

英語報告部会 要旨

English session Abstract

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A River Apart: Complexities of an International Border Contamination Study

David Allen (Texas A&M International University)

Key words: International border contamination health hazard

Approximately 2000 miles of the Rio Grande, from the Gulf of Mexico to cities of El Paso (USA) and Juarez (Mexico), serves as part of the international border between the USA and Mexico along the southwest edge of the state of Texas. About 200 miles (320 km) up the river from the Gulf of Mexico are two cities separated by the Rio Grande, Laredo (USA) and Nuevo Laredo (Mexico). Laredo had a 2010 population of 236,091 (US Census Bureau, 2019) and Nuevo Laredo had an estimated 2010 population of 373,725 (citypopulation.de, 2019).

These sister cities share a lot of culture and history but they do not share a well-functioning sanitary sewer system. Documentation exists of Texas cities having sanitary sewers as far back as the late 1800s (Melosi, 1994), however, Nuevo Laredo saw its first wastewater treatment plant go online in 1996 (Satija, 2013). Prior to this event, up to 25 million gallons of raw sewage from Nuevo Laredo were released into the Rio Grande (Dougherty, 2018). Even with the wastewater treatment plant, broken pipes and still unconnected areas of Nuevo Laredo result in a continuing release of over five million gallons per day (Satija, 2013).

To investigate the contamination, Dr. Tom Vaughn of Texas A&M International University in Laredo monthly collected environmental data for over 23 years (9/18/1993 to 12/30/2017). Several attempts have been made to analyze the data, including this study, but due to complexities associated with the Rio Grande and associated data, no statistically significant conclusions can be reached. Some of the measured values are: Site A (upstream of both cities) average 92.5 col/ 100 ml, maximum 1937 col/ 100 ml; Site B (north Laredo) average 145 col/100 ml, maximum 2200 col/100 ml; Site C (south Laredo) average 1244 col/100 ml, maximum 38,000 col/ 100 ml; Site D (downstream of both cities) average 2293 col/100 ml, maximum 88,000 col/100 ml. The Texas Department of Environmental Quality (2007) identified limits to fecal coliform in water for recreational use. For contact recreation the limit is 200 col/100 ml. For non-contact recreation the limit is 2000 col/100 ml. The level of contamination poses a serious health threat to human health for any recreational use of the Rio Grande for citizens of both cities.

Given the seriousness of the contamination, there are several complexities that prevent detailed statistical analysis of the data and rectification of the continual release of raw sewage. The two greatest complexities include the politicization of the issue and a highly variable flow rate and water depth due to water use and release requirements from Amistad Dam. The water level variability is one factor that prevents the deployment of continual monitoring equipment.

References: Please contact the author for the reference list.

Pilot study of connection with nature scale developed for senior high school student

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Key words: connection with nature, adolescent, scale development

Since 2000, a group of scholars from educational and psychological fields started to pay attention to people's relationships with natural environments. In 2005, Louv interviewed children and adolescents in US and proposed the term "nature-deficit disorder" (NDD) to describe how losing contact with nature might weaken children and adolescents' physical health and wellbeing, and increase their apathy to natural environments as well. These trends made connection with nature (CWN) a hot research issue in environmental and outdoor education. However, most papers focused on developing scales to measure adults' CWN, which left adolescents' CWN a less explored academic puzzle. The purpose of this study is therefore to develop and test a specific CWN scale designed for Taiwanese adolescents. Through literature review and teenagers' interviews in previous studies, CWN was defined as sensory, emotional and symbolic connections with special or general nature. I totally created 43 CWN items for survey and used INS (Schultz, 2002) to ensure the concurrent validity of this new CWN tool.

In 2019, I surveyed 208 11th graders at three public senior high schools in Taichung City in central Taiwan and conducted item analysis, explorative factor analysis (EFA) and test coefficient alpha. I deleted three items that measured negative emotions toward nature. The EFA reversed 17 items that was separated into five factors with a totally accounted variance for 63.13%. The naming of each factor and the value of Cronbach's α were psychological restoration (.89), sensory experience (.83), nature significance (.86), negative emotions toward environmental destruction (.87) and overall belief about personal relationships with nature (.78). The Cronbach's α for the whole scale was .93. In addition, adolescent's CWN had significant and moderate correlation with INS ($r = .49^{**}$). Therefore, I can conclude that CWN scale developed in this study was a valid and reliable measure at least for Taiwanese adolescents. Suggestions for future research would be discussed in my presentation in the conference.

The Evaluation Research of Climate Change Curriculum to Promote Senior High School Students' Nature Connection

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Key words: Climate change education, Connection with nature, High-School, Evaluation

In recent years, Climate change has impacted many countries in the world and becomes a serious education issue internationally. In order to help students fully understand climate change, it is important to have them learn this issue outdoors to observe and act to reduce the impact climate change has brought on natural flora and fauna. Therefore, the purpose of this study is to create opportunities for high school students to learn climate change on campus and in daily life so as to increase their climate change behaviors and connection with nature. This study used mixed method to collect quantitative data by conducting quasi-experimental designed survey. We also interviewed participatory students and teachers as qualitative data to help explain result from quantitative analysis. We did this study in one senior high school in Taichung city, Taiwan. There are total 99 students participated in our study (treatment group had 42 students and the control group had 57 students).

We found that the climate change curriculum designed by our research can significantly increase students' natural connection and environmental behavior in treatment group. However, there was no significant difference in nature connection among treatment and control groups through covariance analysis. From qualitative data analysis, this study discovered that increasing outdoor activities, designing multiple sensory experiences, and promoting positive emotions related to nature through challenging and skillful learning can strengthen students' natural connection.

The Evaluation Research of Climate Change Curriculum on Senior High School Students' Environmental Hope

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Key words: Climate change, Environmental Hope, Senior High School

In 2003, The United Nations Educational, Scientific and Cultural Organization (UNESCO) proposed sustainable development education. The Ministry of Education in Taiwan also announced a national educational plan of adaptation literacy of climate change to promote citizen's climate change literacy. But past studies have showed that teenagers tended to feel hopeless on complex environmental issues such as climate change (Stevenson & Peterson, 2016) and it's important to raise learner's sense of hope. So we designed a climate change curriculum for high school to enhance student's environmental hope based on Snyder's hope theory (2002). We collaborated with a high school in Taipei City in northern Taiwan by purposive sampling and designed a one-semester, two-credit curriculum (21 weeks). There were totally 101 students joining our research. We used mixed method to measure student's change in hope by adopting Li and Monroe's scale (2017). We also interviewed 10 students to understand what learning activity can enhance their environmental hope. Through the paired t test of the experimental group, we found that student's environmental hope significantly increased between pre- and post-test. When comparing with control group, the result of covariance analysis found that experimental group's environmental hopes was significantly higher than control group due to curriculum intervention. From interview data, some students said our curriculum can help them raise hope by knowing what other citizens or organizations have done for climate action or by understanding and exercising strategies of taking climate action at campus. In sum, we consider this curriculum can successfully enhance high-school student's environmental hope and therefore we recommend future educators can adopt or revise this curriculum according to their educational situations to help develop their students' environmental hope.

Exploring Whole-School Approach for Education for Sustainable Development

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The importance of education in creating a sustainable society has been steadily emphasized. In particular, school education has been a key area for changing towards sustainability. Education in schools is seen as an important area for building capacity to cope with the serious challenges facing mankind, because it can affect a large number of children and adolescents. Although it is more common to deal with sustainability issues in the existing curriculum, there are increasing cases in which the whole-school approach towards sustainability is considered in terms of not only teaching and learning but also managing schools or connecting with wider communities.

The whole-school approach towards sustainability allows members of the schools and local communities to participate in the school's decision-making process and enable students to participate actively in the teaching and learning process. In the process, students and school members can improve their critical thinking, communication abilities, and other competences. The space of education can be extended to the entire school or to local communities. It also includes monitoring, reflection and evaluation of the entire process. In this regard, the whole-school approach makes sustainability a key principle in school planning and operations.

In Korea, the research on the whole-school approach towards sustainability has been carried out mainly on the Environmental Conservation Pilot Schools, the Energy Saving Policy Research Schools, and the School Forest Model. A number of case studies were conducted on UNESCO ASPnet schools, eco-schools and sustainable schools in Korea and abroad.

At the conferences of the Korea Environmental Education Society held in December, 2018, there were case presentations and discussions about the whole school approach that is being carried out at the Innovative School, the Dreaming Schools for Environmental Education, and in environmental clubs in schools. These examples provide meaningful implications for changes that extend the classroom, reconfigure the curriculum, collaborate with stakeholders outside of school, carry out long-term environmental education, and grow by themselves.

The important conditions that enabled this case were teachers' learning communities and teacher groups, which reconfigured the curriculum together with the enthusiasm and ability of teachers, students and parents who share the meaning of environmental education, and community organizations that work together. It is necessary to recognize that at least one school unit is needed to make environmental education for sustainability meaningful.

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