Integral Approach to Environmental Leadership Education: An Exploration in the Heihe River Basin, Northwestern China

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Abstract

An education program called Asian Program for Incubation of Environmental Leaders (APIEL) was established in 2008 by the University of Tokyo. The need arises to equip the students with a wide knowledge base and practical skills related to global and regional environmental issues. This paper explores an integral framework for environmental leadership education, and show how this framework has been used to conduct one of the APIEL field exercises in the Heihe River basin, Northwestern Arid China. The framework was developed by modifying Ken Wilber's 4-quadrant approach. Our conclusion is that the use of an integral approach is effective in not only understanding environmental issues of complexity, but also development and management of environmental leadership education programs.

Keywords: Integral approach, Envionmental Leadership education, Field Excercise, the Heihe River basin

1. Introduction

One of the key characteristics of present-day environmental problems is the complexity in various dimensions, including the complexity in origins, development and impacts, stakeholders involved, knowledge base and so on. Therefore, leaving out multiplicity of the issues, no single solution is going to exist for sustainable world future. Recently, more and more efforts world-wide in educational organizations, business corporations and various communities are directed at enhancing public awareness of environmental issues, and promoting environmental preservation. However, the current education system is unable to provide holistic view on environmental issues yet.

In responding to this situation, the University of Tokyo started an interdepartmental education program called Asian Program for Incubation of Environmental Leaders (APIEL) in 2008. The program was established under the joint initiatives by the Graduate Program in Sustainability Science (GPSS, see Onuki and Mino, 2009) and the Department of Urban Engineering (UE). The program features on first, curriculum encompassing both the interdisciplinary approach toward sustainability science provided by GPSS and the specialized knowledge of environmental engineering provided by UE; second, field exercises which take place several times each year in cooperation with collaborating partners in Asian countries. The students are required to identify the real-world problems and provide solutions through collaboration with various stakeholders in each locality.

We focus on one of the APIEL field exercises conducted in the Heihe River basin, Northwestern Arid China, to show how an integral approach has been used in the practice of environmental leadership education. After a brief explanation of integral approach, we will highlights its benefits for integrating different academic disciplines to facilitate a better understanding of environmental issues and integrating various human and organizational resources towards problem-solving. A full assessment of APIEL activities is beyond the scope of this study.

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2. Integral Approach: What and Why

2.1. Integral Approach

Integral approach means to address multiple perspectives of the world instead of focusing on specific objects and/or specific systems of objects. Given the complexity of reality, the approach cuts across fields and brings together existing methodologies into a trans-disciplinary framework. Integral approach draws attention world-wide only in this decade. Integral approach is under continuing development especially based on Ken Wilber's 4-quadrant framework.

According to Wilber (2001, 2007), all phenomena in the world can be classified into four quadrants. These quadrants are four ways of viewing same occurrence in the reality from four different perspectives. They can be located in the interior and exterior of both individuals and collectives. The exterior aspects of objects are found on the right hand side, with physical and behavioral aspects in the upper right quadrant and social systemic aspects in the lower right quadrant. The interior aspects of objects are found on the left hand side, with intentional, personal, psychological aspects in the upper left quadrant and cultural aspects (collective values) in the lower left quadrant. Although the four quadrants are ontologically distinct, there is nevertheless an interwoven, intimate correspondence between them. In addition, Wilber (2001, 2007) argued that the origin of the quadrants also represents the origin of the development (evolution) process of each quadrant. Although we apply Wilber's approach, we will only highlight the integration and interaction of four quadrants. We do not pay attention to any development (evolution) processes of quadrants.

2.2. Why Applying Integral Approach in Environmental Leadership Education?

Wilber's integral approach has been applied to a variety of fields. It is witnessing the application to both academia and practice. In particular, it is gaining attention from researchers and practitioners in the field of sustainability/environment around the world. We apply the approach because, first, it provides an holistic framework encompassing wide knowledge base in the social, economic, cultural and natural sciences; second, it leads to successful implementation of an environmental leadership education program by providing a comprehensible structure for program design.

In the academic world of sustainability/environment, we especially draw on the works including Esbjorn-Hargens and Zimmerman (2009), Eddy (2005), Kayane et al. (2006), Kayane (2008a,b), Esbjorn-Hargens (2005), Voros (2001), and Floyd and Zubevich (2010). Among these, Kayane et al. (2006) and Kayane (2008a,b) are the pioneering studies which applied the approach to water environment issues. They analyzed water environment and related changes in local communities of Lijiang City, China and Tsuwano Town, Shimane Prefecture, Japan. They argued that, first, natural environment, herein, water, is a common element related to all quadrants; second, current environmental problems are often consequences induced by the abnormal development (evolution) of the lower right quadrant, i.e., rapid technological innovation in the 20th century. We mentioned their works because the keyword of field exercise conducted in the Heihe River basin is water problems in dryland. The Kayane et al. (2006) and Kayane (2008a,b)'s framework was further developed in Akiyama et al. (2010). Figure 1 is a simplified Akiyama et al. (2010)'s 4-quadrant framework related to water environmental issues.

Our framework allocates various perspectives of water environmental issues into four quadrants which are associated with each other. It draws upon conventional concept of sustainability/environment studies, with its emphasis on empirical research methods (quantitative and scientific), as well as the alternative concept to encompass inter-subjective and subjective modes of inquiry (qualitative, hermeneutic and introspective). The advantage of this framework, while still requiring further research, is profound. On the one hand, it offers a common foundation for people to view various perspectives of complexity of water environmental issues. On the other hand, it incorporates knowledge and methodologies of multiple disciplines.

At the practical level, as far as we know, integral approach has been at least applied to international development and education fields. In the field of international development, several international development organizations and non-governmental organizations including UNDP (global leadership development program around HIV/AIDS) are increasingly seeing the advantages of adoption of integral approach in their projects (Brown, 2006). At the local level, the approach has also been employed in the community development projects such as the one in San Juan del Gozo community, El Salvador (Hochachka, 2008). In the field of education, the integral approach has also proved to be useful in curriculum development, see for example, Gidleya and Hampson (2005) and Lloyd (2007). Drawing upon on these practices, we design the field exercise following the 4-quadrant framework presented in Figure 2.

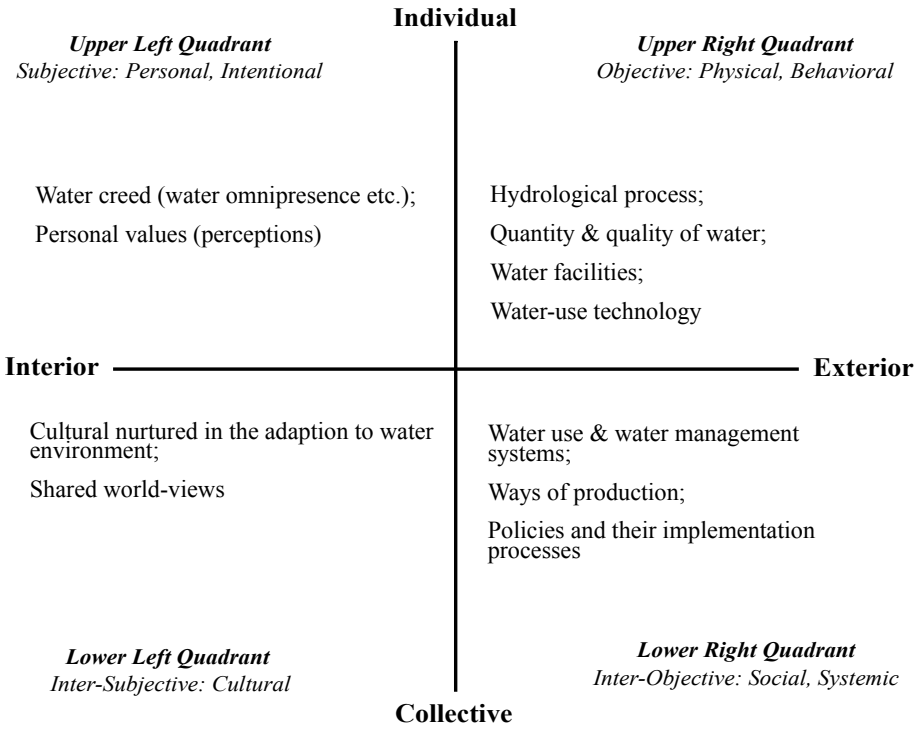

Figure 1: An Integral Framework for Water Environmental Issues.

In Figure 2, 'I' ('we') refers to the participant(s) of field exercise. This framework helps us design a problem-based field exercise. First, it requires the field exercise design to foster self-development through personal learning as well as team work, collaboration and communication with different stakeholders. Second, it requires the field exercise design to be able to lead to common conclusions as well as accommodate the individual ones. This means the field exercise should set up clear shared goals from the beginning while allowing for individual visions.

3. Incorporation of Integral Approach into an Environmental Leadership Education Practice

3.1. Development of Field Exercise Unit Conducted in Northwestern Arid China

The Heihe River river basin is located in arid Eurasia. It provides a good ground for fieldwork participants to consider how sustainable development could be achieved in dryland regions under severe constraint of water resources. APIEL chose the river basin as a target area of field exercise due to the following two reasons.

First, sustainable development of dryland regions is an inevitable challenge facing current world. It is associated with water security as well as food security issues around the world. Currently, irrigated agricultural land comprises less than one-fifth of the total cultivated area of the world but produces about two-fifths of the world food (Postel, 1999). Irrigation farming, to a great extent, contributes to the increase of food production in the 20th century and supports large number of increased population; however, food production relying on 'irrigation miracle' gives significant impacts on water resources. Agricultural water use including irrigation accounts for about 70% of the global water withdrawals (Shiklomanov, 2000). In dryland regions, large-scale development of irrigation farming induces dramatic increase of water demand. Consequently, it often results in stoppage of river flows, dry-up of lakes, decline of groundwater table and other related ecosystem degradation.

Secondly, the Heihe River basin, the second largest inland river in China, provides abundant topics of sustainable development in dryland regions. In particular, we highlight the topics including watershed management, water-saving policies (decision-making processes, implementation and assessment), environmental degradation and its recovery. In the Heihe River basins, historically, people living in the middle reaches and the ones living in the lower reaches had

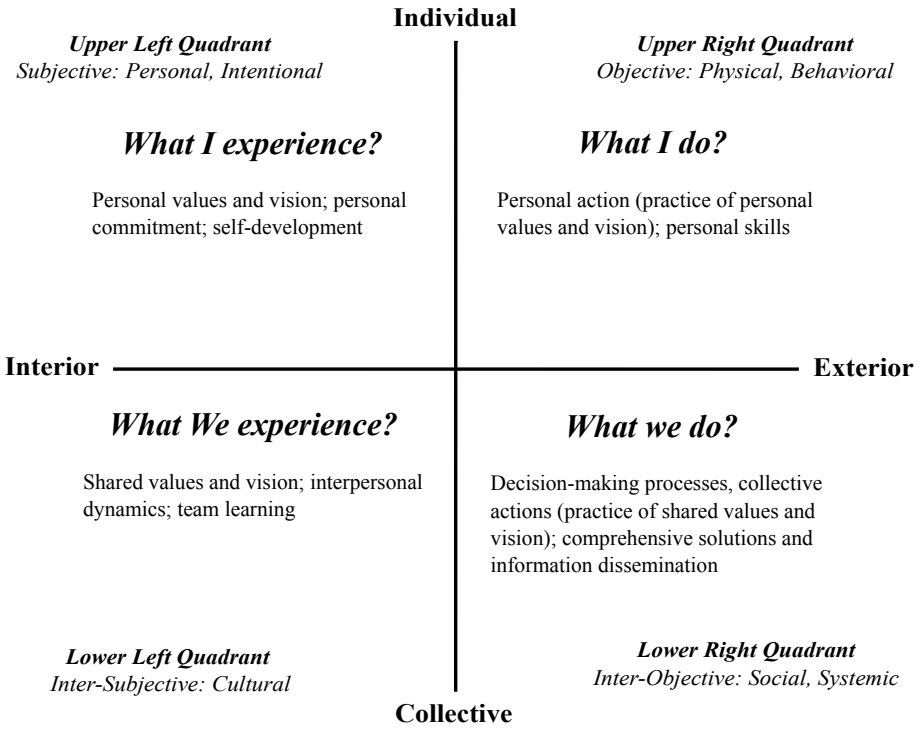

Figure 2: An Integral Framework for Environmental Leadership Education.

different ways of production. The former performed irrigation farming (settled culture); while the latter performed nomadic husbandry. Since 1950s, intensive agricultural practices in the middle reaches have resulted in drastic environmental degradation in the lower reaches[2]. The conflicts around water use between the people living in the middle reaches and the people living in the lower reaches can at least date back to 200 years ago (Inoue, 2007, 2010; Wang and Gao, 2002); however, it has never been as fierce as current situation. In recent years, a variety of environmental conservation activities have been carried out in the river basin[3]. Main purpose of the activities is to preserve the environment in the lower reaches. Since 2004, the terminal lakes revived, while new challenges induced by efforts to environmental protection emerged. Thorough evaluation related to the policy implementation is required.

Table 1 presents a brief description of APIEL field exercise conducted in the Heihe River basin. It started in 2009, and takes place once a year. With integral thinking as general framework of program design, we extend the contents of field exercise from 2009 to 2010 to incoprate more perspectives related to environmental issues, and provide more experiences for students to develop their practical skills. The field exercise is jointly organized by APIEL, the University of Tokyo and Cold and Arid Regions Environment and Engineering Research Institute (CAREERI), Chinese Academy of Science (CAS). Students who join the field exercise are from both institutes. They come from different

[2]The intensive exploitation of water resources in the middle reaches resulted in the discharge decline to the lower reaches. Up to 2002, more than 30 tributaries of the Heihe River basin dried. In the lower reaches, two terminal lakes dried up in 1961 and 1992 respectively. Riparian vegetation degraded. Salinization and desertification intensified.

[3]In 2001, the Chinese state council promulgated the Master Plan of the Heihe River basin. It states that 'when the water from the upstream discharge reaches 1.58 billion m^3/a, Zhangye city located in the middle reaches of the Heihe River basin has to increase discharge of 0.225 billion m^3/a to the lower basin, which means 0.95 billion m^3/a should be released to downstream' (Fang et al., 2007). This indicates the central government requires the Zhangye city to reduce its water consumption by administrative order. In early 2002, the Ministry of Water Resources (MWR) of China initiated an experimental project of establishing water-saving society in the middle reaches, Zhangye city. The project was set to save water and increase water use efficiency mainly in 2 ways: (1) construction of concrete irrigation channels by government budget; (2) introduction of market mechanism. This includes introduction of meters for water users to charge irrigation water based on quantity used, and the introduction of water use right system with tradable water quotas. In the meantime, in the Ejina of the lower reaches, relocation policy has been implemented because overgrazing of the nomads was considered as one of the reason of environmental degradation.

Table 1: Description of the Field Exercise Unit Conducted in the Heihe River Basin.

	2009	2010
Place(s)	Middle reaches of the Heihe River basin (Zhangye City, Gansu Province)	Middle and lower reaches of the Heihe River basin (Zhangye City, Gansu Province and Ejina County, Inner Mongolia)
Duration	8 days (Aug. 7-15, 2009)	14 days (Aug. 10-23, 2010)
Collaborating institution	Cold and Arid Regions Environment and Engineering Research Institute (CAREERI), Chinese Academy of Science (CAS)	
Description of participants	9 students from 4 countries	16 students from 7 countries
Major of students	Sustainability science, urban engineering, geography	
Fields of teaching staffs	6 teaching staffs from the fields of water environmental engineering, hydrology, geology, limnology and geography, international development studies and agriculture	7 teaching staffs from the fields of water environmental engineering, hydrology, geology, limnology, geography, international development studies, economics and sustainability science
Stakeholders involved	Researchers in middle reaches; government (local water management authority) in middle reaches; farmers in middle reaches	Researchers in middle & lower reaches; government (local water management authority) in middle & lower reaches; farmers in middle & lower reaches; agricultural enterprises in middle & lower reaches; nomads in lower reaches
Activities	1. Lectures; 2. Site visits; 3. Discussions and communications with various stakeholders; 4. Quantitative and qualitative studies; 5. Group works; 6. Presentations (group-based); 7. Result report (group-based).	
Required outcomes	Unique proposals to local policy-makers on solutions to water-related issues in the Heihe River basin. Note participants are expected to determine what topics to research independently.	

countries and major in different fields. In order to provide multi-disciplinary knowledge and multiple views about local environmental problems to students, teaching staffs from different academic fields and various local stakeholders were involved in the different stages of the fieldwork.

3.2. Making the Field Exercise Unit Integral

Applying integral approach to the environmental leadership education is an evolving process and is far from complete. There are external constraints such as human resources constraint, financial constraint and time constraint that prevent ideal development of program. In addition, the students who have come through a relatively narrow educative system do not always know how to respond to a new and holistic way of learning. Therefore, when we design our field exercise, we focus on integral knowledge base as well as integral practice.

Figure 3 presents an overview of the organizational framework used in our field exercise. Note that students are the leading players in the framework. We simply create the space for students to solve real-world environmental problems and realize self-development. In Figure 3, environmental issues refer to the research topics covered by the students. Methodologies refer to the ones adopted by the students. Competencies refer to the capabilities and/or skills which students are supposed to equip with after participating in the field exercise.

Problem-based learning is the core concepts of our program design. It brings up related issues, brings together necessary research methodologies, and consequently improves participants' capabilities to become future environmental leaders. The main objective of field exercise is to enhance students' practical skills through solving specific environmental problem in real world. Issues in each quadrant are different perspectives of same environmental problem, in this case, sustainable development of the Heihe River basin facing severe water shortage. The issues are interwoven

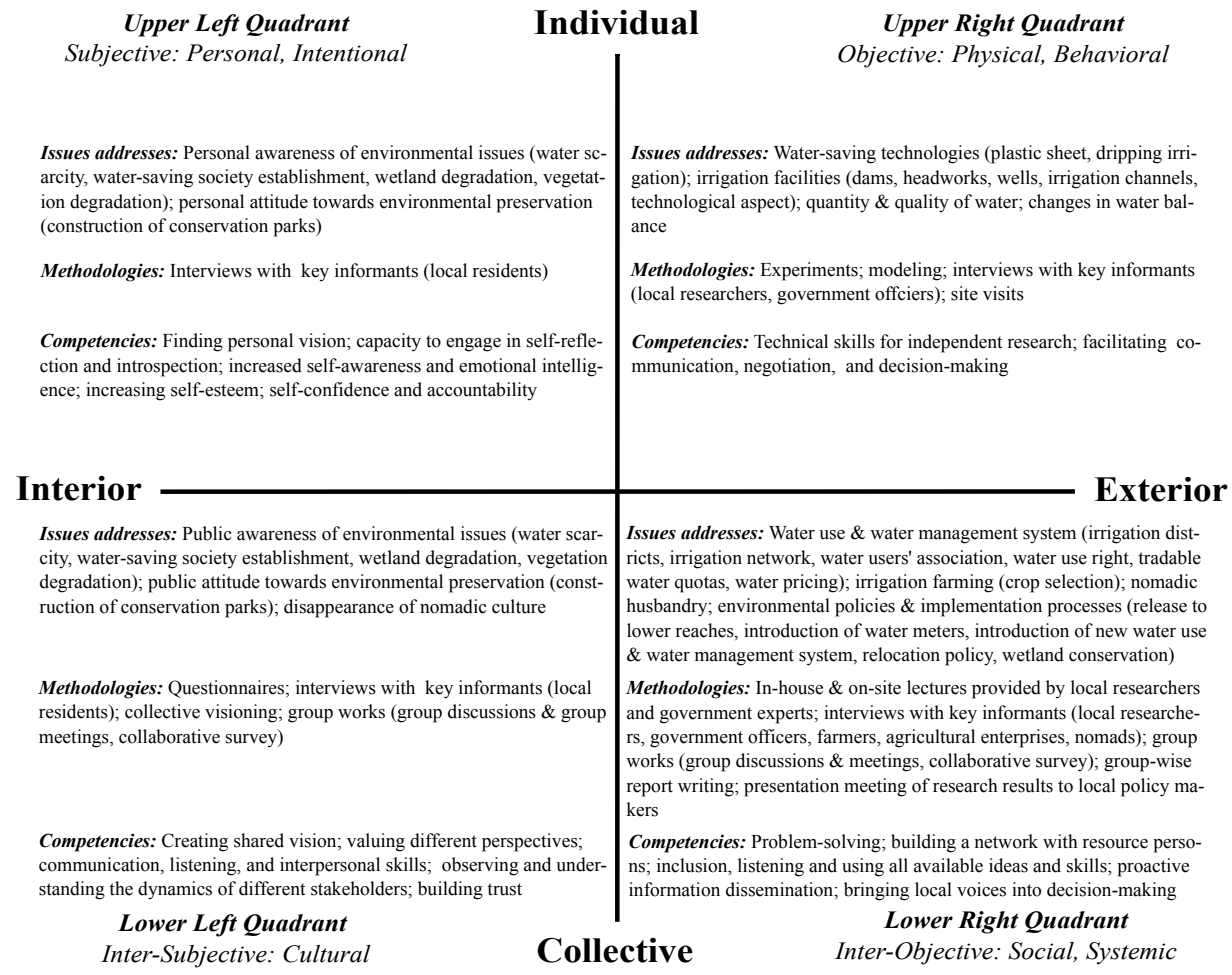

Figure 3: The Integral Organizational Framework with respect to the Field Exercise Unit of Environmental Leadership Education.

with each other. In order to provide comprehensive solutions to multiple issues, different methodologies from different fields are required. Though cutting cross quadrants, to tackle the issues in upper right quadrant, natural-scientific methods including experiments and quantitative modeling are mostly required. In the case of lower right quadrant, social-scientific methods are mostly required. In the case of two left-side quadrants, humanity-based, hermeneutic methods are mostly required.

Competencies identified in Figure 3 are not selected by us intentionally. They develop naturally in the process of fieldwork participation, in particular, through various group works. Team-based activities require the students to listen to, understand and incorporate different ideas while contribute to groups from their respective fields and perspectives. Students need to find their common research interests and decide common research topics, adapt to changes and finally solve the problems. In addition, competencies spill over quadrants. For example, good communication skills may foster students' understanding of different concerns of different stakeholders, create shared vision, as well as integrate different methodologies and fields to find comprehensive solutions.

4. Concluding Comments

The complexity of current environmental problems triggers increasing concerns about the integration of academic fields to find solutions towards sustainability of human future. There arises the need to equip students with a wide

range of knowledge base and practical skills in terms of social, economic, cultural and physical aspects of environmental issues. Undoubtedly, in the absence of established models, it is still challenging to enable educational programs change toward the direction of holistic view. In this paper, we introduced a framework developed from Ken Wilber's 4-quadrant approach. The framework was built on the core concept of problem-based learning. It has been adopted in one of the environmental leadership field exercise initiated by APIEL, the University of Tokyo. After two years of implementation, we found that program participants were enthusiastic and satisfied about the course[4]. Therefore, we conclude that the use of an integral approach is effective in not only understanding environmental issues of complexity, but also development and management of environmental leadership education programs.

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