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# Developing a Tool for Education on Sustainable Development (ESD) and Its Application in China

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**Abstract:** This article presents a study to assess Chinese students sustainability awareness. We used the tool “Assessment of Sustainability Knowledge” (ASK), which was initially designed by the School of Environment and Nature Resource of Ohio State University. Using this tool with Chinese students needed not only translating but also changing the context to adapt it to China. The results indicated that the environmental problems are the most attractive sector for Chinese students, whose SD knowledge was mainly elaborated from the textbook.

**Keywords:** Sustainable Development (SD), Education on Sustainable Development (ESD), Assessment

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## 1. Education on Sustainable Development

Education on Sustainable Development (ESD) has been rapidly increasing in popularity during the past decades. Its importance was realized when the United Nations Decade for Education for Sustainable Development (UNDESD) was established in 2004 by UNESCO. ESD can be termed as altering ways of thinking. This is where the resources used for education are utilized such that the generations to come can access the items of Sustainable Development. It is an educational process that is categorized by methods and approaches focused on establishing awareness on issues related to sustainable development. This is different from the approaches that have been there in the past where importance was placed on issues that were environmental. Whereby it has placed focus on processes, means and tools that give people the opportunity to form knowledge, skills, competencies and values that are required when it comes to contributing towards society that is more sustainable.

Educators worldwide have been influenced to change their contents and ways of teaching so that the education systems can be able to respond better to challenges that are socio-economic globally, regionally and locally. Moreover, new emphasis have been seen when it comes to innovative teaching development methods about sustainable

development. This was according to the report that was done by UN1 that placed emphasis on learning and education on sustainable development context; it also included the stakeholders involved on all levels as well as all the regions included in the UN.

High credibility assessment tools is needed by institutions in the domain of education. Some tools have for instance (Sustainability Tracking, Assessment, and Rating System (STARS), Sustainability Assessment Questionnaire (SAQ) etc.) be designed to measure sustainability performances of universities. Here we paid more attention to higher education students' sustainability awareness.

## 2. “Assessment of Sustainability Knowledge” (ASK) Tool to Evaluate Students Sustainability Awareness

The tool “Assessment of Sustainability Knowledge” (ASK) from Ohio State University, School of Environment and Nature Resource, Laboratory of Environmental and Social Sustainability (ESS Lab) is adopted in the survey to see if the SD awareness is knowable and significant for Chinese

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<sup>1</sup> The General Assembly on 27 July 2012,

[http://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/66/288&Lang=E](http://www.un.org/ga/search/view_doc.asp?symbol=A/RES/66/288&Lang=E)

students of higher education institutions. The ESS lab presents ASK as a survey instrument designed to measure sustainability knowledge and awareness across environmental, economic and social domains. Different from other inquiries, ASK focuses on measuring factual knowledge rather than subjective beliefs or values. Since the instrument was immature, the ESS lab insisted on developing ASK as a complete methodology. The version 2013 of ASK with a questionnaire of 16 aspects has been chosen for this research. As ESS lab mentioned<sup>2</sup>, these 16 attributes are refined from many concern questions, which have been developed and implemented following prior literature, expertise consultations, focus groups and a pilot study that was organized by Item Response Theory. The refining process began with a test on five rounds of focus groups. The focus groups consisted of 3-7 faculty members and 2-12 postgraduates in the School of Environment and Nature Resources. Most of them have good knowledge of SD, and understand very well SD related questions. They worked on eliminating and creating additional matters in an interactive fashion. As populated focus groups have reached their deliberation and consensus they reduced the question in the pool, removing those deemed to be too complicated, too easy, too accurate, or the ones that are not capturing a fundamental concept of sustainability. Following the focus groups, the ESS lab formed a pilot questionnaire that they distributed to additional faculty members, postgraduate students, as well as selected undergraduate students. Content experts in the Ohio State University Office of Energy Services and Sustainability along with other faculties from various departments also shared this poll. Based on the results and feedbacks from these pilot tests they reduced their number of questions to 30 and the remaining 30 questions were retained because firstly they have covered core sustainability concepts within their domain, secondly there neither too easy nor too hard questions, and thirdly it covered in an almost evenly distribution across the three required domains. They also did some job with the way of expressing. They compared the language and relevant questions that they produced with introductory textbooks to make sure the participants can understand without a doubt with the terminologies and expressions. Finally, they formatted the survey using the software package Survey Monkey (Finley 1999). The refining process they took is considerable thoroughly but gradually present, which is aim to get a much small yet more informative value survey tool. For treating those 30 questions, lab ESS has sent off an online questionnaire to 10,478 undergraduate students, who are selected randomly amount all enrolled students of The Ohio State University. In the following weeks, they adapted Dillman 2009 tailored design method, and the complete data was collected to calculate the respondent rates. Another refining philosophy they accepted was called Item Response

Theory (IRT), which assumes that the sample group has a latent construct of interest and are highly related to the correct answer. Describing by graphic, this positive correlation demonstrate by an Item Characteristic Curve (ICC). The researchers in Lab ESS, comparing the indicator of respondent rates and ICC, retained 16 items in the questionnaire, which are more information-rich for Sustainable Development awareness evaluation.

### 3. “Assessment of Sustainability Knowledge” (ASK) of Chinese University Student

The ESD in China has developed some decade years. There're some ESD assessment indicators, however no particular assessment for evaluating the students from higher education institutions. That is the reason I chose this tool to evaluating their awareness. Implementing the tool, in order to avoiding the misunderstanding of the survey, I translated the questionnaire into Chinese. Other changes have been made: when the original inquiry mentioned the issues related to America, I modified the problem in order to relate to China. The questionnaire was made of multiple-choice questions; each question has only one correct answer. How to create the false choice is important. I couldn't do an issue too close to the right, because that would have made the survey too complicated or confusing. At the same time, the incorrect answer too far away from the correct makes the study too smooth. In this case, we cannot see evidently if the student real concern is about these sustainable issues or if the student just had a reasonable consideration. “I don't know” has been set, as the answer E, to lessen random guessing and to reduce the uncertainty of determining whether an unanswered question skipped or the respondent read the question but did not know enough know to make an educated guess. Therefore, through focus group deliberating and the consensus that has built through, the need emerged for the answer “E. Don't know”.

16 questions compose the original questionnaire in Chinese version, eight questions per page. The English version of the questionnaire is available on the next pages. The bold answer is the right one.

For the reason of classifying samples, I asked two personal information of respondents: “what's your major study”, as the reason of seeing if the SD awareness is essentially related to specialized field of study; another one is “ you are in which grade”, to see if there is difference between the students who have accepted long or short studies from universities.

In these 16 questions, although some questions related to different domains, to simplify the analysis, the 16 items have been classified into three main domains: environmental, social, and economic.

The 16 attributes, which belong to the Environment Domain, are Q1, Q4, Q7, Q8, Q9; the questions that belong to the Social Domain are Q3, Q11, Q13, Q14, Q15; the issues that belong to the Economic Domain are Q5, Q6, Q10, Q12, Q16. Only for the second question, the definition of

<sup>2</sup> Assessing Sustainability Knowledge of a Student Population: Developing a Tool to Measure Knowledge in the Environmental, Economic, and Social Domains, The Ohio State University, 2013

Sustainable Development cannot put into any specific domain.

## 4. Participants

The participants came from 6 Chinese universities. I prepared in total 659 questionnaires. The questionnaires fulfilled in 6 Chinese universities were as follows: Southeast University (SEU, 296), Guizhou University (GZU, 97), Guizhou Industry Polytechnic College (GIPC, 42), Nanjing Forestry University (NFU, 87), Central University of Finance and Economics (CUFE, 40), University of Electronic Science and Technology of China (UESTC, 97).

These universities have been chosen because they are in the different regional area of China, they represent Chinese universities' different domain and level of education: SEU and NFU are in the Southeast China, Nanjing city. GZU and GIPC are in southwest of China, Guiyang city; CUFE is in Beijing, north of China and UESTC is in Chengdu city, southwest of China. Then, the students came from different departments and majors, so that they can get sustainability information in various ways: economics, foreign languages, ecology, software engineering, etc.

## 5. Data Coding

Data collection had two modes: in SEU, three investigators distributed the questionnaires before the canteen; for other five universities, I asked one teacher per school to distribute the questionnaires to her/his students during their course.

All the surveys were collected and packaged in envelopes. Then, all the envelopes had been sent to me directly. I coded them in order. Each group has its number. Therefore, the coding is the same as the quantity in each cluster. For example the CUFE of 40 students, it has the coding number of 1,2,3...40. Next, I reported all their answers A, B, C, D or E in application office excel. The right answer won one score. If there were a multi-choice answer, I typed the answer directly. For instance, in the GZU, no<sup>o</sup>12, question 1, corresponded to two choices B and C. I typed B, C in the column Q1. Then, I added the number of right response, if any of the multi-choice answers were correct; I treated it as a valid outcome.

## 6. Data Results

### 6.1. Correct Number of 16 Items

The top 3 questions which evident more awareness of SD by the Chinese students of our study are Q2 (78.6% right answers) the definition of Sustainable Development; Q4 (84.5%) ozone function which was mentioned in the high school geographic textbook; and Q12 (79.5%), the gasoline price, which is an economic common sense.

There are two questions that got lowest scores, which also have particular huge number reply E "Don't know" (compares to 12.4% E rate), Q5 and Q14. Q5 has 12.7 % correct rate and 37.2% E rate. Q14 has 12.3% correct rate and 47.2% E rate. Q5 is the proportion of the riches in GDP, and Q14 is Gini rate

of China.

### 6.2. A Typical Information Modify (Update) Answer

For the question 1, there's a significant difference between the right answer B (48) and the fault answer D (496). The reason for the right answer has changed in 2013, from the report of some leading web news, like ce.cn, 51report.com, finance.china.com.cn, and china.com.cn report, that the farming water that contains too many chemical fertilizers has exceeded the factory waste water. Therefore, the largest source of water pollution has recently lead the response B to be the right answer. However, the environment textbook has not been updated for this information.

### 6.3. Knowledge of Different Domains

Calculating the scores of the three separate domains (and the Q2 SD definition), students get scored as 1310 for the environment domain, 1518 for the economic questions, and 1264 for the social questions. The scores are therefore similar for the environment domain and the social questions. The economic score is higher than the others. Considering the gap number of Q1 (448), we consider that students' performance in the environment sector and economic sector is higher than the social sector.

### 6.4. Correct Rating

For the right rating, SEU has 43.7%; GZU has 42.4%; GIPC has 38.2%; NFU has 46%; CUFE has 46.4%; UESTC has 47.2%. The average correct rating is 44%.

## 7. Conclusion

According to ASK survey in 6 sample Chinese universities, Chinese students involved in our study have been greatly affected by their textbook on the sustainability information. They have more knowledge and interest in the environment sector and economic sector, and students have few attentions of the problems on Gini rate and the top wealthiest.

The average correct rating is under 50%. Meanwhile, the lowest correct rate is GIPC of 38.2%, and the highest is UESTC of 47.2%. The result of correct rate corresponds to the school's ranking.

Interestingly, there are two aspects of the result, which are not as the expected: firstly, the separate knowledge scores have no significant related to students study major. Secondly, there's no significant relation between students' grades and their SD awareness.

## Appendix

The correct answer is in bold.

### QUESTIONNAIRE

- 1) What is the most common cause of pollution of streams and rivers in China?
  - a. Dumping of garbage by cities
  - b. Surface water running off the yard, city streets,

- paved lots, and farm fields
- c. Litter near streams and rivers
  - d. Waste dumped by factories
  - e. Don't know
- 2) Which of the following is the most commonly used definition of sustainable development
    - a. Creating a government welfare system that ensures universal access to education, healthcare, and social services
    - b. Meeting the needs of the present without compromising the ability of future generations to meet their own needs
    - c. Setting aside resources for preservation, never to be used
    - d. Building a neighborhood that is both socio-demographically and economically diverse
    - e. Don't know
  - 3) Higher education generally lead to...
    - a. Lower levels of voter turnout
    - b. Greater annual earnings
    - c. Larger family size
    - d. Higher self-esteem
    - e. Don't know
  - 4) Ozone forms a protective layer in the earth's upper atmosphere. What does ozone protect us from?
    - a. Acid rain
    - b. Climate change
    - c. Sudden changes in temperature
    - d. Harmful UV rays
    - e. Don't know
  - 5) The wealthiest top 1,000 people in China own approximately what percent of the nation's GDP?
    - a. 1/5
    - b. 1/7
    - c. 1/9
    - d. 1/11
    - e. Don't know
  - 6) Which of the following is the most commonly used definition of economic sustainability
    - a. Maximizing the share price of a company's stock
    - b. Long term profitability
    - c. When costs equal revenue
    - d. Continually expanding market share
    - e. Don't know
  - 7) What is the name of the primary federal agency for Environment in China
    - a. Ministry of Environmental Protection of the People's Republic of China
    - b. Environmental Administration of People's Republic of China
    - c. State Environmental Protection Administration of People's Republic of China
    - d. Environmental Protection Administration of People's Republic of China
    - e. Don't know
  - 8) What is the primary benefit of wetlands?
    - a. Promote flooding
    - b. Clean the water before it enters lakes, streams, rivers, or oceans
    - c. Keep the number of undesirable plants and animals low
    - d. Provide good sited for landfills
    - e. Don't know
  - 9) Which of the following countries was the biggest emitter of the greenhouse gas carbon dioxide?
    - a. China
    - b. U.S
    - c. Brazil
    - d. Japan
    - e. Don't know
  - 10) Which of the following is an example of sustainable forest management?
    - a. Setting aside forests to be off limits to the public
    - b. Never harvesting more than what the forest produces in new growth
    - c. Producing lumber for nearby communities to build affordable housing
    - d. Putting the local communities in charge of forest resources
    - e. Don't know
  - 11) Which of the following is a leading cause of the depletion of the fish stocks in Oceans?
    - a. Fishermen seeking to maximize their catch
    - b. Reduced fish fertility due to genetic hybridization
    - c. Ocean pollution
    - d. Global climate change
    - e. Don't know
  - 12) Which of the following is the primary reason that gasoline prices have risen over the last several decades?
    - a. Growing percentage of gas station owned by large corporations
    - b. Increasing oil discovers overseas
    - c. Higher rates of state and federal gasoline tax
    - d. Increasing global demand for oil
    - e. Don't know
  - 13) In China, what do we currently do with the nuclear waste generated by nuclear power plants?
    - a. Use it as nuclear fuel
    - b. Sell it to other countries
    - c. Dump it in landfills
    - d. Store and monitor the waste
    - e. Don't know
  - 14) Over the past three decades, the difference between the wealth of the richest and the poorest is increasing, which Gini coefficient is correct for China
    - a. 0.3
    - b. 0.4
    - c. 0.5
    - d. 0.6
    - e. Don't know
  - 15) Which of the following populations has the highest rate of growth?
    - a. North America

- b. Europe
  - c. China
  - d. Africa
  - e. Don't know
- 16) Many economists argue that electricity prices in the U.S. are too low because...
- a. They do not reflect the costs of pollution from generating the electricity
  - b. Too many suppliers go out of business
  - c. Electric companies have a monopoly in their service area
  - d. Consumers spend only a small part of their income on energy
  - e. Don't know

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