

The Innovation Odyssey

QEF Project Information:

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Introduction

Background

Educators like to talk about how children's aptitude depends on their mathematical knowledge, language skill, and art sense. But when pressed, they admit that what really matters is their ability to execute – to identify and solve problems based on what they have learned. Without that ability, studying is just plain memorizing.

Objectives

This program aims to improve Hong Kong children's ability and efficiency in learning and creation. The program does not turn children into technologists or scientists. While some students will be able to achieve mastery in some areas, it is not our intent to have our students master everything. Instead, we intend for a typical student in this program to enter with intellectual curiosity in making movies, games, robots, animations and toys. Then, he/she will spend his/her weekend hours or summer at the Hong Kong Polytechnic University learning the vocabulary, values, processes and working patterns of the people who create digital films, video games, CG-movies and artificial-intelligent toys. Results will be evident in their abilities to learn independently and to present original ideas effectively. Our aims are:

To inspire teachers and students to the world of innovation

This training scheme aims to improve Hong Kong children's ability and efficiency in learning and innovating. The program is designed to teach

children the tricks of learning new technologies and the nuts and bolts of accomplishing creative ideas. Through this training, children will become accustomed with manipulating different technologies and presenting their sophisticated concepts.

To expose teachers and students to a deeper understanding of creation process

Students will learn and practice the skills and knowledge involved in the process of making and creating. This includes the ability to select and control the use of materials, tools and techniques along with an understanding of the design and implementation process. They will be encouraged to experiment with computer graphics, video production and computer scripting languages along with traditional drawing and story-telling skills to develop, express and modify ideas, intentions and feelings.

To encourage students to develop their perception in the world of innovation

Students will be encouraged to develop their perception of innovation by observing and creating. They will be encouraged to visualize complex ideas and make it presentable on their own upon a wide range of resources which they find in school or on the Internet.

To promote appreciation, discussion and team work

We believe students will experience delight and pleasure in their own and others' work and have knowledge of the language of existing technologies to help them express their feelings about what they see. They will be encouraged to evaluate their own work and understand how the techniques of other artists, designers and engineers can assist them in their development.

To promote students analytical thinking and self-learning

For active learning students need to participate in learning situations which matter to them, for it is by capturing their attention, interest and imagination that they become willing to accept the challenge of the experience and begin to use their own initiative. Encourage children to weigh up the suitability of one solution against another. Getting children to ask themselves the question "Where can we go from here?" rather than waiting for the teacher to define the next step for them requires encouragement and achievement.

To assist students to adapt to emerging knowledge and technologies

This program teaches children how to find information, resources and the most importantly, answers, in a variety of ways. Every child needs to know, to learn, to solve, and to ponder. There will be times when a child's expertise on a topic will be greater than his or her parents', and parents will not be able to provide answers or solutions. The program isn't designed to train the child to learn a specific program or technology, but, to learn how to digest and adapt to new knowledge.

To guide students to their own fantasy

This program enables children to see the potential, and master the practice, of any relevant knowledge: from the handling of simple software to the understanding of the world of technology. It enables them to work confidently in group and class situations as well as individually: thinking, making, appraising and modifying the work they are undertaking, negotiating skillfully with one another and discussing or talking about what they are doing, or have done.

To promote innovative problem solving in participant schools

After the training in Polytechnic University, teacher and students will be encouraged to develop similar program or include relevant training activities in classes. As participant schools may not have all the resource and equipments that involve in the training, they will be provided with guidelines to help setting up activities using practical replacements based on their own circumstance.

About the Team

For education to keep on-track with the rapid advancements in innovative (and sometimes technical) project development it is required to develop a close relationship between Universities (that have the resources to track new knowledge and technologies) and schools.

Our Project Team consists of staff from the Department of Computing, School of Design and Multimedia Innovation Centre. The Project Team has been running similar programs for secondary and primary students for many years. The experience and expertise from each of them together form the foundation of the program.

Programs

Training Program

Teachers and students will join the training program of their own accord. The training program serves as a medium by which students can demonstrate what it is they know and what they are able to do. No specialized technical expertise are required for joining any of the modules. However, we recommend teachers and students from the same school with similar interest to join the program as a team. To ensure each participant school will have sufficient trained staff and students to set up their own seeding programs, we will suggest each participant to take only one or two modules (There are total 6 modules). So that, more staff and students can join the training program and therefore there will be more helpers are available in each school for setting up the seeding programs.

Seeding Program

Principals and teachers are suggested to consider the possibilities of setting up similar programs or campaigns in their own schools according to the resources, the needs and the experience they gained in the training.

The seeding programs are not limit to any form of activities as long as they are fun and engaging. However, in planning the seeding programs, teachers should put emphasis on learning problem-solving, thinking skills, and solving complex tasks in group situations using the available technology. We expect seeding programs will be deployed in such a way that it will:

- Give students choices. Students will have choices about how they are going to spend their time.
- Provide opportunities for student input. By working with students to develop curriculum activities, you will allow them to develop a sense of ownership of the seeding program, and select activities that reflect other students' interests as they help plan and lead activities.
- Serve the particular needs of school. With the support from the University, teachers and seeding program coordinator will be able to fine-tune activities for the best possible fit with their own unique situation.

Besides the Project Team from the Hong Kong Polytechnic University, an Advisory Committee will be established for the programs. Principals and teachers from primary/secondary schools will be invited to join as a committee member. A project associate will be responsible for overseeing the program operation, managing project resources, visiting participant schools during seeding program period, consolidating user feedbacks and seeding program results.

<Compulsory Introduction Workshop>

INTRODUCTION: Basic Skills 1-2-3

Objective: To describe the skills and methodology involved in the training program

Duration: 2 hours

This 2-hour lecture aims to provide a glance of the training as well as some skills that will be involved in coming classes. Basic computer and Internet

skills will be reinforced to bring on smooth and efficient learning in class.

- The Relations Between Innovation and Learning
- Elementary skills for the program

<Elective Learning Modules>

MODULE 1: INSPIRED LEARNING Knowledge and Technology Digestion, Hints and Tricks

Objective: To introduce the skill and steps for investigating and learning new knowledge

Duration: 21 hours

This module introduces students to the key elements of learning new knowledge and understanding technology. The steps for manipulating new knowledge are addressed. The purpose is to prepare students for learning multidisciplinary knowledge on their own. Students will visit the TV station to see the operations there. Interactive learning tools such as LEGO Mindstorm Invention System will be assigned to each group of students for learning and testing vehicle mechanics and robotics. A lesson will focus in dissecting technology using 3D stereoscopic video as an example. Finally, an exercise will be assigned to each of the students to test their abilities in investigating unseen electronic products.

- Understanding New Environment: Case Study - TV Station
- Learn from Trail and Error – Building Brick Exercise
- Technical Knowledge Learning I: Case Study - Interacting with Machines and Sensors
- Technical Knowledge Learning II: Case Study - Car Mechanics
- Learn from Teaching: Team Exercise – Writing User Manual
- Technology Breakdown: Case Study – 3D Stereoscopic Technology
- Investigating Unseen Objects: Team Exercise

MODULE 2: CONCEPT PROTOTYPING

Engineering Discovery

Objective: To introduce the workflow and skills for prototyping product idea

Duration: 21 hours

This module will give students the perception of product assembly through tangible and exciting experiences. Students will learn the basis of

product design, product engineering and reverse engineering. They will be exposed to different kinds of toys and electronics, which they are familiar with. Student will have the opportunity to assemble and modify toys and electronics. Throughout the training, students will learn to concern the practicability and the possibility of their own ideas.

- Take Pleasure in Engineering: Build It and Play It - Metal Detector
- Technology Evolution: Case Study - Mobile Phone
- Human-Machine Interface: Case Study - Electronic Keyboard and Audio Speaker
- Design and Testing Process I: Model Aircraft Design
- Design and Testing Process II: Model Aircraft Flying Test
- Reverse Engineering I: Ping Pong Shooter
- Reverse Engineering II: Ping Pong Shooter Game

Module 3: INNOVATION THROUGH TEAM COLLABORATION

Visual Presentation and Storytelling

Objective: To explore the artifices of consolidating individual's innovation in team project

Duration: 21 hours

This module will give students the practical theoretical framework to create comics, films, animations and video games. There are workshops to introduce students to the various aspects of telling stories using various technologies. Each group of students will be assigned with a digital camera and will also have chance to work with the operator to use the 3D motion capture system. Students will be asked to work step-by-step from taking still pictures to making videos for the same story. They will learn how to frame and select basic camera movements in order to enhance the interpretation of the story. Complicated computer graphic editing will not be taught in class; however, students will be encouraged to do their best for a better outcome by all means.

- Story Telling : Team Exercise - Digital Comics I
- Implementation and Publishing: Team Exercise - Digital Comics II
- Movie and Animation Production I – Being the Director and the Cameraman
- Movie and Animation Production II – Computer Effects and Post-Production
- Using Sophisticated Equipment: Animate Using Motion Capture

- System
- Design a Video Game
- Presentation and Screening

Module 4: FEASIBILITY STUDY

Idea Analysis and Validation

Objective: To introduce the approaches and skills using to verify innovative concepts

Duration: 21 hours

This module introduces students to the guidelines for verifying idea and planning for innovative project development. Students will work in groups and will be guided to criticize their own plans. Information analysis, creative problem solving and decision-making are the core in the training. Students will have exercises asking for a solution to a given problem. Besides this, they will have an open topic assignment to find both questions and solutions on the student's own initiative. The last lesson "For Here or To Go" will emphasize the importance of friendliness and flexibility for all innovations, which, in fact, is being ignored by many product inventors.

- Rule #1: To know which side your bread is buttered on
- Make-to-Order Innovation: Future City Planning I
- Make-to-Order Innovation: Future City Planning II
- Rule #2: The Side Dish is Nothing Less than the Main Course
- Unrestricted Innovation: Research on Student's Choice of Funny Affair I
- Unrestricted Innovation: Research on Student's Choice of Funny Affair II
- The Human Touch Solution: For Here or To GO?

Module 5: The TRAIL AND ERROR APPROACH

Robotics Soccer Player Design and Implementation

Objective: To introduce the step-by-step approach for solving scientific and technical problems

Duration: 21 hours

This module promotes innovation through product-oriented and team-based development. It gives children with interests in robotics an opportunity to pick their own challenges while contributing to the progress of the whole. The goal for this module is to have students building soccer player robots for soccer games between robots. Students will be introduced to the basic robotics, soccer player mechanics, sensors and AI programming through interactive learning tools. Each of the teams will compete against the other during the trail match, students will learn to test, review and modify their own robots. These tuning steps are essential for students who wish to learn more sophisticated technologies. The champion in the class may be eligible for promotion to entry into global competitions.

- Introduction: How Robot Can Play Soccer?
- Soccer Player Mechanics
- Input Device: Sensors and the Environment
- Basic Programming: Command-Based Routine
- AI Programming: Strategy and Decision Making
- Robot Design: Brain and Muscle
- Trail Match and Review
- Robot Soccer Championship

Module 6: PACKAGING SURREALISTIC IDEA

Space Settlement Project

Objective: To introduce the techniques for presenting innovative idea and abstractive concepts

Duration: 21 hours

Students usually have a lot of creative ideas in their minds. However, most of their ideas cannot be implemented due to the lack of relevant knowledge, and more importantly, the lack of proper presentation and integration skills. This 21-hour module introduces students to the idea packaging, concept illustration & presentation techniques. Students will work on the space settlement solution, which will help humanity move off the planet before the earth becomes unsustainable to humanity. They will work in groups throughout the whole module to prepare presentation matter, illustrations and 3D graphics for showing at the end of the course.

Outstanding students may be eligible to promote for entry into global competitions.

- Introduction and Science Fiction Movie Review: The Problem in the Earth
- What's possible? What isn't? Exploring Existing Technologies and Limitation
- Creative Presentation
- Question and Answer Section
- Illustration Drawing and Idea Expression
- Introduction to Computer 3D Modeling
- Computer 3D Space Ship Modeling
- Proposal Presentation

Action Plan and Calendar

i) Formation of Advisory Committee (June 2004 to Aug 2004)

The program will start by forming an advisory committee which consists both university staff and participant school representatives. Advisory University staff will be responsible for initiating the training material development, and the participant school representatives provide inputs and suggestions during the training material development.

Advisory Committee Roles:

- Facilitate learning and training
- Help coordinate university training and seeding programs
- Provide a network for information exchange
- Communicate the message of member schools, teachers and University to the community and encourage participation

The Advisory Committee does not control the activities of individual member schools; rather it provides a supportive role. Each member school is free to carry out its own activities, including running continuation programs, promoting this project and obtaining media coverage.

ii) Content and Training Material Development (Sept 2004 to Sept 2005)

Workshop instructors will develop necessary training material based on the module objectives and the advice from Advisory Committee. They will be responsible for developing the materials to be used in the training program as well as for later adoption in seeding programs. Pilot training may be established if time permits. If done, feedbacks are obtained from the Advisory Committee members and the participants. All training materials will be revised from time to time throughout the program.

iii) Training Program (Jan 2005 to Dec 2005)

The following is an estimate of the time-lines for the various classes of 25 students and staff. Variance is due to school holidays, exams and summer vacation. The training program will commence in Jan, 2005 and will end in Dec, 2005. It would be optimal if the class sizes were comprised so that there are at least 4 students per team. Students will be group into 4 classes by ages and knowledge.

iv) Seeding Program (Sept 2005 to May 2006)

Upon the completion of training, participant schools will be recommended to run their own programs based on their needs and resources. School teachers will be in charge of their own seeding programs while the Project Team provides necessary guidelines and suggestions. The Project Associate can help the schools to develop their training plans, the adoption of the developed materials, advising on possible activities that can be done, providing reference information, and archiving program results and feedbacks.

TRAINING	Group 1 (10am – 1pm) Group 2 (3pm – 6pm) (school term)	Group 3 (morning) Group 4 (afternoon) (summer)
MODULE 1: (everyday in summer, Saturdays during school year)	08/01/05 – 19/02/05	04/07/05 – 12/07/05
MODULE 2: (everyday in summer, Saturdays during school year)	26/02/05 – 09/04/05	13/07/05 – 20/07/05
MODULE 3: (everyday in summer, Saturdays during school year)	16/04/05 – 28/05/05	21/07/05 – 28/07/05
MODULE 4: (everyday in summer, Saturdays during school year)	02/07/05 – 13/08/05	29/07/05 – 08/08/05
MODULE 5: (everyday in summer, Saturdays during school year)	24/09/05 – 05/11/05	19/08/05 – 30/08/05
MODULE 6: (4 days in X'mas holiday, everyday in summer)	12/11/05 – 24/12/05	09/08/05 – 18/08/05
Graduation Exhibition (on a Saturday)	Jan 2006	

* The compulsory “Introduction” lesson will be held for new students on the first day of each module.

TEAM PARTICIPATION

We invite all member schools to recruit their own team of 6 people (e.g. 5 student and 1 teaching staff) to join the programs. Up to two teams from each school will be allowed. Each team member will be allowed to take training module of his or her own choices. Thus, before joining the programs, each team should do some planning and preparatory work based on their own expectation and resource.

Fee: To recapture the material cost for the training, there will be a cost of \$3000 for each team. The fee will include:

- 2 modules training (total about 14 lessons)
- 2 hr introductory training workshop
- All necessary equipment and consumable material

Team Application Period for 2005 Spring programs: Nov, 2004

CONTINUATION

Train-The-Trainers: After the training in the University, students and teaching staffs will be encouraged to transfer the knowledge to their schools in due course. As each applicant school will have 5 or more students be trained, teachers will have adequate student support to employ new school-based campaigns.

Customized Sample Material: Member schools will be given a starter kit which contains necessary training guidelines and partial sample material. During the seeding program period, member schools may request reviews on their program plans. If necessary, we will visit school personally to have a more details investigation on member schools' environment and situations. Advice will be given to schools regarding their program scope and practicability.

Resource Website: During the training programs, the weekly-updated website will act as the information center for teachers, principals, students and parents. CD-Rom containing students' works will be given to students and teachers for appreciation and demo. Reference resource, guidelines and sample program plans will be given on the web site for member schools to organize their own seeding programs.

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