

ENHANCING WATER MANAGEMENT AWARENESS IN THE STUDENTS OF SECONDARY SCHOOL THROUGH INQUIRY-BASED TEACHING MODEL

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Abstract - The management of water resources is presently undergoing a hypothesis transfer toward a more incorporated and participatory management approach. In this paper, the author highlights the need to completely obtain into account the intricacy of the systems to be managed and to give supplementary concentration to worries. Hence this situation requires more awareness toward water management though improved management policies and practices by learning from the outcomes of previous management actions. This paper describes the procedure of increasing the adaptive water management awareness for sustainable and integrated water management in an uncertain and complex world in the students with help of the Inquiry based teaching model. During the class time period's Critical debate is structured around four questions: (1) What types of uncertainty need to be taken into account in water management? (2) How does adaptive management account for uncertainty? (3) What are the characteristics of adaptive management regimes? (4) What is the role of social learning in managing change? The inquiry-based teaching model illustrates all the facts related to the water utilization and motivates the students for better water utilization.

Keywords— Inquiry-based teaching model, Water utilization, Climate change, Social learning, Student awareness, Smart Classes.

INTRODUCTION

For the past two decades, new and more integrated approaches to water management have been developed and are being implemented to address perceived shortcomings in earlier approaches. During the last decade, the principle of integrated water resources management (IWRM) has, for example, been used as a framework for the implementation of such integrated approaches to water management (GWP-TEC 2000). "Integrated" clearly indicates a desire to functionally engage a range of perspectives by formally considering a wide range of potential trade-offs at different scales in space and time. Such an approach attempts to overcome the shortcomings of technical end-of-pipe solutions that deal with individual problems in isolation and

run the risk of causing unexpected consequences. However, the implementation of an IWRM approach that fully accounts for the complexity and interdependencies of human-technology-environment (HTE) systems has yet to be realized. The increasing awareness of the complexity of environmental problems and of HTE systems has encouraged the development of new management approaches based on the insight that the systems to be managed are, in broad terms, complex, unpredictable, and characterized by unexpected responses to intervention.

Such complex adaptive systems are characterized as hierarchies of components interacting within and across scales, with emergent properties that cannot be predicted by knowing the components

alone. Rather than trying to change the structure of complex, adaptive systems to make them controllable by external intervention, innovative management approaches aim to make use of the self-organizing properties of the systems to be managed. Current water management regimes have evolved over decades, and changing them will take some time. How can we directly study and analyze transition processes when the scale of change approaches or exceeds the time horizon of academic projects or careers? A better understanding of the transition processes and the barriers and facilitators for change is essential to catalyze change and foster the implementation of a transition process toward integrated and adaptive resource and water management regimes. Management failures, despite superior technology and well-financed central control, give rise to a key question: How can we improve understanding and trust through a social process of learning and negotiated change? We maintain that, in environmental, economic, and social terms, sustainable water management can be successfully implemented only if more attention is given to understanding and closing these knowledge gaps, including the need to deal with uncertainties.

Numerous technical and quantitative approaches already exist to account for uncertainties in policy analysis and formulation (Morgan and Henrion 1990). Qualitative uncertainty can be tackled via a variety of participatory approaches targeted at achieving social learning processes and negotiations to reach consensus despite different perspectives. However, a change in the overall management paradigm is needed to account for all the uncertainties in a more comprehensive fashion. This paper describes how the principles of adaptive water management might improve the conceptual and methodological basis for achieving sustainable and integrated water management in an uncertain and complex

world. Sections 2 through 5 address the following questions:

- What types of uncertainty need to be taken into account in water management?
- What is adaptive management, and how does it account for uncertainty?
- What are the characteristics of adaptive management regimes?
- What is the role of social learning in managing change in the context of adaptive management?

ROLE OF EDUCATION IN WATER UTILIZATION

Education and awareness is essential to achieve the change in attitudes and behaviours needed to reach sustainability. The 'Make your water mark!' Watersaver education program has been designed to make the process of learning about water conservation and Gold Coast City Council's initiatives to reduce water consumption as easy, interesting and straight-forward as possible. By starting at the grass roots of our community - our children - at schools, we can have a positive impact on a sustainable water future. Our environment and access to a unique water-based lifestyle attracts huge tourist numbers and new residents. Visitor and population growth calls for planning to ensure our future is on tap.

Each concept will build on what students have learnt in previous years. This program aims to promote positive changes in behaviour and highlight future workforce opportunities in water-related fields. These water units use an 'inquiry-based' approach to teaching and learning. Students formulate questions that become the basis for student-planned investigations to form the context for developing scientific explanations. Materials include key water topics for the city of the Gold Coast:

- The water cycle.
- How our water cares for us.

- Saving water.
- School water audit.
- Drought.
- From catchment to tap.
- Changing the way we use water.

The program is designed to assist with achieving effective behavioural change. Such initiatives are essential to ensure the sustainable development of the region and to maintain water balance over the long-term. It focuses on South East Queensland water issues, but includes how water is a significant environmental issue on a local, national and global level.

5Es TEACHING MODELS

Scientific phenomena are explored through hands-on investigations as students use their prior knowledge and literacy to develop explanations, understanding and investigative skills. Learning and teaching progress through the 5 E's model.

- Engage: To create student interest and stimulate curiosity. Open questions, writing, drawing and discussion so that teachers can extend and challenge students with future learning experiences.
- Explore: To conduct hands-on investigations to experience scientific phenomena. Students collect evidence by observing and measurement, testing ideas, discussing and questioning. This allows students to acquire experiences they can use to make sense of new concepts or skills.
- Explain: Patterns and relationships within observations are identified and discussed by students. Current scientific explanations are used to extend understanding. Writing, drawing and mapping is used to clarify ideas and explanations and to develop understanding. Formative assessment is used for teacher and student feedback about investigation skills and conceptual understandings.

- Elaborate: Plan and conduct an open investigation to apply, clarify, extend and consolidate new conceptual understanding and skills. Reports of student investigation are used by the teacher to assess outcomes.

- Evaluate: Students are provided with an opportunity to review and reflect on their learning and comprehension skills. A product is produced by students to re-examine their conceptual understanding. Evidence from this lesson can be used by teachers to assess how students have achieved outcomes.

UTILIZING INQUIRY - BASED TEACHING MODEL

Inquiry is perhaps one of the most misunderstood approaches to teaching and learning. Often oversimplified as merely "asking a question," and more often seen as a fad that denies central themes and content within the discipline, inquiry, by its very nature, seems to defy a central definition. Part of the confusion rests in existence as both a teaching strategy as well as a learning strategy, and part of the issue rests within the diverse facets of its implementation within dissimilar disciplines. Assessment of learning can also provide challenges for instructors, since inquiry by its very nature seeks to develop deeper understandings than a traditional forced-choice assessment can provide.

The traditional approach to teaching has been a more didactic format, where the expert imparts knowledge upon novices, seeking to assist learners in understanding the discipline from the perspective of linchpin findings from the field of study. Teaching within an inquiry-format removes the "sage on the stage" approach and the instructor becomes a facilitator of learning, or a "guide on the side." The classroom becomes more dynamic, as the inter-play between instructor and students moves to higher level thinking strategies and deeper

understanding. Certainly the teacher needs a depth of content knowledge to assist learners in constructing their own understandings, but information provided too early it will not be understood, and given too late will be ignored. Michaels et. al. (2008) describe this as "just in time" teaching for new ideas to be applied. The instructor must constantly be using formative assessments as to what background information is required, and when it will be needed. An effective model for this approach is the 5E learning cycle (Bybee, 1993; 2002; 2006) where teachers move fluidly through the processes of engaging students, having students explore data or documents, explaining key concepts or listening to students explain their understandings, and often expanding on prior experiences. At the heart of this model is evaluation, where the instructor is constantly assessing the direction of the class meeting.

Inquiry-based learning requires student engagement, most often manifested in terms of authentic, real-world experiences. Learners become immersed in solving problems, collecting data, and exploring primary and secondary sources. Duschl et. al. (2007) describe the importance of reflecting and connecting evidence to explanation, rather than assuming a scientific viewpoint will be achieved through a discovery process: "If the educational goal is to help students understand not just the conclusions of science, but also how one knows and why one believes, then talk needs to focus on how evidence is used in science for the construction of explanations". While this occurs within the domain of science education research, the premise applies to other content areas as well. By empowering students to collect relevant data, and connect it to the data of others, students develop richer understandings of the concepts under investigation. Rather than working in isolation, students not only share findings, they interact as a community of

investigators, defending their claims with evidence, as Duschl et. al. (2007) suggest: "The practice of developing and defending knowledge claims involves students in participating in a scientific community as they learn from and attempt to convince their peers of scientific claims". In the science classroom, this can be accomplished through science writing heuristics, but claims and evidence can become integral to most areas of study, often through other terminology such as thesis/proof, cause/effect, or even main idea and supporting details.

CONCLUSION

Study concluded that the level of awareness in the field of perception and adaptation and respond to the problem of water shortage in India was unsatisfaction, and towards water conservation, this referred for weakness of water awareness. The study concluded that females are more careful in conservation of water more than males. The study recommends the following actions, which can contribute to raising level of water awareness:

- Enrich the curriculum of CBSE board disciplines with more topics that are looking at water in terms of its significant importance, adapt and respond, water shortage, water conservation, both quantity and quality and rationalization of water uses
- Organized of student activities, especially male students through seminars or workshops to train students to simple means to rationalize water consumption in the household
- Laws and legislations related of water demand management, must be activated towards important of water, it's resources, uses, consumption, conservation, reducing waste water and reducing water loses
- Encourage personal or family initiatives or volunteer work, which aims to conserve water, such as water harvesting

at the level of the family home, or create simple ways to rationalize water consumption

- Activating the role of media and youth associations and clubs, non-governmental associations and worships, in raising the level of water awareness and water conservation
- Encourage graduate students at universities and scientific research centers to conduct scientific researches towards topics related of water

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