



# Method and application of ocean environmental awareness measurement: Lessons learnt from university students of China



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## ABSTRACT

Different studies have proved that enhancing public Ocean Environmental Awareness (OEA) will lead to increased public support for ocean environmental protection. Our study develops a questionnaire to investigate current levels of students' OEA from three aspects including ocean environmental concerns, ocean environment knowledge and willingness to participate in ocean related activities. This questionnaire was applied to students from Xiamen University to understand the OEA of university students in China, of which there are few studies. Using data gathered from a random purposive sample, the OEA level of students in Xiamen University was investigated and then the influencing factors (education, geographical situation, age and gender etc.) were further analyzed. Findings suggest that most students are concerned about the ocean environment but their knowledge is not enough that makes the willingness to participate in ocean related actions limited as well. The results show there is an urgent need to improve students' OEA.

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## 1. Introduction

Global concern regarding the steadily deteriorating state of the marine environment has emphasized the need for public ocean awareness and literacy. The need of today is to make people sensitive toward the marine environment through educational programs either formal or informal. Agenda 21 states "education is critical for promoting sustainable development and improving the capacity of the people to address environment and development issues"; moreover, ocean literacy is stated to be an indispensable means of "achieving environmental awareness, values and attitudes, skills and behavior consistent with sustainable development and effective public participation in decision-making" (UN, 1992). More recently, the SOST (Subcommittee on Ocean Science and Technology) in USA suggested that ocean literacy emphasizes development of a multi-disciplinary ocean workforce and an ocean-literate citizenry that better understand the majesty and mystery of the ocean, coasts, and the Great Lakes, and make well-informed decisions about their uses. Improving education and ocean literacy will involve a long-term commitment to change, beyond tomorrow's ocean scientists, managers, and decision makers. Public perception shifts with familiarity; and people protect what they understand and perceive as valuable

(SOST, 2007, 2013). Without a doubt, environmental knowledge and public awareness are important factors influencing environmental policy and management (Steel et al., 2005).

More specifically, ocean environmental awareness prompts the public get more involved in ocean policy development and implementation, and lead to sustainable utilization and management of ocean resources. The increase of ocean environmental awareness enhances the willingness of individuals as stakeholders to participate in ocean policy making, and promote individuals to change their behaviors toward more eco-friendly and sustainably to the development and utilization of the ocean. Meanwhile, the individual with strong ocean environmental awareness can better comply and enforce rules and regulations to protect the marine environment. Therefore, ocean environmental awareness plays a huge role as a policy channel to support the delivery of a healthy marine environment and to enhance marine governance (Mckinley and Fletcher, 2011).

A number of studies have addressed ocean environmental awareness and literacy (Brody, 1996; Uneputtu et al., 1998; Steel et al., 2005; Greely, 2008; Brian and Meghan, 2010; Zaheed, 2011). However, they are mostly concerned with measuring the level of understanding ocean related concepts and terms and the use of the coastal areas. Little concern was given to the recognition of a safe marine environment as valuable and readiness to participate in ocean related activities.

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In addition, several programs namely Centers for Ocean Sciences Education Excellence, Academic Institutions, etc. have been designed to raise public awareness about the ocean (COSEE, 2005). In recent years, further “concerning, understanding, managing and planning” ocean has also become a consensus in high-level decision-makers in China. COSEE-China was initiated in 2010 by scientists from Xiamen University, Ocean University of China and others by supports from both NSF of USA and Natural Science Foundation of China (<http://www.cosee-china.com>). However, there is little understanding of the public’s ocean environmental awareness in China since there are no studies reported in academic journals on measuring ocean environmental awareness of the public.

For this purpose, measuring methods for ocean awareness are needed to understand current levels of acquisition of ocean related issues and applying such knowledge. This study develops a measurement instrument for ocean environmental awareness and applies it to assess the levels of Xiamen University students’ ocean environmental awareness. This paper is structured as follow: section two describes the method of questionnaire survey and a random purposive sampling method were used to gather data of Xiamen University students’ ocean environmental awareness; section three describes the results of the questionnaire survey and analyzes factors influencing the results and causes for the gaps in university students’ ocean environmental awareness; conclusions and recommendations to higher education in terms of increasing university students’ ocean environment awareness are included in section four.

## 2. Research method

As literature on ocean environmental awareness concept is not yet well documented for the simple reason that many scholars have been focusing on environmental awareness for decades but very few have focused on ocean environmental awareness, the definition of ocean environmental awareness in this paper is derived from the concept of environmental awareness. Referring to the views of Linke (1980), Yiu (2004) on environmental awareness, this paper defines ocean environmental awareness (OEA) as the ability of a person to realize an existing connection between human activities and the state of the oceans and then favor a safe and healthy marine environment. This includes the concern about the marine environment, the understanding of ocean related concepts and terms and willingness to take part in ocean related activities.

Based on the main characteristics of environmental awareness, the OEA includes the following features: (1) a concern for the state of the marine environment; (2) recognition of a safe and healthy marine environment as socially valuable; (3) an ability to identify the sources of marine environmental threats; (4) an understanding of the necessity to take personal part in prevention, protest, creation, and other collective actions about the oceans; (5) a readiness to take personal part in the marine environment concerned actions. Therefore, a coherent interaction of “perception – understanding – action” is identified as the key to understand OEA (Umuhire, 2013).

In this paper, OEA is regarded as an iterative cognitive cycle with the components of ocean environmental concern (perception, which can be further distinguished to “a concern for the state of the oceans” and “recognition of a safe marine environment as socially valuable”), ocean environment knowledge represents (understanding, which can be further distinguished to “ability to identify the sources of the threats” and “understand the necessity to take personal part in preventing coastal degradation”) and participation in ocean related activities represents (action). The acquisition of ocean environment knowledge helps to increase concerns about ocean issues then further to drive individuals to take actions to protect the marine environment. The integration of ocean environmental concern and ocean environment knowledge can dramatically increase the willingness to participate in marine environmental protection. Conversely, a person who lacks of ocean environment knowledge would be

very hard to realize the significance of a healthy marine environment; as a result, he or she is unlikely to participate in protecting marine environment, even choosing harmful behaviors to the marine environment. Fig. 1 illustrates the general concept of ocean environmental awareness and the correlation of its five features.

To measure these three aspects of OEA, we designed a questionnaire consisting of four sections: the first section is about the background of the respondents and demographics including the information of gender, age, grade, college, home country and so on.

The second part is a set of ocean related multiple-choice questions to assess the respondents’ concern and knowledge about the oceans in terms of (1) Use of the coastal area; (2) Ability to identify the sources of threats to the ocean environment; (3) Recognition of a safe ocean environment as socially valuable; (4) Understanding of some ocean environment concepts; and (5) Familiarity with some terms related to coastal management.

Part three is about the actions toward the marine environment in terms of willingness to take part in ocean related organizations.

A fourth part includes 8 multiple-choice questions, which assesses which source of information the respondents prefer to.

The structure of the questionnaire is summarized in Table 1. This questionnaire was applied in Xiamen University to investigate the OEA level of the university students. Founded in 1921, Xiamen University was located in Xiamen, a coastal city of Southeast China, which has been identified as a pioneer in the local practice of integrated coastal management in China and East Asian Seas (PEMSEA, 2006). Xiamen University currently counts 33 schools or colleges; each college has different programs of undergraduate, graduate and PhD studies. While some programs have courses related to the oceans, particularly its Department of Oceanography since 1946 is the first one in China and its State Key Laboratory of Marine Environmental Science since 2005 is also the first one of its kind in China; others count no ocean-related courses. The total number of Xiamen University students is 38,000 among which 2500 are international students.

A random purposive sampling method considering the ratios of gender, age, program and degree etc. has been followed to include all the colleges in Xiamen University, international and Chinese students, undergraduate, graduate and PhD students. Considering the total student number is around 40,000 from around 30 schools/colleges, 500 printed copies of the questionnaire were distributed in Siming Campus and Xiang'an Campus by a group of 20 volunteers from different schools on the 13th March 2013 and by the 20th March 429 students responded to the questionnaire (85.8% responding rate). The background of the respondents is summarized in Table 2.

## 3. Results and discussion

The main results were categorized into the three components of OEA, i.e., ocean environmental concern, ocean environmental knowledge and participation in ocean related activities. The results of every indicator will be shown in details in the following discussion part, some key indicators results show relatively high ocean environment concern (with 62% of respondents visiting coastal areas more than once a month, and over 74% of respondents recognizing a safe marine environment is socially valuable); medium level of ocean environment knowledge (71% of respondents having the ability to identify the sources of ocean threats, but only 59% of respondents completely grasped ocean related terms), and low participation willingness (though 80% of respondents agreed to the influence of individuals on ocean environmental protection, less 50% of respondents were willing to take part in ocean related activities) (Table 3).

### 3.1. Ocean environmental concern

The concern about the ocean environment has been analyzed in the context of use of coastal areas, and the ability to identify a safe marine

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