

ABC WATERS PROGRAMME (CENTRAL CATCHMENT) – CONTEXT FOR STUDENT LEARNING

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ABSTRACT

The Active, Beautiful and Clean (ABC) Waters programme by PUB, the national water agency of Singapore, aims to restore the waterways and create new waterscapes in Singapore so as to bring people closer to water and provide a beautiful environment for all to enjoy. The conventional engineering approach for designing man-made channels is replaced by an integrated view that includes engineering, science, landscape design, urban design and a commitment to community connection. Singapore Polytechnic has adopted the Singapore River and Kallang River at Bishan Park, and will be adopting and organising activities at the Marina Reservoir. All these places are in the central catchment of Singapore. The paper describes how the adoption programme can help engineering students better appreciate the external and societal context for engineering systems and the engineering profession and provide learning experiences for students outside classrooms. This is aligned with the Conceiving-Designing-Implementing-Operating (CDIO) syllabus, a component of which is focused on the external and societal context.

KEYWORDS

Waterways, adoption, students, community, societal context, content

INTRODUCTION

ABC Waters Programme

The Active, Beautiful and Clean (ABC) Waters programme by PUB, Singapore's national water agency, aims to restore the natural rivers, lakes and waterways and create new waterscapes in Singapore so as to bring people closer to water, the scarce resource in the island nation. The conventional engineering approach for designing man-made channels is replaced by an integrated view that includes engineering, science, landscape design, urban design and a commitment to community connection. Concrete drains and canals will be transformed into natural streams with habitats for aquatic and marine flora and fauna. Community spaces beside the waters will be created for new lifestyle activities and attractions. More recreational choices such as kayaking and leisure boating will be offered. These are in addition to the engineering systems to be put in place, for example careful design to ensure adequate drainage, the recirculation of water in the system to create flowing waters, and basic treatment measures for the waterways such as litter traps, rain gardens, bio-retention systems and infiltration trenches.

With this nexus of engineering systems and societal impact, the ABC Waters Programme provides an excellent platform for engineering students to better appreciate the external and

societal context that engineers operate in. It also helps the students appreciate the engineering principles and technical concepts learnt in the classroom, for example in the module on Hydrology & Hydraulics. The Singapore Polytechnic (SP), through its adoption of various water-bodies under the ABC Waters programme, has involved the students from the Diploma of Environmental Management and Water Technologies (DEWT) and Diploma in Civil Engineering & Management (DCEM) courses to work with government agencies, NGO, industry and the community. The adoption programmes are described in more details below.

ADOPTION PROGRAMMES

Adoption of Singapore River

SP has officially adopted Singapore River since January 2006. As part of the adoption programme, SP has been working closely with Waterways Watch Society (WWS), a non-governmental organisation, to monitor the water quality in Singapore River. Since 2005, SP, together with the Environmental Engineering Society of Singapore, WWS and PUB, has been organising the World Water Monitoring Day from 18 September to 18 October every year. On the World Water Monitoring Day (WWMD), students from various schools, including SP, use water testing kits to test the levels of dissolved oxygen, acidity, clarity and temperature of water at Singapore's reservoirs and waterways such as Kallang Basin and Singapore River.

The exercise is part of the global efforts of WWMD which aims to create awareness of the importance of clean water. Such activity helps to nurture ownership among young Singaporeans and encourage us to be guardians of our water, which will ensure the sustainability of our precious water resources. For the past 3 years, over 40 SP students and staff have participated in the WWMD.

SP has also organised Singapore River Raft Race (SRRR), an annual event, with the objectives to nurture creativity and spirit of adventure, raise awareness of recycling & environment, encourage healthy life style and raise funds for charity. In 2007, there were 100 rafts from 35 organisations registered for the race and some 2000 people participated in SRRR including the fringe events. Since 1997, SRRR has raised some \$1.2 m for 21 charities to date.

Adoption of Kallang River at Bishan Park

SP has officially adopted the Kallang River at Bishan Park since November 2007. The ABC Waters Programme at the Kallang River is currently in progress. Upon the completion of the project, the DEWT and DCEM students will assist in analysing and monitoring of water quality in the river. The students will also be involved in gathering feedback from residents on community spaces created near the waterways, planning outreach programmes to secondary schools to raise awareness of protecting the precious resources, conducting research on cultural heritage of the Kallang River and developing signages to educate the public.

Adoption of Marina Reservoir

SP will be adopting the Marina Reservoir, Singapore's first reservoir in the heart of the city in June 2009. Marina Reservoir is created by a barrage built across the mouth of Marina Channel. It is set to boost Singapore's water supply, alleviate flooding in the low-lying areas of the city and provide a new venue for water recreational activities. Some 40 DEWT students have been trained as volunteer guides to share with local and foreign visitors the Singapore Water Story and the function of the barrage at the Sustainable Singapore Gallery

at Marina Barrage. It is an enriching learning experience for the students – not only can they better appreciate the engineering knowledge acquired in class, they are able to communicate the concept and idea to the community.

CONTENT FOR CLASSROOM TEACHING

In the classroom, DEWT and DCEM students are taught the hydrological cycle, catchment management, stormwater management and design of drainage systems. They learn to design trapezoidal or rectangular concrete drains using conventional methods such as using Manning's equation. They learn that raw water is collected within the catchment areas as runoff and to ensure the quality of raw water, rules and regulations are usually imposed by the authority to restrict development and human activities within the catchment.

Through the adoption programmes, students are exposed to innovative features of the ABC Waters Programme initiated by PUB, where the conventional engineering approach to resolve flooding and drainage problems, i.e. designing concrete man-made channels, are now replaced with natural streams with habitats for aquatic and marine flora and fauna. Instead of protecting the waterways against any human activities, the community is now encouraged to get close to the water bodies and participate in various recreational activities such as kayaking without compromising the water quality in the waterways. This can be made possible with the basic water treatment measures put in place along the waterways such as the litter traps and infiltration trenches.

CONTEXT FOR CLASSROOM TEACHING

With the participation in various activities of the adoption programmes, students can have a better understanding on how engineering concept is being applied in real life context and keep abreast of the latest technologies adopted by the industry. The partnership with the government agencies, NGO, industry and community will help broaden the students' perspectives in real working world and develop them as whole, mature and thoughtful individuals.

In addition, through participating in the adoption programmes, our students learn to appreciate the importance of water in the context of a water-scarce resource country like Singapore. This importance is reflected by PUB's tagline: *Water for All: Conserve, Value and Enjoy*. Students learn to conserve water as they come to know that it takes great effort to collect every drop of water; they learn the value of water and take greater ownership of our waterways and reservoirs and they enjoy the water bodies through the various water sports and activities at the waterways.

CONCLUSION

The adoption of water-bodies by SP and the involvement of engineering students in the programme is an example of programmes focusing on the external and societal context, which is a significant component of the Conceiving-Designing-Implementing-Operating (CDIO) syllabus. Exposing the students to the industry as well as participating in the community allow them to have a better appreciation of the external and societal context that engineers operate in. This will prepare them as active citizens and professionals to help conserve, value and enjoy Singapore's waters.

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Biographical Information

Tracy Law is a lecturer in the School of Architecture and the Built Environment, Singapore Polytechnic since 2007. Her teaching focuses on civil, environmental management and water technology. Prior to joining Singapore Polytechnic, she worked in PUB for 7 years as an engineer managing the municipal water supply matters. She graduated from the National University of Singapore with a Bachelor degree in Civil Engineering.

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