Using a *Problem Based Approach* in Managing Environmental Issues for Sec 2 Geography

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Abstract

Over the last two years, Jurong Secondary School has taken a PBL approach in the teaching and learning of environmental issues such as water shortages, increasing waste in the environment and global warming.

Using the PBL approach has made learning authentic and relevant to students who are posed with real world problems affecting the environment today. Hence students become more motivated to work on these issues and tasked to solve them with creative and original solutions.

What makes learning of this theme, which forms a large part of the Secondary Two syllabus, interesting, is that Learning Journeys are conducted relevant to the environmental issues at task, such as NeWater Centre, Tuas Incineration, and other relevant organisations. Furthermore, students work on various tasks and contribute to their learning through CIP hours through the design of materials (brochures, calendars, exhibition posters) and software (video, website) that would educate their peers on these issues and more importantly, on how one can work towards a sustainable environment.

The teachers have taken efforts to redesign the scheme of work over a 10-week module using the Understanding by Design (UbD) model to infuse real world problems, with LJs and CIP and actual fieldwork with the use of GPS to make learning engaging and authentic. As one of the Future School@ Singapore, one of the aims is to take learning beyond the school walls and work with the community at large. The PBL approach lends itself in developing an adaptive, productive learner and team player – a must to meet the needs and demands of the 21st century workforce!
Introduction

Before 2007

In Jurong Secondary School (JSS), we have experimented with different pedagogies in the teaching of Geography. Before 2007, teaching geography was mainly didactic with fieldtrips both local and overseas to provide our students with experiential learning. We had also designed meaningful project work assignments with the aim to deepen students’ understanding of what they had learnt in the classroom and providing a channel for students’ to showcase their creative talents and abilities.

After 2007

Since 2007, the Humanities department has embarked on Problem-Based Learning (PBL) as the main pedagogical tool to investigate and explore real issues in both Lower Secondary Geography. PBL is an active learning and student-centred pedagogical approach in which problems are used as the starting point of the inquiry and learning process (Tan, 2003). Students work in groups of four or five to solve problem tasks crafted by teachers. They go through the process of identifying the problems, analysing critical issues, generating ideas, independent and collaborative problem solving, and integrating new knowledge to derive solutions, which could be in the form of proposals, models or products. The PBL stages are represented in Figure 1 below.

Figure 1
With the growing concern over global environmental issues today and the shift in focus towards environmental studies in our lower secondary geography syllabus, we have made the transition to adopt a **Problem-based approach (PBL)** to also align our instructional programme with the Future School curriculum. In 2007, JSS was selected as one of the first three secondary ‘Future Schools’ and we have been given more flexibility to develop our own curriculum to meet the needs of the 21st century workforce. We have since revised our scheme of work to incorporate student-centred pedagogies with the main objective of teaching for enduring understanding using the Understanding by Design (UbD) model. In this paper, our team would like to share our experience in applying a PBL approach in the teaching and learning of environmental issues such as water shortages, increasing waste in the environment and the consequences of global warming. Our ultimate objective is through PBL, enable our students to internalise positive values on social and civic responsibility through activities that are meaningful and relevant to their lives.

**Why the Problem Based Learning Approach?**

We have used project work assignments as a teaching strategy in geography for many years. This strategy has proven to be a valuable teaching tool as pupils learn content matter through research and inquiry while engaging in group projects. The process also assists in developing independent and cooperative learning skills in students. With the adoption of the PBL approach in our project work assignments, our students are led to a higher level of cognitive learning. Through the PBL approach, we are able to stimulate our students' interest in learning as it appeals to their innate curiosity to discover more about the world around them. We observed that students are more engaged when they are self-directed in finding solutions to real world problems because they find meaning in the tasks assigned to them and they understand the relevance of their study to their lives. Furthermore, the PBL approach allows us to achieve the learning objectives of the Future School curriculum.

**FS Alignment**

As a Future School, our vision is ‘The community and the world is our classroom’. Therefore, PBL which poses real problems in the society and world would provide enriching experiences for students to work with real issues and in the process, provide opportunities to work in the community, through the community and for the community. The key features of the Future School at Jurong Secondary are an emphasis in **Authentic Learning**, promoting a **Media Literacy programme** to develop communicative technologies and establishing and working with **Community partnerships**.

**Authentic Learning Environment**

Nothing ‘beats’ real life experiences. Hence Learning Journeys (LJ) were carefully selected to complement the study on environmental issues in Singapore.

We have to agree with RAdm (NS) Teo Chee Hean who said at the Launch of Learning Journey (1998), “Inherent in the concept of Learning Journeys is the belief that every trip undertaken by
the pupils out of the school is an important learning experience that will link the theoretical with
the experiential - injecting life and meaning to the learning so that it becomes real and concrete.”

As Learning Journeys (LJ) is part of our school curriculum, we decided to work together with the
National Education Committee of the school to organise the LJ and integrate them as part of the
curriculum. Different pupils went to different places according to the environmental issue that
they were tasked to solve. Some pupils went to Tuas Incineration Centre, others to Tuas Marine
Transfer Centre, Science Centre Water Exhibition, PUB, Marina Barrage and NeWater Centre.
These outdoor classrooms provided a wider scope for the pupils to collect facts and information
for their PBL project work. Pupils also learnt to share what they have learnt with other members
of the group who were unable to go on these visits.

The students were provided with an opportunity to see the principles and theories learnt in the
classroom and textbooks applied in real-life situations when they
visited these key installations in Singapore. They learnt to appreciate the importance of planning
and how limited resources have been efficiently used in Singapore. They would have also
realised that through hard work and creative solutions we have overcome many constraints and
turned challenges into opportunities.

**21st Century Skills**

Our students were also given the opportunity to put their research skills to test as they go
through the process of gathering, selecting and adapting relevant and reliable information from
the internet and other sources as they conducted their research on the problem task. They were
able to post questions related to their problem task to generate more interest among their peers
and conduct oral interviews while polling for differing opinions on their study topic from the school
community through the online forums and polls through their own blogs. Finally, our students
also had to present their findings and solutions through original and creative means using their IT
skills and media literacy skills. Thus through this problem based approach, we are equipping our
students with skills to meet the needs and demands of the 21st century workforce. The 21st
century skills are shown in Figure 2.

<table>
<thead>
<tr>
<th>Digital Age Literacy:</th>
<th>Basic literacies, technological literacies, Visual and information literacies, global awareness.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventive Thinking:</td>
<td>Adaptability, self-direction, curiosity, Creativity, risk-taking and higher order thinking</td>
</tr>
<tr>
<td>Effective communication:</td>
<td>Collaboration skills, civic responsibility, Interactive communication</td>
</tr>
<tr>
<td>High Productivity:</td>
<td>Effective use of IT, Ability to produce high quality products.</td>
</tr>
</tbody>
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**Figure 2 - enGauge 21st Century skills**
Community Partnerships

We have also incorporated the Community Involvement Programme (CIP) as a further extension to our study of geography since 2007. We decided to work with the Singapore Waterwatch Group, a non-governmental organisation (NGO), to raise pupils’ awareness of the importance of doing their part in saving the waterways of Singapore and to inculcate the values of keeping the environment clean and pollution-free. Last year, we did a pilot project which involved only two of our Sec 2 classes as part of their environmental studies. This year, we extended the study to include all the Secondary Two Express and Normal Academic classes. Through their involvement in the Kallang Basin project, our students learnt social responsibility and developed a sense of belonging, commitment and pride in our country. As CIP is part of the holistic education of the students, the Sec 2 Form Teachers were assigned to accompany their own classes on this service learning outing. Hence, while providing an opportunity for Form Teachers to bond with their pupils, our objective of creating a greater awareness of the environmental problems was also achieved. In this way, CIP becomes very meaningful to our pupils as it is seen as part of the learning process within the curriculum.

Through participating in the community work, students also learn to value service and develop lasting friendship with one another. Students learn not only to serve the community, but also to identify with the needs of the community and to reflect on their own experience in working with the community so that they have a better understanding and appreciation of what it involves. In 2007, a group of students volunteered to put up exhibits spreading the conservation message during the Tree Planting Day organised by Taman Jurong Community Club. This year, we were greatly heartened when a group of 7 Secondary Two students volunteered to join the Water Watch Group team to collect data for the World Water Monitoring Day organised by the Nanyang Polytechnic.

Planning and Implementation

As PBL is a new school-wide pedagogical approach in anchoring our Future School curriculum, our department planned a systematic two-year programme to incorporate this pedagogy into our Geography lessons for the lower secondary classes since 2007. We identified one theme each for Secondary One and Two levels to conduct our PBL lessons. The students worked in small groups of four to find a solution to an authentic problem, over a period of about three weeks. At the end of this period, the students presented their observations, suggestions, solutions or recommendations through various media like (brochures, notebooks, calendars, posters, banner, T-shirt, shoes, bags) and software (video, website, blogs). In 2007, we carried out our first attempt at crafting a problem scenario based on the topic of conservation of the rainforest for Sec 1. At the same time, the Sec 2 students were also given a problem task based on the theme of environment. This assignment constituted 30% of CA2. The students were assessed for their achievement in knowledge application, communication, collaboration and independent learning.

This year we refined our PBL lessons further. It became one of the strategies we incorporated in our unit plan for teaching the topic on environmental issues. The lessons were designed using the Understanding by Design (UbD) model. Guided by the framework of big ideas we wish to uncover in our unit plan, we were able to facilitate students’ learning by scaffolding using the
(Facts, Interesting Ideas, Learning Issues, Action By, (FILA) template and asking essential questions. Environmental issues such as management of water resources, waste management and global warming are of universal interest and extensive information and reading materials on these issues were easily available and accessible on the internet as well as from other sources to our pupils to do self-study. The topics under the theme of Managing the Changing Environment were taught in two phases. The first three to four weeks of the second semester was spent on introducing and delivering the content ideas on the environment. This was to provide our pupils with an overview of important concepts on environmental issues and the conservation measures. At the end of this phase, pupils had acquired sufficient background knowledge and had also the opportunity to clarify any misconceptions on the related topics.

In the second phase, pupils were assigned the problem task on water shortages, climate change or increasing waste. As stated by Barbara (2001), PBL learning is a powerful classroom process, which uses real world problems to motivate students to identify and apply research concepts and information, work collaboratively and communicate effectively. It is a strategy that promotes life-long habits of learning. Besides, problem-based project work also encourages learning across a variety of disciplines; and it makes the task of turning classrooms into settings for active learning a whole lot easier.

Assessment

Different problem tasks were given to the Sec 2 Express and Normal Academic classes and the marking rubrics were also adjusted accordingly. In order to fulfill the requirements of both formative and summative assessments, students had to apply digital age literacy skills to do their research and planning, exercise inventive thinking to find solutions to the problem task, demonstrate effective communication skills to present their work and display good habits of mind to bring their project to completion. To motivate the students to taking their tasks seriously and to emphasise the importance of process learning, the PBL project tasks contributed 50% towards students' CA2 semestral weightage.

We also wanted to see if our students have actually attained a higher level of cognitive learning through this PBL approach by including structured questions that required them to evaluate and assess the effectiveness of alternative solutions to the environmental issue they had studied at the 2008 end of year examination. Answer scripts are marked according to rubrics with three bands of level descriptors. This was also in alignment with the new assessment format in the 'N' and `O' Level Geography Examination. We are still in the process of refining this assessment mode and analysing our data to gather conclusive evidence on the benefits of the PBL approach in developing critical thinking in our pupils.

Presentation

In previous years, the top winners of each class would present in front of the whole Sec 2 cohort to present their projects during Assembly. This year to enhance the presentation and interaction skills, the best teams of each class were stationed at different venues to present to individual classes and teachers. This opportunity was created through “The Humanities PBL Carnival” to showcase the best project of each class. The selected teams shared their work with their peers in this post-exam activity through a gallery walk, allowing classes to interact with presenters
directly and ask questions. For the purpose of providing motivation and recognition of students’ effort, prizes were also awarded to the best teams from each class. To motivate the best teams, classes were given opportunities to vote for the best-presented project among all the best teams this year. We were gratified to see that our students have become more confident and articulate speakers and were proud to demonstrate ownership of their creative ideas. There was also a heightened awareness of environmental issues and a sense of passion and conviction in wanting to do more to save the environment, among many presenters.

**Looking Ahead**

As we look forward to continue in our adventure in using the PBL approach, we hope to be able to gather specific evidence which would reflect the extent of learning outcomes achieved, example, through self-directed learning in our pupils. Next year, we will be working towards a modular humanities programme for the lower secondary classes. We are revising our curriculum to cover the lower secondary Geography and History syllabuses in eight modules over two years.

For example, the Secondary Two students will learn two modules on ‘Man and His Activities’ and ‘Man’s Impact on the Environment’. The first module will undertake a Fieldwork approach whilst the second module, on a PBL approach. We will be exploring new possibilities in community partnerships and a greater use of technology through the use of Global Positioning System (GPS) and Geographic Information Service (GIS).

In JSS, we are fortunate to have a supportive school management team and we enjoy collegial collaboration with our colleagues from other departments. We have been also privileged to be able to work with other professional partners in the community. Through the collaboration and support of relevant people and organisations we, as teachers of Geography, have grown professionally. We now look forward to explore new ideas in the continued adventure of using PBL as a teaching pedagogy in engaging and empowering our students in their learning.
REFERENCE


