and focus on human society that is the ultimate point of sustainable development. In other word, that will improve the quality of human life and create a better living environment. The strategy believes that countries can develop according to their different national conditions and development goals. However, the connotation of "development" should include the improving human health, improving the quality of human life, the approaches to receive necessary resources and environment can guarantee
that people equality, freedom, human rights. If people lives in all these areas have been improved, that is the real "development".

- **The ecological dimension**

In 1991, the International Association of Ecology (INTECOL) and the International Union of Biological Sciences (IUBS) held jointly seminar on sustainable development issues. The outcome of the seminar is not only developed and deepened concept of natural attributes on sustainable development, also mark the definition of sustainable development as: "to protect and strengthen the production and updating capabilities of environmental systems". The definition of the concept of sustainable development starting from biosphere is another representation from the sustainable development of the natural attributes. Sustainable development is searching a best ecological system to support the ecological integrity in order to maintain human living environment (Eeagrants, 2006).

- **The economic dimension**

Traditional economic development has been considered as target and through used a tool of environment resources. In sustainable development, economic prosperity is a very important factor (Eeagrants, 2006); it makes the finance remediation burdens, eradication of poverty and rejuvenates the changes in our development. However, not all economic growth means that the improvement of sustainable development. Only in reducing the environmental impact of economic growth can be justified as part of sustainable development. In other words, the impact of economic growth and environment must be decoupled by improving eco-efficiency. Economic market mechanisms and policies must be applied in support of sustainable development, rather than against it. The sustainable development of economy is a very powerful tool without denying the importance of tools such as public awareness, legislation, etc. Used in the correct way, it supplies efficient incentives to make choices for sustainable development.

2.2.2 The philosophical and ethical perspective

According Baihai (1993) and Standford (2008), in last early century, people establish incorrect development view to achieve modern industrial civilization based on opposition between man and nature and center of human benefit. Under this development view, people make nature as opponent to create abundant physical and mental civilization
continuously, and let human benefit as starting point to use and change nature as well. Humans enjoyed with high developed material civilization, while they ignoring the threat of their own development from environmental pollution and ecological destruction. Human plight promote people to rethink profoundly the relationship between man and nature. Introspection can realize gradually that people are one part of nature, we must coordinate with nature in order to survive and prosper and give up the opposition of nature. People need to recognize value and right of nature, care the survival and development from all kinds of species and walk away from anthropocentrism. This world view changes provide the origin of thoughts of sustainable development.

2.2.3 The technological and cultural perspective

Development of modern technology turns global economy, society, resources and environment system into an inseparable unit. Therefore, protection of environment is no longer the responsibility and obligation of a country or a region. If want to achieve protection of environment, its need peoples of all countries and regions in the world working together. For this reason, people want to achieve the target of human development and prosperity, each type of countries should take the road of sustainable development. With the improvement of people's material life, they not only focus on their own, but also noted that the life of next generation or generations (Nurse, 2006).

People hoped that the next generation will get the same or even more material and spiritual civilization. Therefore, inter-generational equity has act as one of their objectives. Human generations living in the same planet have equal right to use and develop the resources and space of this planet. Therefore, people should take the wealth of contemporary transfer policies, in order to make future generations stay relaxed. Intergenerational balance thinking for sustainable development provides theoretical support.

2.3 Education for sustainable development (ESD)

Education is the foundation for achieving sustainable development. Education for sustainable development, with the purpose of helping people to develop their knowledge, awareness, attitudes and skills to make a proper decision for the benefit of all in present and future, and take actions based on the decisions. The United Nations Decade of Education for Sustainable Development (2005-2014), for which the UNESCO is the lead
agency, seeks to incorporate the principles, values and practices of sustainable development into all aspects of education and learning (UNESCO, 2010).

### 2.3.1 Interpretation of ESD

It is apparent that there is a wide range of the description of ESD. However, based on the country’s particular situation and practical challenges the country facing currently, the definition of ESD varies from country to country. So far there is no consensus on it besides some key components (UNESCO, 2009). The definition of education for sustainable development was provided in the DESD Monitoring & Evaluation (M&E) guidelines document, it was described as follow: (UNESCO, 2009)

> “Education for Sustainable Development (ESD) is a learning process (or approach to teaching) based on the ideals and principles that underlie sustainability and is concerned with all levels and types of education. ESD supports five fundamental types of learning to provide quality education and foster sustainable human development – learning to know, learning to be, learning to live together, learning to do and learning to transform oneself and society.”

Also, in the DESD M&E guidelines document, it is mentioned that education for sustainable development must be seen as a comprehensive project for quality education and learning with key issues of sustainable development. For instance, some hot issues mostly people concern nowadays, poverty reduction, sustainable livelihoods, climate change, gender equality, corporate social responsibility and protection of indigenous cultures (UNESCO, 2009). The characteristics of education for sustainable development make it to be able to reach the development goals, which include the Millennium Development Goals (MDGs) and Education for All (EFA) (UNESCO, 2009). In term of these initiatives, a set of goals are to be achieved within a limited period of time. Education for sustainable development can be seen as the tool for achieving those goals (UNESCO, 2009).

Even though the various meaning of ESD in different countries, they share some key points in common that can be described as: (UNESCO, 2009)

- ESD is a transformative and reflective approach for integrating the values and perceptions of sustainability both in education system and one’s personal life and career.
- ESD is an approach to give students the ability with new knowledge and skills to help to solve common problems that the global society facing at present and in the future.
- ESD is a holistic measure to attain economic and social justice and respect for all life.
- ESD is a means to promote the quality of basic education, as well as to adjust the existing education programs and to enhance awareness.

2.3.2 Challenges to ESD

Based on the various situations different counties facing right now, they have some impediment on the achievement to sustainability, such as lack of awareness, lack of funding. For implementing ESD successfully, government and educational institutes should take action to address the issues generally exited so far. The generic 12 issues can be showed as follow as stated by McKeown (2002):

- Increasing awareness it is essential to develop education for sustainable development.
- Structuring and placing education for sustainable development in curricula
- Educational reform and economic viability
- The complexity of sustainable development concept
- Developing ESD programs with public participation
- Threading the traditional disciplines in a interdisciplinary framework
- Sharing the responsibilities
- Building human capacity
- Developing financial and material resources
- Developing policy
- Nurturing an appropriate climate
- Promoting sustainability in popularization

2.3.3 Higher education for sustainable development

Comparison between the child education in school and the student education in university, the university plays a more effective role in promoting sustainable development. Higher education has social responsibility to contribute to the sustainable development. Faced with the severe challenges of current and future global, higher education is responsible for improving students’ understanding of existing issues, which include social, economic and environmental dimensions and their ability to respond to them (UNESCO, 2009).
And through implementing the core functions of higher education institutes, students pay more attention to interdisciplinary, as well as their critical thinking are promoted (UNESCO, 2009). This would contribute to sustainable development.

Fundamental characteristics of higher education make some positive contributions on promoting sustainable development. Higher education is innovative to promote ESD effectively and train others to implement its goals, particular the future generations of teachers in elementary school and secondary school. Also, higher education is specialized to offer great support on the technology and science to help to save energy and reduce emission as well as the development of indicators and assessment system, and the implementation of strategies for new technology. Moreover, higher education educates students in various professional fields, which has effect on students’ future career and thus influences the development of future (Niu et al., 2010).

Bourn (2010) pointed out the some strategies on ESD within higher education. He mentioned that the greatest contribution higher education has to make to sustainable development is empower students with new values, knowledge and skills. This is one of main concepts of education for sustainable development. Curricula and pedagogy are the main ways but not the only way for higher education to make great contribution to sustainable development.

2.3.4 Curriculum in university

ESD introduces the elements of sustainable development into curricula. There are many opportunities for students to develop their knowledge and understanding of sustainable development within the university curriculum, for example, their work in science, geography, and energy.

How to integrate sustainable development into the curriculum? Four approaches are mentioned by Lozano and Peattie (2007), which can be used separately as well as combined with others. First one is the existing module or course covers some environmental issues and material; second one is to offer a specific sustainable development course; thirdly, sustainable development as a concept embeds into the regular disciplinary courses, compatibly with the nature of each particular course; the fourth is sustainable development as possibility for specialization within the framework of each faulty (Lozano & Peattie, 2007).
Those four approaches mentioned above are not the only ways to incorporate sustainable development into curricula. There could be many others paths to make that happen. Hungerford (1994) designed the model for the implementation of environmental education into curricula. This model can refer to the implementation of sustainable development into the curricula. Two models are described as two figures in following; the first model is Diffusion Model, the second model is Infusion Model. (Majumdar, 2010)

According to figure 3, the diffusion model shows that sustainable development issues from different disciplines of education are dispersed. Different disciplines make different degree of contribution to sustainable development. A discipline makes contribution to particular dimensions of sustainable development with its own professional knowledge, such as business contributes to the economic dimension (Lozano, 2009). And the generic knowledge, skills and attitude of sustainable development will be covered with specialization in specific fields.

![Diffusion Model](image)

Figure 3 Diffusion Model (Majumdar, 2010)

The infusion model illustrates the generic knowledge, skills and attitude of sustainable development are embedded into different disciplines from the figure 4. Sustainable development is explicit and reflected within various disciplines (Figures 3).

Different schools in the university make a different contribution in sustainable development. Some do less, some do much. Some schools are competent for their own discipline and the contributions for a particular aspect of sustainable development. However, sometimes these schools overlook the potential contribution to other discipline and other aspects of sustainable development because of compartmentalization, overspecialization and reductionism. Therefore, a move towards more balanced, synergistic, interdisciplinary and holistic perspective is necessary for the university, which will help
the graduates to make a better contribution for the society on sustainable development (Lozano, 2009).

![Infusion Model](image)

Figure 4 Infusion Model (Majumdar, 2010)

### 2.4 Action competence

Holt (2003) takes environmental education as example to illustrate personal’s environmental knowledge and awareness could be increased by various resources, information and have an effect on their action. Figure 5 describes three different periods for people to gain environmental information, technical skills and environmental attitude, the storage of knowledge, skills and attitude increases from the first period to the third period. In the previous period, people develop knowledge, skills and attitude through school curriculum and informal environmental education, for instance, media, social interaction, TV and film. In the university period, the ways for people to develop their knowledge, skills and attitude are familiar to the previous stage. Besides, there is one more path that is employers’ environmental staff and development training. In the working period, students graduate from university or college and start their career life; they develop their knowledge, skills and attitude through the informal education and the training. This is a flow chart to explain the knowledge, skills and attitude will be change with personal experiences. (Holt, 2003)
According to the figure 6, Smmalisto (2007) provides a model to study the implementation of sustainable development in university. It takes six steps to develop. From this, step 2, step 3 and step 5 will be focused on explain the changes of students action competence in this thesis study. In step 2, implementation of environmental management system (EMS) in higher education, university has more opportunities to empower students to gain more knowledge about sustainable development. In step 3, students’ awareness can be increased through knowledge learning in curricula in the university and informal information out of university. In step 5, students can take action to support sustainable development practically, in their future career and daily life.
Figure 6 Model for the study of sustainable development implementation in university (Sammalisto, 2007)
3 Methodology

This chapter’s purpose is to offer the reader with an understanding of the methodology and research approaches adopted in this thesis. And this chapter will describe the research method, research setting, research sampling and collection of data.

The research aim of this thesis is to find out is there any difference of students’ knowledge and awareness on sustainable development in university, based in the comparison between the freshmen and seniors. Through the comparison, this thesis aims at exploring students’ knowledge and awareness influence to their action. Obtain valid data and accurate information is an important to set the research methods and use them effectively in order to reply research questions and achieve the research purpose well.

This study took place in University of Gävle (HIG). University of Gävle founded in 1977 (HIG, 2010), it has expanded rapidly and three faculties that provide about fifty degree programs and eight hundred elective courses. There are about 12,000 students registered at the University of Gävle. 50% of these students come from surrounding areas and 50% from other parts of Sweden. Slightly more than half the students are female and the amounts of students with ethnic backgrounds other than Swedish are rising every year. Students and scholars come from near region, as well as from abroad thriving academic environment committed to learning and teaching.

This study chooses students as research object. And we select freshmen and seniors from four programs in University of Gävle which have both Swedish students and international students. They are electronics, energy system, geomatics and industrial and logistics management.

3.1 Collecting Primary data

Primary data is the first hand information researcher gather up through various approaches. Usually, this kind of data is interested to the researcher and relevant to the study, in order to help researcher to investigate the research problems. There are many ways to collect primary data, and the methods commonly used include: questionnaires, diaries, interviews, observations, standardized scales and tests, and accounts. (Walliman, 2005)
3.1.1 Sampling

When conducting the survey or select some particular cases to study, it need an approach to select a part of individual as the sample from the population. Basically, there are two types of sampling procedure, which consisted of random and non-random. Simple random is a measure that each part of the population has possibility to be selected coequally. There are some main types of random sampling, including simple random sampling, simple stratified sampling, proportional stratified sampling, cluster sampling, systematic sampling (Walliman, 2005).

In this study, four departments are chosen to have a questionnaire with students. They are Electronics, Energy System, Industrial and logistics management, and Geomatics. The amounts of freshmen and seniors in each selected apartment are different. Totally there are 29 freshmen and 26 seniors in Electronics, 18 freshmen and 35 seniors in Energy System, 42 freshmen and 41 seniors in Geomatics, 27 freshmen and 40 seniors in Industrial and logistics management. There are two departments the number of freshmen and seniors are almost the same, but in other two departments the number of seniors are much more than freshmen. Based on this, we choose 15 freshmen and 15 seniors of each department from the population as the sample to study randomly.

3.1.2 Questionnaire

In this study, questionnaire is the main method to collect data. As an approach of data collection, questionnaire is a flexible and popular tool to gather first hand source. There are some advantages and disadvantages to gather information through questionnaire. The advantages are mentioned as following. One of the main advantages is that the responses can be completely anonymous, which could avoid the embarrassing to answer some particular questions with a true reply (Walliman, 2005). Also, it has a wide geographic coverage of the respondents, no matter where they are on the globe as long as they can be reached by post or contacted by internet (Walliman, 2005). It can be delivered by post, emails or fax. Moreover, questionnaire is a relatively economic method both in time and cost, and a large number of people or organization could be covered (Walliman, 2005). In addition, there is no interview bias and no need for the prior arrangements. However, there are some disadvantages of questionnaire. Firstly, questionnaire can be low respondent rate, and sometimes the analysis could be delayed because of waiting for the respond returned. Secondly, here is the problem on incomplete replies, because there is no control to the participants to finish all of the questions. Thirdly, it is not easy to get assistance when respondents answering the questions.
When constructing a questionnaire, there are some simple rules have to be considered. The following is stated as main points when devising a questionnaire: (Walliman, 2005)

- Generally keep the questions simple, and as short as possible
- Express in simple language
- No more than one question at one time
- No ambiguous questions and inappropriate questions
- Avoid leading questions
- Avoid sensitive questions
- Avoid double negation

A questionnaire is designed in order to investigate the research questions of this thesis, because its characteristics are appropriate to the purpose of this thesis. And the questionnaire is formatted in two different languages, which involved English version (Appendix 1) and Swedish version (Appendix 2), for the international students and Swedish students to answer the same questions. At the beginning of questionnaire, purpose and the introduction are explained, and the tribute is showed to thank all the participants. The questions are mainly classified by four parts. First of all is the basic information about the person who answers the following questions. The remaining three parts are divided into knowledge, awareness and action section to get information from the students. Again, this questionnaire mainly provides attitude questions with different scales. This attempts to see how strongly the respondent held with regard to the questions. Furthermore, this questionnaire offers some closed questions and an open question.

3.1.3 Using internet for the primary research

Most people think internet is a way to find secondary data. However, internet also could be the way to get the first hand information. According to Hewson et al. (2003), surveys and questionnaires are the most widely used web-based approaches. Because using a web-based survey can be an easy way to reach huge numbers of respondents wherever they are across the world. Also, it is an economic and convenient method to distribute and collect the questionnaires (Walliman, 2005), for instance, it just takes few seconds a hundreds of questionnaire can be sent all around the world. But there are some drawbacks with the web-based method. Validity and reliability of the data are the main problems for the researcher (Walliman, 2005). Lacking of control by researcher, the completion of the answers cannot be controlled. And the sampling is another problem researchers have to consider (Walliman, 2005).
In this study, questionnaire is implemented web-based method, more convenient and faster than post. The questionnaire is designed through the website of free online survey (http://www.freeonlinesurveys.com/). Because this website has data statistics function, can help the researcher to analyze data easily. Also, it is free for constructing and delivering the questionnaire. In addition, this questionnaire is sent to the students in four different majors by e-mails. Freshmen and senior students are sent separately, which makes it easy for data statistics.

### 3.2 Secondary data

A range of source is available to be the secondary data. Generally the sources are classified in two categories, which involved paper-based sources and electric sources. Like the books, journals, magazines are the most common paper-based sources. Of course, there are other paper-based sources, such as research reports, conference papers, annual papers etc. And the common electric sources people well known are online database, internet, and media. About the places where researcher can get the secondary information, Walliman (2005) mentions some sources of them as below:

- Libraries and archives. These usually have well-developed catalogue systems which facilitate to seek particular data or find out any information which are relevant to the research.
- Museums and collections. These have efficient cataloguing systems which can help researcher to do search. And large museums usually have their own research departments, which will help researcher a lot in this particular field.
- Government departments and commercial/ professional bodies. Researcher can get the statistical information from these places, both present and historic.
- Internet. The latest and newest information can be found in the internet.
- The field. Not all historical artifacts can be found within museums, for example, ancient cities, architectures.

In this study, literature review is a main method to look for relevant material, getting the secondary information. Reviewing from the books, journals, relevant articles and reports of some particular organizations, background of sustainable development and education for sustainable development can be easily found out. United Nations (UN), and United Nations Educational, Scientific and Cultural organizations (UNESCO) are the mostly used to get some official sources through their official websites. From the library and home, Emerald and Science Direct are two databases accessed to look for related journals.
and articles to help to find the relevant concept and construct framework of the elements of the thesis. During looking for the articles in the databases, there are some keys word mostly used, including ‘sustainable development’, ‘education’, ‘curricula’, ‘university’, ‘students’.

3.3 **Quantitative and qualitative**

There are some features can tell about the distinction between quantitative research and qualitative research. The aim of quantitative is to explain the facts through classification calculation and statistics, and the aim of qualitative is a complete, detailed description. In the quantitative research, researchers usually collect numerical data through the tools or equipment, for example questionnaires; and in the qualitative research, researcher is the data collecting instrument. Usually in the qualitative research data is in form of words, pictures or objects; and data is in the form of numbers and statistics in the quantitative research (Neill, 2007).

In this thesis, questionnaire is the only to collect data. Both quantitative and qualitative researches are used in the data collection and analysis. In the questionnaire, classify the students as freshmen and seniors, count the results returned from them and conduct the statistics to analysis. Questionnaire is a tool to gather data from the students. These are the characters of quantitative research. The units of results and analysis are both words and numbers, and the analysis is made based on the numbers.
4 Result

4.1 Response rate

We sent this survey to 120 students by email. Half of them are freshman and half of them are senior. 15 students of each department have been chosen to send. We got 68 respondents from these. 38 freshmen participated out of 60 asked; response rate is 63.3%. For senior students, the response rate is 50%, 30 students participated out of 60 students asked. There are 32 Swedish students and 36 international students. The total response rate of this survey is 56.7%.

According to the Figure 7, we can see the response rate clearly from four programs. Students participated in this survey from Electronics are 22.1%, Energy Systems students are 22.1%, Geomatics students are 30.9% and Industrial Management and Logistics are 25%. Also, the Figure 8 presents the proportions of gender of the students involved this survey, female and male respondents are about the same in freshmen and seniors. Among the respondents, about 49% students are female and 51% students are male.

![Figure 7 Response Rate of survey](image)

![Figure 8 Proportion of Gender](image)
4.2 Knowledge

The first three questions of the questionnaire are designed to try to find out how much the students know about sustainable development. The first question is described with two statements to know what extent the students agree with the statements of sustainable development by marking five scales from strongly disagree to strongly agree.

The statement is I know a lot about sustainable development. From the figure 9, it shows half of freshmen are neutral with this statement. 23.7% of freshmen disagree with this statement. And 26.3% freshmen agree with this statement, they think they have enough knowledge about sustainable development. No one strongly disagree and strongly agree and with this statement. Senior students have a little different from the freshmen. 6.7% of the seniors disagree with the statement. 26.7% of the seniors have fair knowledge of sustainable development with middle level. The amounts of seniors agree with and strongly agree with this statement are the same, both are 33.3%. No seniors strongly disagree with this description.

![Figure 9 I know a lot about sustainable development](image)

The statement is that the three dimensions of sustainable development are environmental, economic and social. According to the figure 10, a majority of freshmen basically are neutral with this description, it is about 63.2%. And about 36.8% freshmen agree with the statement. None of freshmen strongly disagree and disagree with this description, as well as the proportion of freshmen strongly agree with this is zero. To the seniors, 6.7% students strongly disagree on this. The ratio of neutral and the students agree with the statement are 26.7%. There is no one disagree with the statement.
The second question is used to figure out what kind of the documents about sustainable development students are familiar with. It is required for an example if the students know any documents with regard to sustainable development.

From the figure 11, majority of the freshmen involved in this survey are not familiar with the documents about sustainable development. 68% freshmen don’t know any documents about sustainable development. And 32% freshmen are aware of the documents of sustainable development. Half of senior students know about the document of sustainable development. The other half of seniors don’t know about any documents deal with sustainable development. Among the examples of documents provided by freshmen, Kyoto Protocol is the document they well known about, and our common future is another answer from students. The situation of senior is almost the same with freshmen. Kyoto Protocol and the agenda 21 are the document known by senior students. But not all of students provided the examples when they choose a positive answer. Some of them miss the answer or offered the wrong answers.
The third question is constructed through six aspects to find out students’ knowledge about sustainable development from their decision making.

The statement is sustainable development meets basic needs of human life. About this description, figure 12 shows that 79.0% freshmen believe this is true; 10.5% of freshmen consider it is in error; and 10.5% of them don’t know about this. For the senior students, 93.3% of them think it is true about sustainable development. And about 6.7% of the seniors have no idea about that.

The statement is sustainable development coordinates development between human and nature. Based on this statement, we can see the result from figure 13, majority of freshmen believe it is true, about 94.7%. And the rest of them are unaware of this. 80%
seniors think this description is correct, 6.7 % seniors don’t know about this statement, and 13.3 % think this expression is wrong.

![Figure 13 Sustainable development coordinates development between people and nature.](image)

The statement is implementing sustainable development means that we can use nonrenewable resource as much as we want. All the freshmen involved in this survey think this statement is wrong. The case of seniors is different from the freshmen. According to figure 14, mostly seniors believe this statement is false, 90% of seniors consider this is true and 6.7% of senior have no idea on this statement.

![Figure 14 Implementing sustainable development means that we can use nonrenewable sources as much as we want.](image)

The statement is sustainable development can protect nature. From figure 15, all freshmen involved think that is true about sustainable development. And most of the
seniors consider this statement is true, about 80%. Also, 13.3% of seniors believe this description is wrong, and 6.7% of them are unaware.

Figure 15 Sustainable development can protect nature.

From the statement sustainable development will raise the quality of life, we can see the result below (figure 16), and it shows that 79% of freshmen support this statement. And 21.05% freshmen don’t know about this. The situation of senior is almost the same with the freshmen. 93.3% seniors think quality of human life will be raise by sustainable development, and 6.7% of them are not sure about this.

Figure 16 Sustainable development will raise the quality of life
The statement sustainable development can help many animal and plants from disappearing. From figure 17, all of the freshmen believe on this statement. For the seniors, 86.7% seniors think this description is true, 3.3% of them consider this statement is wrong, and 10% of them are unaware of this.

Figure 17 Sustainable development can help to keep many animals and plants from disappearing.

4.3 Awareness

This part of the questionnaire is designed to explore student awareness of sustainable development. The fourth question is described with five subjects to understand what degree the students agree with the phenomenon of sustainable development in modern society. The scales are classified from strongly disagree to strongly agree.

The first statement of question is a huge population brings a lot of pressure on the earth’s resources. According to Figure 18, although most of them strongly agree with it, but both freshmen and seniors still have some different opinions on this statement. In freshmen opinions, no one disagrees with it, 10.5% of them are neutral, 39.5% agree and 50% strongly agree. In seniors’ opinions, 13.33% of them strongly disagree, 6.7% disagree, 6.7% neutral, 33.3% agree and 40% strongly agree.

According to Figure 19, we can see the second statement is that it is urgent to protect fresh water recourses from pollution. Mostly freshmen agree with this statement, 23.7% agree and 76.3% strongly agree. Senior students have a few different views, 6.7% of them
strongly disagrees, 10% neutral the other are 23.3% agree and 60% strongly agree.

Figure 18 A huge populations brings a lot of pressure on the earth’s resources

Figure 19 It is urgent to protect fresh water recourses from pollution

The third statement is the choice of personal lifestyle (e.g. saving water and electrical energy, waste recycling etc.) can make a contribution to the sustainable development. According to Figure 20, no freshmen student disagree this statement, most of them agree it. 7.9% is neutral, 26.3% agrees and 65.8% strongly agrees. Senior students have another opinion, some of them disagree with this statement, 6.7% strongly disagree, 3.3% disagree, the other are 6.7% neutral, 23.3% agrees and 60% strongly agrees.
The choice of personal lifestyle (e.g. saving water and electrical energy, waste recycling etc.) can make a contribution to the sustainable development.

The fourth statement is reports of damage that people cause on the environment are exaggerated. In this statement we can see as the figure 21, both freshmen and seniors have different ideas. Each option has been choose by them. Freshmen are 31.6% strongly disagree, 7.9% disagree, the other are 13.2% neutral, 39.5% agrees and 7.9% strongly agrees. Senior students are 36.7% strongly disagrees, 16.7% disagrees, the other are 13.3% neutral, 23.3% agrees and 10% strongly agrees.
The fifth statement is studying about sustainable development can promote sustainability. We can easily to see Figure 22 show this statement all the freshmen and seniors have high awareness of the studying of sustainable development. Because they all choose the option of agree, just the agree level is different. 39.5% freshmen and 60% senior choose agree, 60.5% freshmen and 40% senior choose strongly agree.

![Bar Chart](image)

*Figure 22 Studying about sustainable development can promote sustainability*

### 4.4 Action

This part is the last part of the questionnaire; also it is the fifth question. It was designed to find out when the students have knowledge and awareness of sustainable development, would the incremental knowledge and awareness impact their actions or not. The questionnaire was set eight statements in it; all of them can give expression to student’s activities of daily living which regard to sustainable development. Depend on the statements; we give five options for students to describe the frequency of these activities what they will do. They include 1 is never, 2 is seldom, 3 is about half of the time, 4 is often and 5 is always.

The first statement is about waste sorting, in order to check students’ living habit of waste sorting, in other word do they sort their waste or not. According to Figure 23 show the situation of freshmen and seniors has a little difference, but overall trend of their option is same. For freshmen situation, 79.0% of them is always sort waste, 15.8% often sort waste;
no one choose ‘seldom’ option and ‘about half of the time’ option; just a few freshmen don’t sort waste, it is about 5.3%. For seniors’ situation, 66.7% always sort waste, 23.3% of them consider they often sort their waste, 6.7% sort waste about half of the time, No seniors are seldom to sort waste. Also 3.3% of seniors never sort their waste.

Figure 23 Waste sorting

In the second statement, we want to know whether the students buy second hand. From Figure 24, both freshmen and seniors have different options. 47.4% freshmen never buy second hand; 26.3% seldom buy second hand, 13.2% buy second hand about half of time, 13.2% often buy second hand and 0% always buys second hand. 3.3% of senior students never buy second hand, 30% seniors seldom buy second hand, 50% senior buy second hand about half of time, 6.7% often buy second hand and 10% always buy second hand.
Figure 24 Buy second hand

The third statement is I talk with my family or friends about the current environmental situation. We can see Figure 25 all the respondent students talk the current environmental situation with their family and friends. Just the frequencies are different. But most of them seldom do that. 52.6% of freshmen seldom talk about this, 31.6% of freshmen talk about this half of time, 10.5% of freshmen often talks about their family and friends on this topic and 5.3% of freshmen always do that. 40% of seniors seldom talk about this, 40% seniors talk about environmental issues half of time, 10% often talk about this and 10% always do.

![Bar chart showing percentages of students talking about environmental issues with family and friends by frequency and year of study.]

Figure 25 Talking about current environmental situation

The fourth statement is I try to save water when I take a shower, freshmen and seniors have different point of this. From Figure 26, On the one hand in this statement, no freshmen students always and often save water when they are taking shower. 44.7% of freshmen choose about half of time option, 39.5% seldom do like that and 15.8% never save water when taking shower. On the other hand, just a few of senior students always and never do it. 6.7% of them always save water when they are taking shower, 6.7% never do that, 36.7% of seniors seldom try to save water, 26.7% about half of time try to save water, 20% often try to save water when they taking shower.
Figure 26 Saving water

The fifth statement is the rate of students attending activities about sustainable development. From figure 27, 36.9% of freshmen never attend any activities about sustainable development; 18.4% freshmen seldom participate in the activities; 7.9% freshmen attend the activities about half of the time. 23.7% of freshmen often take part in events about sustainable development; and 13.2% freshmen always joint the activities. 20% of seniors never participate in any actives about sustainable development; 16.7% of seniors seldom joint the actives; 13.3% seniors attend the activities half of the time; 23.3% seniors often attend the actives; 26.7% of seniors always take part in the activities about sustainable development.

Figure 27 Attending activities about sustainable development

The sixth statement is frequency of students for printing reading material from their computer. From figure 28, it shows 10.5% freshmen never print any reading material.
65.8% of freshmen seldom print the materials. And 23.7% freshmen print the reading material from their computer. No freshmen involved often or always print reading material from their computers. 10% seniors never print the reading information, 30% of seniors seldom print the paper. 20% seniors print their reading materials half of the time. 30% seniors often do printing. And 10% seniors always print reading material from their computer.

![Image](image_url)

Figure 28 Printing reading material from my computer

The seventh statement is the rate of students on using disposable products. According to figure 29, most of freshmen are seldom use disposable products, it is about 92.1%. 7.9% freshmen use disposable products half of their time. No freshmen never use the disposable products, often use or always use it. From the figure below, it shows 26.7% of seniors seldom use the disposable products. 60% of them show they use the disposable products like half of the time. 6.7% seniors are often use disposable products. And 6.7% of seniors always use.
Figure 29 Using disposable products

The eighth statement is the frequency of students using public transportation. According to figure 30, it shows the rate of public transportation of freshmen and seniors. The proportions of freshmen never use public transportation is 13.2%, 7.9 % of them seldom use and 52.7% of them often use. 26.3% of freshmen always do. To the seniors, most of the seniors always use the public transportation, it is about 70% and 30% of them often use the transportation. None of them never use, seldom use or use about half of the time.

Figure 30 Using public transportation
5 Discussion

Through the survey took place in both freshmen and seniors with four departments, we try to find out the situations between them on their knowledge, awareness and action about sustainable development. Data from this study that was a case, to be aware of students’ situation through the questions asked from three aspects, compared the results between them. According to the research questions presented previously, this thesis wants to find out has the students’ knowledge and awareness increased during years’ studies, as well as are there any differences the actions between freshmen and seniors based on their different knowledge and awareness.

5.1 Knowledge

Through the first part of survey, we checked about student's knowledge about sustainable development. Firstly, we want to realize how much they know about sustainable development. Knowledge about sustainable development of freshmen and senior students has a different degree. From the response of questionnaire, it shows seniors they think they have more knowledge on sustainable development than freshmen. Over thirty present of senior absolutely consider they know a lot about sustainable development, but no freshmen think about that. So we can get a message that senior students through three years study, they have increased their sustainable development knowledge. Secondly, we set a question about some common knowledge about sustainable development. Sustainable development includes much knowledge, such as many dimensions of sustainable development. And the three main dimensions have more and more people known about. They are social dimension, ecological dimension and economic dimension (Eaegrants, 2006). On this statement, senior students know more than freshmen, mostly seniors know the main dimensions about sustainable development. Most freshmen remain neutral. They are not sure the main dimensions whether are environmental, economic and social. This show the freshmen and seniors have the basic knowledge of sustainable development are different. Also, we try to explore students known any documents about sustainable development or not. From 1972 “Conference on the Human Environment” in Stockholm to 1992 Rio United Nations Conference on Environment and Development. UN and many other organizations published a lot of documents about sustainable development. Like “World Conservation Strategy: Living Resource Conservation for Sustainable Development” (IUCN, UNEP & WWF 1980), "our common future (UN, 1987), "the Rio Declaration on Environment and Development" and "Agenda 21” (UN, 1992). According to the survey finding, almost seventy present of freshmen do not know
any documents about sustainable development. The situation of senior students is not optimistic as well; just 50% of them realize the documents of sustainable development. Most answers from seniors are "our common future" (UN, 1987) Agenda 21" (UN, 1992). The result of first part in the survey indicates that seniors’ knowledge more than freshmen.

The second part of questionnaire was checking the student’s sustainable development knowledge as well. But this part we try to explore through a little deeper questions on knowledge about the sustainable development. In 1972, the United Nations Conference on Human Environment held at Stockholm, the meeting having considered the need for a common outlook and for common principles to encourage and guide peoples overall the world in the preservation and enhancement of the human environment. According the social dimension in literature review, the World Conservation Alliance (INCN), United Nations Environment Programme (UNEP) and the World Wildlife Fund (WWF) jointly published “Caring for the Earth: A Strategy for sustainable Living”, it is proposed definition of sustainable development as: " Improving the quality of human life while living within the carrying capacity of supporting ecosystems "(IUCN, UNEP, WWF, 1991), and made 9 principles of sustainable human basic survival. So we set the well-known principles of sustainable development in the survey to understand whether students have this knowledge. Such as sustainable development meets the basic needs of human life, sustainable development can protect nature and sustainable development can help to keep many animals and plants from disappearing. The questions of this part we use true-false type to find out whether students have the knowledge about these questions.

In this part, the answers of freshmen and senior student are not very different. Overwhelming majority of them understand the statement and make correct selection. Even some statements are overwhelming majority of freshmen a litter higher than senior students. From this part, we conclude that freshmen and seniors have the same basic knowledge of sustainable development. The knowledge of seniors higher than freshmen, the reasons we consider that seniors have three years study can get more knowledge in different ways, such as from course, from media and from teachers etc.

### 5.2 Awareness

Awareness is the ability to perceive, to feel, or conscious activity, object or sensory mode. This part will discuss whether the awareness of freshmen and senior student has any differences. According the answers of the questionnaire, we know about student’s awareness of sustainable development through population problem, water recourses problem, personal lifestyle problem, environmental problem and learning problem.
Nowadays, a huge population brings a lot of pressure on the earth’s resources, such as pressure on land resources, pressure on energy resources, pressure on water recourses and pressure on much other natural recource (Jackson & Roberts, 2000). In this problem, awareness of freshmen has higher than seniors. Most of freshmen and senior student agree with this problem. But some senior students do not agree with the problem of a huge population brings a lot of pressure on the earth’s resources. Some students who disagrees this problem have not realized problems cause by population issues. Students as a part of society, they should know population problem will influence on our society that students can do something to eliminate the influence.

Water is one of the most common materials in world, the total volume of 1.41 billion cubic kilometers; only 2% is fresh water. 87% of fresh water has been frozen in polar ice, glaciers and mountains. It is difficult to use. These water resources are unevenly distributed on earth. Because of the human irrationally use water resources and pollute them in order to many parts of the world is facing a severe crisis (UNESCO). All of the freshmen surveyed agree with the problem it is urgent to protect fresh water recourses from pollution. A few senior students remain neutral and disagree. From this question, we conclude that most of students have awareness of protecting fresh water.

With the people's increased awareness of sustainable development, more and more peoples through many kinds of way to make a contribution to sustainable development. As a people live in the earth, we should start from one of the simplest way. It is personal lifestyle. People just need start from little things in life, like saving water and electrical energy, waste recycling etc. Opinion of freshmen is positive, just a few keep neutral. In senior student opinion, although most of them consider it can make a contribution to sustainable development, but about 10 present of seniors do not think about that.

From industrial revolution, human being damage on the natural environment more and more serious. But when sustainable development was presented mean human realize the ponderance of environmental disruption. In survey, the question is reports of damage that people cause on the environment are exaggerated. The answers from students are different. 39.5% freshmen and 53.4% seniors disagree with this statement. Also 47.4 % of freshmen and 33.3% of seniors think reports of damage that people cause on the environment are not exaggerated. Logically senior student are older than freshmen, seniors can get more information about the environmental disruption. So they are awareness of this aspect can be higher than freshmen.
As a student that not only freshmen but also seniors should know studying is the most important thing in this period. Studying can help you increase your knowledge that can be impact your life. Higher education educates students in various professional fields, which has effect on students’ future career and thus influences the development of future (Niu et al, 2010). The students surveyed agree with studying about sustainable development can promote sustainability. This positive awareness must be maintained and developed. So the attitude of freshmen and senior students on this statement is the same.

5.3 Actions

According to the model of study of sustainable development (Sammalisto, 2007), students need to be taught so that they will have basic knowledge and awareness of why they should protect environment and recycle the waste, can contribute to environmental and sustainability goals of university and society. As the students are educated in university, their awareness is expected to increase and they can take action to make changes on their daily life. (Sammalisto, 2007) When students graduate from university after few years study, they will make various decisions in their professional and private aspects based on what they have learn that will help to achieve sustainable development (Sammalisto, 2007). From the results of questionnaire, we can see how students’ do in their actions about sustainable development based on their certain knowledge and awareness. There are some differences between freshmen and seniors in some aspects. On the other hand, there are some common between them. The questions are asked in eight categories, including waste sorting, purchasing second hand, talking about environmental issues with family and friends, saving water, activities about sustainable development, printing reading material, using disposable products, and public transportation.

Waste classifications are offered within campus and household, we can see how the freshmen and seniors to deal with this in their life. The students sort the waste building on having knowledge and awareness of waste classification, and following with the particular routines or guidelines. In the university, there is a routine of waste sorting in Swedish next to the classification dustbin. There is a comparison of awareness and actions of freshmen and seniors in below figure 31. It indicates that majority of freshmen and seniors strongly agree with that statement, which shows that they believe their lifestyle can make a contribution to sustainable development. And from the chart of action below, we can see majority of freshmen and seniors always sort their waste, and the proportion of freshmen and seniors in action part and awareness part are similar. In
this action, freshmen do better than the seniors in sorting waste. Probably with the reason freshmen have higher awareness than seniors in this aspect.

Hausfrau (2008) listed seven top reasons why people buy used things. Hausfrau (2008) mentioned buying second hand is the most environmental choice people can make in almost all cases. Purchasing used things are not only for saving money, but also helping to save energy, keep sustainability. Some advantages of used products presented by Hausfrau (2008): used products don’t need new resources, new energy to create, don’t generate pollution and no packaging. From the figure 24, it is clearly seen that almost half of freshmen never buy second hand, there are some reasons could be in our opinions. The used products are old fashion, maybe the design or color are not popular now; and some students may worry about that the used products are not cleaned, particularly clothes and shoes; also the quality of second hand is not as good as new products; those students probably do not care about the money and the environment, they can afford what they want to buy. Half of the seniors buy second hand about half of the time. Although we don’t know the exact reasons of buying used products by students is for environmental or for economic motivation, or for both of them. For environmental reasons could be that students have high environmental awareness and try to save energy and resource by use second hand; they have little impact on used products, so there is no need to buy the new one. For economic reason, that could be students try to save the money to use in other spheres, for example, saving the money in buying second hand electrical appliance for buying the food. No matters for environmental reason or economic intension, these two dimensions are involved in sustainable development. In this regard, the performance of seniors shows they do better than freshmen do. Students buy second hand based on the awareness they have on sustainable development, so that
we can see how awareness affect on their actions and how sustainable development mean to them.

According to the UNSECO (2009), it mentioned ESD must be seen as a comprehensive project for quality education and learning with key issues of sustainable development. Students pay attention to the key issues then they can talk about current environmental situation within their social network, spread the awareness and increase more people concern on this either. From the result of awareness part in below figure 32, it shows that about 40% freshmen think environmental damage is not that serious as the report said. Then we can see the result of the action part in the left, half of freshmen seldom talk to their friends and family about the current environmental situation. The reason for this could be that freshmen do not see the environmental problems are serious and do not talk much to their family or friends. Conversely, the figure 32 shows that seniors realize the environmental issues are serious like the report said, have higher awareness on this. So the proportion of senior is more than freshmen on talking with friends and family about environmental situation. Seniors have awareness and concern on environment, and then they will care about it.

![Figure 32 Comparison of awareness and actions of freshmen and seniors in environmental issues](image)

There are many useful tips to help people to save water when they are taking shower, such as using an efficient showerhead, or using a shower timer (Dunn, 2004). Using a timer to remind you don’t take long time in taking shower, saving the money and saving water. From the right chart below, we can see that a large part of freshmen strongly agree that it is urgent to protect fresh water resources from pollution, and freshmen have higher awareness than seniors in water protection. However, from the result of action part shown below, freshmen did not do better with their good awareness as we expect. In fact, seniors
do better than freshmen although have lower awareness in this aspect. Therefore, we can see good awareness of freshmen does not help them to do in a better way.

![Comparison of awareness and actions of freshmen and seniors in water protection](image1.png)

Figure 33 Comparison of awareness and actions of freshmen and seniors in water protection

Various kinds of activities are held about sustainable development within university or in community. For example, in campus, it is spread through having lectures or program about sustainable development, Earth Hour. According to the figure 34, both freshmen and seniors think studying sustainable development can promote sustainability; particularly freshmen have higher awareness than seniors in this aspect. However, from the result of students’ action, it is beyond our expectation that students’ actions do not match with their awareness. 36.8% freshmen never attend any activities about sustainable development, although they have a good awareness. But seniors are more active than freshmen to take part in the activities of sustainable development.

![Comparison of awareness and actions of freshmen and seniors in studying sustainable development](image2.png)

Figure 34 Comparison of awareness and actions of freshmen and seniors in studying sustainable development.
Some people prefer to do the reading in their computer, for example reading the articles, emails. However, some people prefer to read it after printing out. Relatively, reading the material in computer is a greener way than printing the material out, which could save the paper. Also, it can save money. Students cost a certain money in printing reading material each semester. According to the figure 28, more than half of freshmen seldom print out the reading material, and none of them often or always do for the printing. More than half of the seniors prefer to print over half of the time, including the students often or always do the printing. The reason why students prefer to read in the paper could be they are old school, like this way to read. Also, money of printing is not in the scope to consider, they think it does not cost much for printing. At the other hand, some students may consider the cost of printing, and they prefer a greener way to read, saving resource and money. Therefore, the result shows that freshmen do better than seniors in reading material printing no matter for environmental or economic reasons.

Many disposable products are used in the daily life, for example, Styrofoam cup, plastic cutlery, disposable glove. It will be greener if people can live without those products or use as less as possible. It is good if students are willing to try to use less disposable products, and good to have this awareness. According to the figure 29, the action results of freshmen prove they are doing better than seniors. Most of freshmen seldom use disposable products and more than half of seniors use disposable products about half of the time. In the university, the food bought in cafeteria or the take-away food in the restaurant out of campus are wrapped with plastic bags or serviced in disposable lunch boxes, and the cup using to drink water serviced in the restroom, all of these are disposable products. Some students may think it is convenient to use the disposable cup for drink and buy food in cafeteria instead of using their own cup or bottle to drink and bring the home-made food. However, other students may think it is a good way to save money and protect environment with their own bottle for drink and the home-made food brought for lunch. And university provides microwave for students to reheat the food.

People who live in the suburban areas have option to use public transportation, like the daily commute to work and school. Some people like to drive by themselves, especially for the short distance trip. However, people who are using their own vehicle are causing some personal pollution to the earth. According to the results from figure 30, we are surprise that about 13.2% freshmen never use public transportation. In our opinion, those students choose ‘never’ may misunderstand the meaning of public transportation, which includes bus, train, air plane etc. A large part of seniors use public transportation in a high
frequency, probably because they have more knowledge about sustainable development than freshmen. Except of higher awareness, other reasons might be the students do not have their own vehicle and they have bicycle to ride to university. There are just half of freshmen and a small part of them never take public transportation. Based on this action for sustainable development, seniors are better than freshmen.

### 5.4 Reasons of low respond rate

This survey has limitations because of low respond rate. Following is the main reasons might cause this result to happen.

- Students may not concern on this topic.
- The design of questionnaire might be not attracted to the students.
- It is the final thesis and exam for the students; they might be busy for their study.
- The duration of respond is not long enough.
6 Conclusion

Facing with the dilemma and crisis caused by human, plenty of issues have risen. Human beings are already aware of how serious are the problems, and know the sustainability of human life has been threatened. Since then, sustainable development raise more and more widely public concerned and gradually spread across the world. It is believed that education will be an effective and comprehensive approach to spread the knowledge and awareness about sustainable development to the public. Decade Education for sustainable development (DESD) from 2005 to 2014, this concept has been proposed and implemented. Promoting sustainable development through education field, it is useful to let students know about those three main dimensions of sustainable development and the importance of them. Hence, people behavior and action have to be changed and adjust to sustainability. In order to promote sustainable development, university tries to improve students’ knowledge and awareness through curricula, relevant policies, programs, and training etc. It is hoped that the knowledge and awareness will affect students’ action on supporting sustainable development.

Based on the effort university made, it is necessary to know what the results would come out from this. Through the comparison between freshmen and seniors the outcomes are deferent. From the finding and the analysis of the data, it is not hard to see that concerning on the knowledge of sustainable development, seniors are slightly better than freshmen. Seniors are better aware of the concept and the principles of sustainable development, which indicated that knowledge of students on sustainable development has increased through years study. The results of awareness of both freshmen and seniors are different from the knowledge. In this part, seniors’ awareness is not higher than the freshmen’s even though their knowledge is better than the freshmen’s. Both of them have a certain understanding of sustainable development. Apparently, the awareness of students about sustainable development is not improved during years study, although knowledge has increased. Based on the difference of knowledge and unchanged awareness between freshmen and seniors, action is a good aspect to response from those fields. About the actions to support sustainable development from freshmen and seniors, each of them is superior in some particular aspects. However, generally speaking, seniors do better than freshmen, because knowledge of seniors during year’s studies is higher than freshmen, although they have similar degree of awareness. Based on their different knowledge and similar awareness, it is sure that there are some differences on action between freshmen and seniors. Of course, it is hoped that students can be active to take
action in promoting sustainable development in their daily life, and spread this idea through their social network, to let more and more people join and work together for sustainable development. And even when they graduate from university, they still can promote in their future career in the society.
7 Limitation of methodology

From gathering data to analyzing the results, we find some limitations of the method used in this thesis. The weaknesses of the thesis method are described as below:

- Questionnaire is the only way to collect data for this thesis. The evidence might be not sufficient enough. There could be some bias from incomplete respond and low respond rate.

- The questionnaire has a low respond rate; 120 questionnaires are sent and just got 68 responds, the total response rate of this survey is 56.7%.

- The duration of questionnaire is a little short. It just took 6 days for collecting response.

- Few answers are incomplete in the questionnaire. Some students participated in the survey but did not answer all the questions as required. Two students missed the third question, and six students did not give any examples if they know any documents about sustainable development.

- Validity of the answers from students would be considered, because of without control of researcher.

- Sampling from each department. The numbers of students in each programme are not average and select 120 students from them, including 15 students from each programme. The opportunities of students from each programme are different. Students from electronic have more opportunities to be picked up in the sampling because of less volume; and the students from geomatics have fewer opportunities to be selected because of more volume.

- Reliability of the results. We did not take the same amounts of respondents to analyze, because of different respond rate of freshmen and seniors. The responses were not available for us in the web site, which we choose to make the questionnaire in.
8 Further study

- The study should expand to more departments instead of four departments in the university, in order to do the research on freshmen and seniors from those departments.

- For the research, questionnaire is not the only way to investigate. Interview and observation could be considered to use to help the investigation.

- The duration of the questionnaire can be extended a little longer, and then it may be able to be helpful for improving respond rate.

- One or more universities can be taken as the examples to refer, to see the performance of the freshmen and seniors about the knowledge, awareness and action about sustainable development.
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Appendix

Appendix 1: Sustainable Development Questionnaire

We are two MSc students who would need your help in our thesis. Through this survey, we want to study students’ knowledge, awareness and their practical actions on sustainable development. It will take you just a few minutes to answer the following questions. We appreciate your willingness to participate.

(Zhilei yao, tli09yvo@student.hig.se; Yin he, tli09yhe@student.hig.se)

Which bachelor program are you studying?
A. Electronics
B. Energy Systems
C. Geomatics
D. Industrial Management and Logistics

You are   A. Female    B. Male

1. Do you agree with below statements? Grade them with a scale from 1 to 5.

◆ I know a lot about sustainable development.
◆ The three dimensions of sustainable development are environmental, economic and social.
◆ Do you know about any document that deals with sustainable development?
  No; If yes, please give an example.____________________

2. Please state if the following statements are true or false.
1. True  2. False 3. I don't know
◆ Sustainable development meets the basic needs of human life.
◆ Sustainable development coordinates development between people and nature.
◆ Implementing sustainable development means that we can use nonrenewable resources as much as we want.
◆ Sustainable development can protect nature.
◆ Sustainable development will raise the quality of life for people.
◆ Sustainable development can help to keep many animals and plants from disappearing.

3. Do you agree with the following? Grade them with a scale from 1 to 5.
A huge population brings a lot of pressure on the earth's resources.
It is urgent to protect fresh water resources from pollution.
The choice of personal lifestyle (e.g., saving water and electrical energy, waste recycling etc.) can make a contribution to the sustainable development.
Reports of damage that people cause on the environment are exaggerated.
Studying about sustainable development can promote sustainability.

4. How often do you do the following to contribute to sustainable development? Grade them with a scale from 1 to 5.


◆ I sort my waste.
◆ I buy second hand (e.g., clothes, furniture etc.)
◆ I talk with my family or friends about the current environmental situation.
◆ I try to save water when I take a shower.
◆ I attend activities about sustainable development (e.g., lectures about sustainable development)?
◆ I print reading materials from my computer.
◆ I use disposable products.
◆ I use the public transportation.
Appendix 2: Frågeformulär om Hållbar Utveckling

(Zhilei yao, t09zyo@student.hig.se; Yin he, t09yhe@student.hig.se)

Vilket program läser du på HiG?
A. Elektronik
B. Energisystem
C. Geomatik
D. Industriell ekonomi och logistik

Du är  A. Kvinna  B. Man


◆ Jag vet mycket om hållbar utveckling.
◆ De tre delarna i hållbar utveckling är ekologiska, ekonomiska och sociala aspekter.
◆ Känner du till något dokument som talar om hållbar utveckling?
   Nej. Ja, ge en exempel.________________________

2. Ange om följande påståenden är sanna eller falska.
◆ Hållbar utveckling betyder att alla ska kunna tillgodose sina grundläggande mänskliga behov.
◆ Hållbar utveckling tar hänsyn till utveckling av både människor och naturen.
◆ Hållbar utveckling innebär att vi kan använda obegränsa med icke-förnyelsebara resurser.
◆ Hållbar utveckling skyddar naturen.
◆ Hållbar utveckling ökar livskvaliteten för människor.
◆ Hållbar utveckling bidrar till att flera djur- och växtarter bevaras.

En stor befolkning ökar belastningen på jordens resurser.
Det är jätteviktigt att skydda sötvattenresurserna från föroreningar.
Valet av personlig livsstil (t.ex att spara vatten och energi att återvinna avfall etc.) kan bidra till en hållbar utveckling.
Rapporter om att människorna orsakar miljö-problem är mycket överdrivna.
Att lära sig mera om hållbar utveckling kan bidra till hållbar utveckling.

◆ Jag sorterar avfall.
◆ Jag köper second hand (t.ex. kläder, möbler etc.).
◆ Jag pratar med min familj och vänner om dagens miljösituation.
◆ Jag försöker spara vatten då jag duschar.
◆ Jag deltar i aktiviteter som gäller hållbar utveckling (t.ex. föreläsningar om hållbar utveckling)?
◆ Jag skriver ut dokument från min dator.
◆ Jag använder engångsprodukter.
◆ Jag använder kollektivtrafik.