Part B Project Summary (Revised)

Project Title: *(Please fill in the blank)* Coding As Learning with Robots in Hong Kong Primary Schools	**Project Number 2016/0924 (To be assigned by the EPMS)**

Name of Organization: The Education University of Hong Kong (EdUHK)

(1) Goals: This project aims to explore how to develop pupils' coding knowledge and skills as well as learning through coding activities in Hong Kong primary schools.

Objectives:

(i) to develop primary school pupils' coding knowledge and skills through coding activities;
(ii) to explore the pedagogy and assessment strategies in coding activities in Hong Kong primary schools;
(iii) to provide exemplars of good experience of coding education in Hong Kong primary school environments.

(2) Targets: Expected number of beneficiaries: 6 primary schools in Hong Kong (project schools) and about 100-200 primary school teachers (through seminars)

(3) Implementation Plan:

(i) Duration: 1 Feb 2018 – 31 May 2019 (16 months)
(ii) Process / Schedule:
  (a) Preparation stage: Feb 2018 (1 month);
  (b) Phase I (Implementation cycles and sharing): Mar 2018 – Sep 2018 (7 months);
  (c) Phase II (Implementation cycles and sharing): Oct 2018 – Apr 2019 (7 months);
  (d) Post-activities (Analysis, seminars and reporting): May 2019 (1 month).
(iii) Collaboration with other parties / partners: Teachers of project schools

(4) Products:

(i) Deliverables/outcomes:
A set of professional development materials, including:
- Teaching Materials;
- Website;
- Seminars and Workshops

(ii) Dissemination of deliverables / outcomes:
- A no. of sharing sessions during and at the end of the projects;
- A website for sharing good practice to the public;
- Interim reports and final report to project schools and QEF

(iii) Commercialization potential of deliverables / outcomes:
- Teaching materials about coding activities (theory and practice).

(5) Budget:

Expense item	Amount (HK$)
1. Staffing:	$392,175
2. Equipment:	$75,000
3. General Expenses:	$90,835
4. Contingency (3% of non-staffing budget)	$2,790
Grand total:	**$560,800**

(6) Evaluation:

(i) Performance indicators: Questionnaires and interviews to collect views from project schools and participants of the sharing sessions. Process data will be collected at different times in the project to document the effects of the implementation phases as the evaluation of the project.

(ii) Outcome measurements: For each learning task, the class is measured on their understanding of the topic by a pre-test. With the findings of the pre-test, teachers tailor-make coding activities. After class, students' understanding of the topic is measured by a post-test. The collected quantitative data aim to provide evidence for analyzing the student performance. In addition, a sample of students will be interviewed at regular intervals to gauge their attitudes towards the new teaching approach by adopting a "one group, time-series" design. In order to evaluate the impact of the intervention on student, we will use a variety of other data-collection methods, including classroom observations, structured and semi-structured teacher questionnaires and interviews, and student interviews.

Quality Education Fund

Project No.: 2016/0924

Project title: Coding As Learning with Robots in Hong Kong Primary Schools
Applicant: The Education University of Hong Kong

Project team:
Principal investigator:
Co-investigator:

The Proposal (Revised)

Project Needs

1. Background and Needs

"Coding", recognized as the "21st century skill", has become increasingly a key competence. It is a skill that an increasing number of young students and workers will have to acquire in a wide range of industries and professions. Therefore, there have been quite a number of countries focusing on developing students' coding skills. In Europe, coding education is currently offered or made compulsory in primary schools in more and more countries, including Belgium, Estonia, Finland, France, Israel, Slovakia, Spain and the U.K. (European Schoolnet, 2015). For instance, in England's public schools, the new curriculum is "Reading, writing, arithmetic, and coding" where coding is considered equally important to the other conventional learning areas. In fact, England was the first country in the European Union to make computer science classes compulsory for all children between the ages of 5 and 16, starting in the school year of 2014-15. The U.K. government has overhauled the way it taught computing to the country's children by adding mandatory programming classes. Officials were convinced that the state-school curriculum was out of step with modern-day technical standards (Chambers, 2014). Besides, Estonia has also launched a nationwide scheme to teach coding to children from the age of 7 to 19. 550 schools have taken part in the program which is a public private partnership receiving financial support of about 70,000 euro from the government. The money goes to course material for participating schools, whose teachers will also get specialized training (Olson, 2012). On the other hand, Barack Obama, the President of the United States, has reiterated the value of ubiquitous STEM education (Science, Technology, Engineering and Mathematics education), comparing learning to code to learning the alphabet in terms of its importance to the future of the country (Handrahan, 2015; Schatz, 2015; Mechaber, 2014). In Asia, the Infocomm Development Authority of Singapore, a government agency in charge of the country's internet industry, is planning to gradually introduce coding education into public schools for boosting the economy (Lee, 2014). A trial by the Ministry of Education to teach students coding in primary schools is part of a national push to make Singapore a Smart Nation (Teng, 2014).

Besides developing learners' understanding of how computers function and helping them acquire vocational skills that are relevant to the IT market, the broader reason is that in the process of learning to code, students are also learning strategies for logical thinking, problem-solving skills, project design, communicating ideas, which are useful not just for computer scientists but for lots of people, regardless of background, interests, or occupation. Students are not only "learning to code"; they are "coding to learn". For example, students can learn the skills of dividing complex problems into simpler parts, identifying and fixing bugs, refining the designs iteratively and collaborating with others (Trucano, 2016; Kafai & Burke, 2014; Resnick, 2013).

In Hong Kong, programming is embedded into computer education. For primary schools, one out of the eight modules in Computer Awareness Programme covers basic programming. However, the 2012 ICT (Information and Communications Technology) Manpower Survey revealed that 38.9% of employers had

difficulties in attracting suitable candidates, which suggests that current programme education might not respond to the needs of the market. The consultation with Hong Kong's major ICT industry bodies, local and multinational ICT vendors and service providers, and Chief Information Officers indicates that the younger generation of ICT professionals may not be skilled enough to match market demand. The skills gaps include programming skills (IBM, 2013). To keep up with the technological development, the demand for strengthening students' coding skills is raising in Hong Kong, especially in primary schools.

The report on "The Fourth Strategy on Information Technology in Education" from EDB (2015) points out that coding education not only improves students' coding skills, but also nurtures students' ability to solve daily-life problems from personal to community levels. EDB Curriculum Development Institute recommends that the coding education should be integrated into various learning activities in different subjects (Bauhinia Foundation Research Centre, 2015). Furthermore, the strategy report of "Consultancy Services for the Digital 21 Strategy Review for the Office of the Government Chief" (2013) opines that the elements of coding should be included in every child's education plan to inculcate their logical mindset, providing a new way to help children to become familiar with the power of technology and develop creative solutions to everyday problems. It also proposes that the opportunities of learning coding, in but not only limited to computer class, should be strengthened in schools so as to help encourage more structured and logical thinking among students and provide a hands-on experience to nurture creativity and innovation. The report points out some potential areas for action to develop coding education:

(1) Promote the benefits of coding:
The benefits of coding, such as developing students' mindset of active exploitation of technology to solve problems, should be conveyed to schools, parents and students.

(2) Strengthen coding learning for children:
Coding elements in the existing computer curricula can be further enriched for primary students. More opportunities and examples should be provided for students to understand how to code, as well as how to apply technology to solve real-life problems.

(3) Support teachers in teaching coding:
More professional development projects as well as learning and teaching materials on coding should be developed and provided in various subject areas so as to develop teachers' knowledge and support their capabilities in coding.

To provide young people with skills that can improve their coding learning, the Charities Trust has recently initiated the "Coding Education for Primary Schools" programme with three overseas and local universities as co-creators and the Education Bureau as a supporting organization. However, the programme funded by the Trust with a donation of HK$216 million is only targeted at upper primary students (2016). Though the demand for strengthening students' coding skills in primary schools is rising in Hong Kong, most of the lower primary school students between the ages of 5 and 8 still do not have enough opportunities to learn coding, which are primarily limited by the lack of teaching resources in enriched curriculum (2015). The growing demands for coding learning in lower primary school nowadays indicate the importance of research and the implementation of coding education since lower primary school education (Serafini, 2011).

To strengthen coding education in Hong Kong primary schools, this project aims to develop lower primary pupils' coding knowledge and skills as well as problem-solving skills through coding activities. It does not only explore how to enable pupils master coding knowledge and skills, but also investigate how to develop their problem-solving skills and enrich their knowledge in other subjects through learning coding. The project title implies that we will attempt to integrate "learning to code" and "coding to learn" in our learning activities. "Coding as learning" is our major guiding principle. By the end of the project, a school-based coding curriculum for local primary schools will be developed.

2. Goals and Objectives

In this project, we will attempt to explore how to develop pupils' coding knowledge and skills as well as learning through coding activities in Hong Kong primary schools. The project objectives are as follows:

- To develop primary school pupils' coding knowledge and skills through coding activities;
- To explore the pedagogy and assessment strategies in coding activities in Hong Kong primary schools;
- To provide exemplars of good experience of coding education in Hong Kong primary school environments.

To achieve the objectives of the study, the following research questions have been generated:

- RQ1: How assessment strategies can be used to support coding learning?
- RQ2: What kinds of pedagogy are more effective for teaching coding at primary level?
- RQ3: How the coding activities can be used to develop pupils' problem-solving skills?

3. Capability and Beneficiaries

(1) PI: (Associate Professor)
Co-I: (Lecturer I,)

(2) Support from Schools
This project has received strong support from local primary schools. Five schools have expressed interest in joining this project:

- Kwun Tong Government Primary School (Sau Ming Road)
- Ping Shek Estate Catholic Primary School
- St. Paul's Co-educational College Primary School
- SKH Ling Oi Primary School
- Maryknoll Convent School (Primary Section)

We will invite 6 schools to participate in this project. It is preliminarily estimated that there will be more than 1000 students and teachers who can be benefited from the project schools. Furthermore, the teachers from more than one hundred other schools can be benefited from the sharing seminars, the teaching materials on project website and the school-based coding curriculum.

4. Innovation

(1) Developing primary pupils' coding knowledge and skills with robots

Generally, robots are useful in the science and technology learning area. Moreover, some modern robotic toys are also useful as teaching aids to enhance student engagement with mathematics while addressing other learning contents (Attard, 2012). Real tools such as robots are powerful to help lower primary pupils study the abstract element of coding at the level of concrete operations and learn the knowledge based on their own experiences. In the process of coding activities with robots, pupils may not only learn about technology, but also increase their sequencing abilities, which are also applicable to mathematics, reading, and basic life tasks (Kazakoff & Bers, 2014; Pásztor, Pap-Szigeti & Lakatos Török, 2010). In this project, robots such as Bee-Bot, Blue-Bot and Dash & Dot will be used in coding activities to support pupils' learning.

(2) B Bot and B Bot (for lower primary pupils)

B Bot and B Bot (Figure 1) can move forwards, backwards, or turn to the left or right by coding in a sequence of commands, which are designed as programmable floor robots with simple and child-friendly layouts for a starting point of teaching coding to young children. Blue-Bot can even be controlled from the iPad Blue-Bot app once it has paired with an iPad (Figure 2). They can help develop appropriate constructionist programming environments where abstract ideas can become more concrete and children can see their program in action and decide if their plans work as expected (Kazakoff, Sullivan, Bers, 2013; Vize, 2013; Highfield, 2010).

Figure 2. Blue-Bot can be controlled by iPad

B Bot and Bl Bot have the following main functions:

- The user can press a sequence of commands which are stored in the sequence memory. (Figure 3)
- B Bot and B Bot can execute all the commands stored in order with a short pause between each command.
- B Bot and B . Bot computer games can be used to help pupils learning coding. (Figure 4)

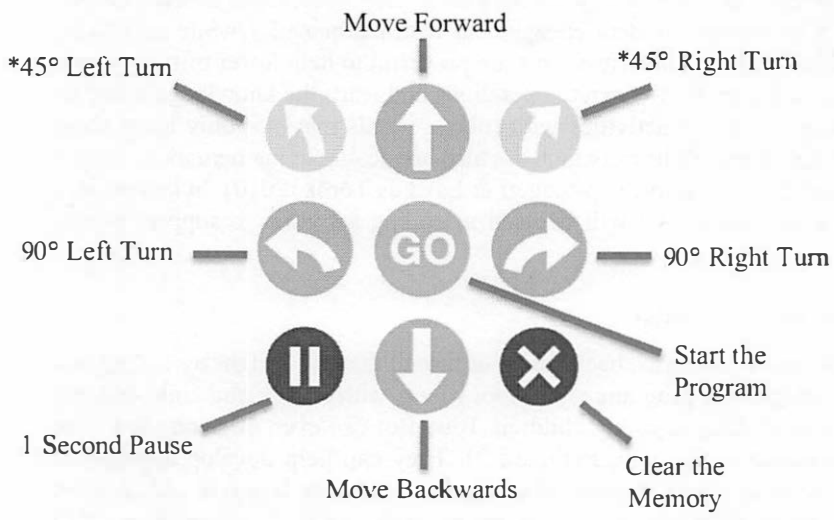

Figure 3. The Commands of B Bot and B Bot

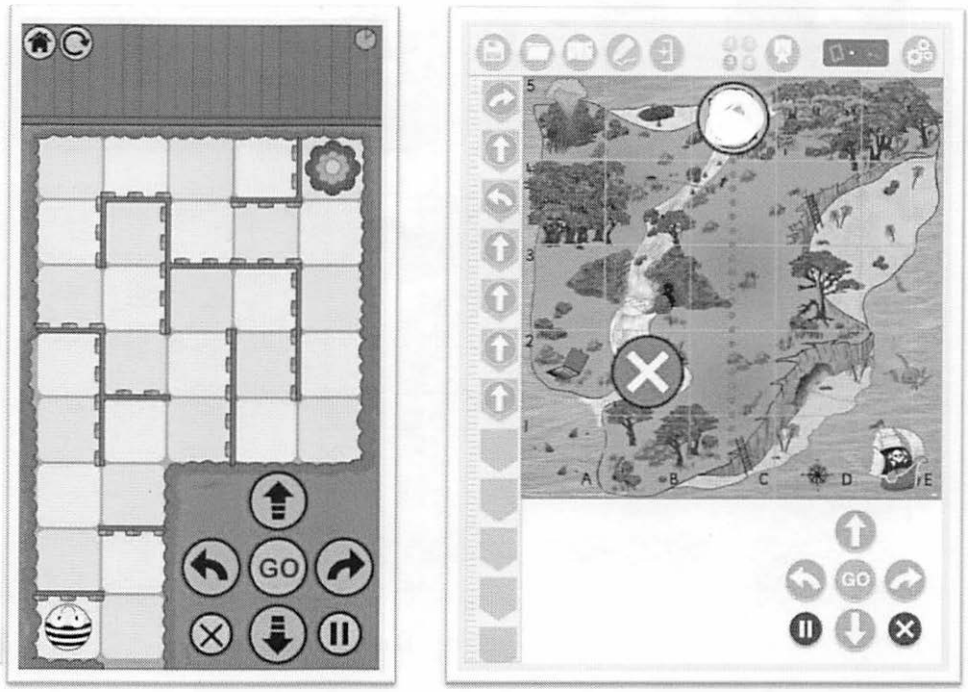

Figure 4. B· Bot and B Bot Apps

(3) D Dot (for primary pupils at all levels)

D is a robot can move, dance, sing, respond to voice and navigate objects. D is the brain of a robot comes with several games, such as Magic D Ball, D of Music, and Light Sword. There are apps for different age group, learning level, and play style. Using these free apps, children can create detailed behaviors for D by coding with picture-based coding language. They can not only get to see how the games are created, but also make over a hundred more of their own games. (Figure 5)

With the D: apps, children start with the fundamentals of robotics and coding. The apps introduce advanced concepts of coding through playful projects and puzzles. Exploring variables, events, conditionals and more, D. becomes a dancer, adventurer and artist, powered by children's code. (Figure 6)

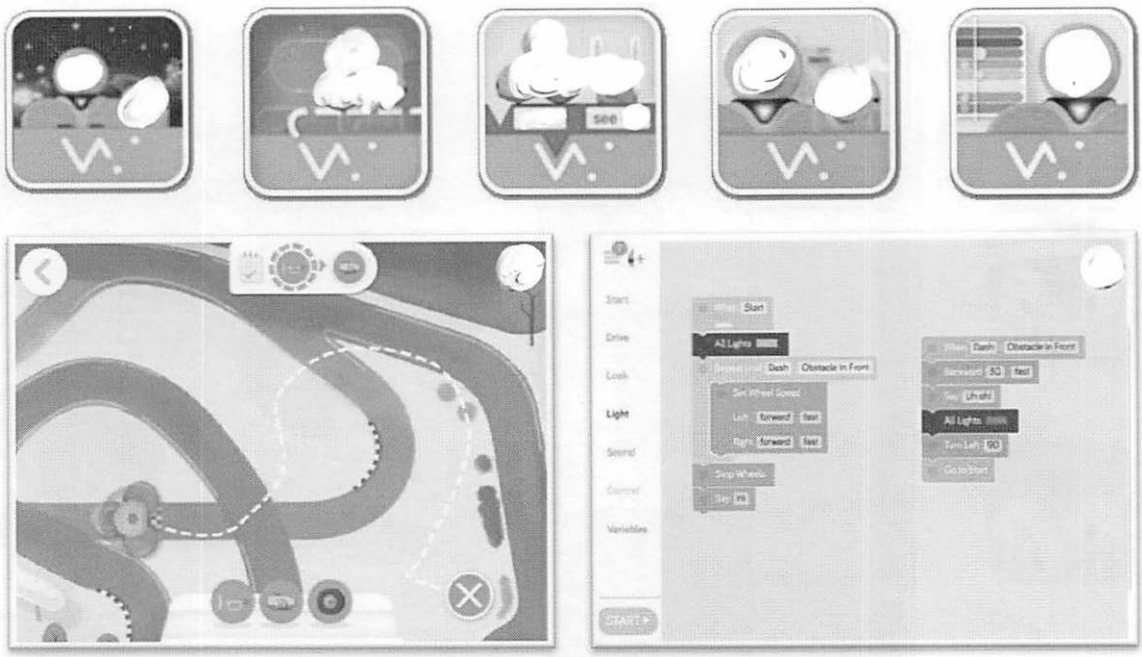

Figure 6. D & D Apps

Project Feasibility

5. Period and Duration

Proposed commencement date: 1 Feb 2018
Estimated completion Date: 31 May 2019
Duration: 16 months

6. Teacher Development

Six schools will be invited to participate in this project that consists of two phases spanning over 15 months. Half of the invited schools (3 schools) will participate in the project in the first phase while the other half (3 schools) in the second phase. For each phase, there will be school-based workshops and meetings at the beginning of the new academic year in which teachers are introduced to the coding education strategies and shown how they can be incorporated into their teaching. A particularly important feature of the assessment model developed by Black et al. (2003), and one which we propose to maintain in the proposed project, is action planning by teachers.

Details of Teacher Workshops and Meetings

- Topic: Coding As Learning with Robots
- Trainer: The experts who have extensive experience in teaching computer subjects and teacher training, also have higher degree in Education/Computer Science
- Frequency: 3-5 workshops or meetings for each school (about 2 hours for each session)
- Content:
  - Design and implementation of coding activities with robots
  - Pedagogies to enhance students' knowledge and skills in coding
- Duration: Around 1 semester
- On-site support: RA will work closely with teachers to hold coding activities in the classroom at least 3 times per school.

By the end of the workshop, the project teachers will be required to finalize an action plan detailing the coding activities they will make in their practice for the following academic year. A major focus of the meeting envisioned for this project will be on helping teachers understand and internalize coding education and supporting teachers in trying out the technique, reflecting on its effectiveness, and making decisions about whether to abandon that approach as inappropriate, or improving it for the next go. As well as providing a space for teachers to discuss their experience in coding activities, each meeting will also have "input" through either formal or informal workshops, where teachers will learn about new teclmiques and practical strategies for implementing them.

After the school-based workshops and meetings, research team will collaborate with the teachers to design the coding activities for their pupils. Table 1 shows a sample of the coding activities with B Bot and B -Bot for lower primary pupils in the implementation cycles. In the coding activities with B -Bot and B Bot, pupils can not only experience a motivated learning situation while they playing robots, but also can develop motives by further achievement in coding (Pásztor, Pap-Szigeti & Lakatos Török, 2010).

In addition, two sharing seminars will be held to facilitate exchange of experience among participating teachers and a public seminar will be held to further engage wider primary school teachers.

Table 1. A Sample of Coding Activities with Bee-Bot and Blue-Bot

Cycle	Learning Objectives	Coding Activities
1st	Upon completion of this lesson, the pupils are expected to be able to: ● identify the commands of B Bot and B Bot; ● press a sequence of commands to control B Bot and B Bot.	● Pupils try to put the arrow signs on the mats for designing the routes; ● Pupils try to press commands to control B Bots and B Bots to move along the default routes.
2nd	Upon completion of this lesson, the pupils are expected to be able to: ● understand the basic stages of programming; ● write algorithms by using the app; ● control B Bot with .	● Pupils learn to write algorithms by playing the challenge game of B Bot app; ● Pupils who succeed to win the challenge game can try to control B Bots with .
3rd	Upon completion of this lesson, the pupils are expected to be able to: ● Use repeat function of the B Bot app to create counted loops; ● control B Bot to move in a square by the REPEAT command.	● Pupils cooperate to create counted loops; ● Pupils cooperate to control B -Bot to move in a square by the REPEAT command; ● Pupils who succeed to control B Bot to move in a square by the REPEAT command can join the competition of writing algorithms.

7. Design Cycles

Besides teacher development, the project will be a design-based research study (DBR), which will be complemented by using the quasi-experimental designs. As the study adopts a mixed method approach, the qualitative data will be triangulated by the quantitative data collected. DBR is characterized as a research paradigm that blends empirical educational research with the theory-driven design of learning environments (Design-Based Research Collective, 2003; Bell, 2004). Barab (2006) points out that DBR is less a method than it is a collection of approaches that involves a commitment to researching activity in naturalistic settings. DBR usually involves multiple iterations or progressive refinement and each design cycle includes design, implementation, analysis, and redesign. Two design cycles will be conducted in the study for each school in order to produce sharable theories that have implications for practitioners and designers with a focus on design inauthentic settings (Collins, Joseph & Bielaczyc, 2004; Strobel, Jonassen & Ionas, 2008). Mixed methods will be used; in each design cycle, both qualitative and quantitative data will be collected.

At the first stage, the teachers in the project school will collaborate with the research team to design the coding activities for their pupils. At the second stage, one of the project teachers will teach a short coding module for a selected class. Upon completion of the first module, a group of pupils, from three to five, will be invited to join a focus group to share their learning experience in the coding activities. Besides, the project teachers and the research team will have a post-activity meeting to evaluate the design of learning activities and decide the changes for the next coding module. The whole process will be repeated for the next cycle. In this regard, the study adopts a design-based research study approach. In the project, data will be collected from teachers' reflection, focus group meetings and observation.

In our study, qualitative data sources include dialogue exchanges, focus group interviews for case classes, interviews for sample pupils for tracking attitudes towards the new teaching approach and also reflections from teachers. In each design cycle for each school case, the study will adopt a "one group, pre-test/post-test" design (Gray, 2009) as the quantitative data sources. These data will be used to triangulate the qualitative data for examining the effect of coding as learning. Based on the findings of the cross cases analysis in the first cycle, the coding activities applied in the second cycle will be adjusted. The same process will be repeated for the next cycle. By the end of the design cycles, we should be able to answer RQs and develop some good teaching examples of integrating "learning to code" and "coding to learn". Figure 7 shows the research framework of the study for each design cycle.

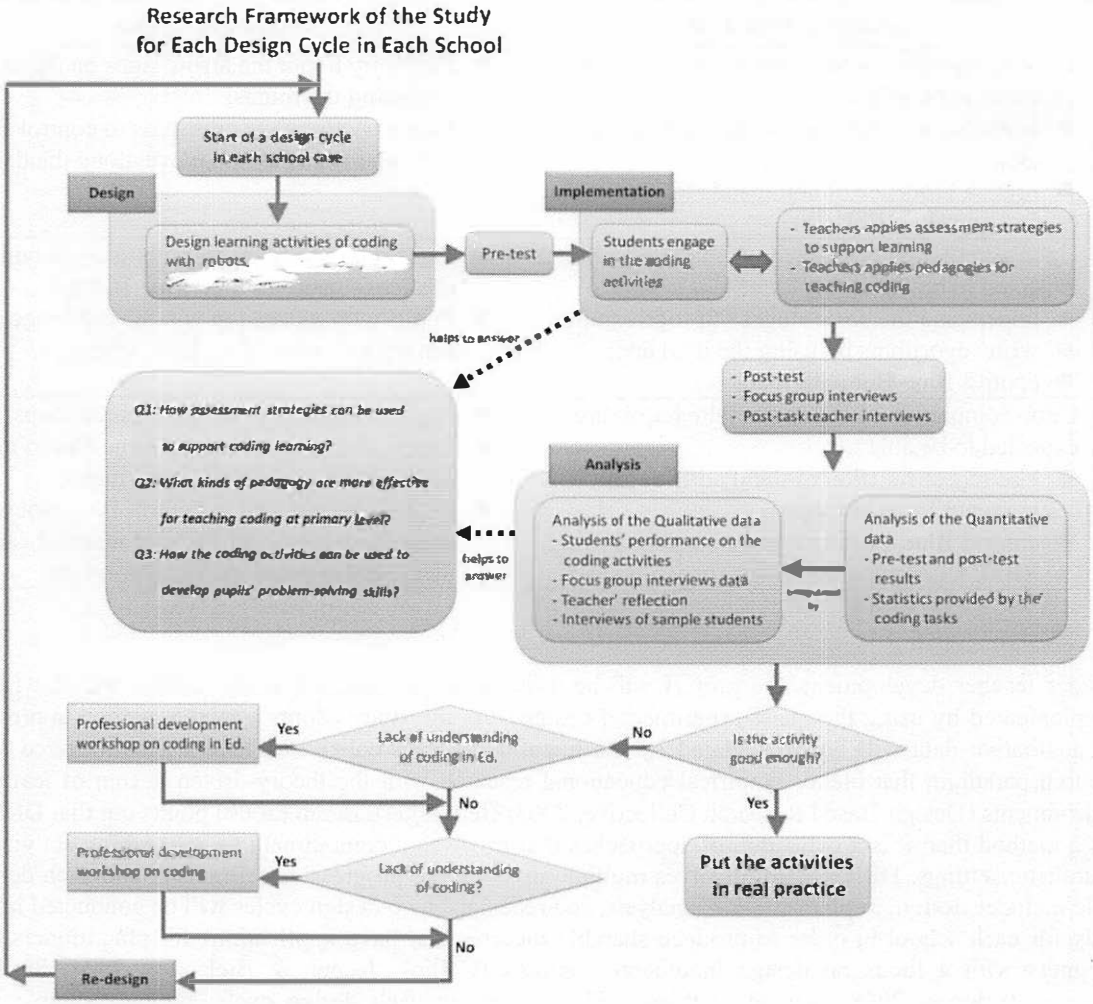

Figure 7. Research Framework of the Study for Each Design Cycle

8. Timeline

Time	Activities	Actions
Preparation Stage		
Feb 2018	Preparation of workshop materials	• Project website • Materials for school-based workshops and meetings
Phase I		
Mar 2018	School-based workshops or meetings in project schools	• Teachers are introduced to the coding education strategies and shown how they can be incorporated into their teaching. • Teachers collaborate with the research team to design the coding activities for pupils.
Apr – Jul 2018	Implementation Cycles	• Pre-test • Coding Activities • Student Interview • Post-test • Post-activity Discussion
Jul – Sep 2018	Data analysis / Improvement / Sharing Seminar	• Data analysis of pre-& post-test, student interview and so on • Sharing teaching experience in sharing seminar • Project website update and improvement of teaching materials
Phase II		
Sep – Oct 2018	School-based workshops or meetings in project schools	• Teachers are introduced to the coding education strategies and shown how they can be incorporated into their teaching. • Teachers collaborate with the research team to design the coding activities for pupils.
Oct 2018 – Apr 2019	Implementation Cycles	• Pre-test • Coding Activities • Student Interview • Post-test • Post-activity Discussion
Jan – Apr 2019	Data analysis / Sharing Seminar	• Data analysis of pre-& post-test, student interview and so on • Project website update and improvement of teaching materials • Sharing teaching experience in sharing seminar
Post-activities		
Apr – May 2019	Data analysis / Public Seminar / Reporting	• Data analysis of pre-& post-test, student interview and so on • Project website update and improvement of teaching materials • Sharing teaching experience in public seminar

9. Budget and Commitment

Budget overview:

Expense item	Amount (HK$)
1. Staffing:	$392,175
2. Equipment:	$75,000
3. General Expenses:	$90,835
4. Contingency:	$2,790
Grand total:	**$560,800**

Budget details:

Expense item	Purpose of the expenses	Amount (HK$)
1. Staffing:		**HK$,392,175**
Senior Research Assistant (FT, SRA)	The SRA is the manager of the project and is responsible for the administrative work and research duties of the project and collaboration with the project teachers to design the coding activities. The SRA will also be responsible for research work including literature review, data collection, data analysis (qualitative & quantitative data, e.g. interview, pre- & post-test and lesson observation, etc.), website development and management, drafting reports, materials development, supporting lesson observation, and other project duties as assigned.	HK$24,700/month x 15 months x 1.05 (MPF) = HK$389,025
Student helpers	Support the SRA with the project duties as assigned.	(HK$60 per hour + HK$3 (MPF)) x 50 hours = HK$3,150
2. Equipment:		**HK$75,000**
B Bot (HK$4,300/set)	Teaching aids for coding activities for all schools in total (5 sets)	HK$21,500
B Bot (HK$6,300/set)	Teaching aids for coding activities for all schools in total (5 sets)	HK$31,500
B Mat (HK$400)	Teaching aids for coding activities for all schools in total (5 mats)	HK$2,000
D & D (HK$2,500/pack)	Teaching aids for coding activities for all schools in total (8 packs)	HK$20,000
3. General expenses:		**HK$90,835**
Sundries	Printing, consumables, recruitment advertisement, stationery, photocopying, stamps, posters; DVD, hard disk for data storages, batteries, relevant references, course materials and development, etc.	HK$6,000
Travelling	Travelling to schools and workshops and seminar venues, etc. for giving on-site support, discussions, data collection, information dissemination, etc.	HK$3,000
Audit Fee		HK$5,000
Overhead		HK$72,776
Other	Website development, video recording, venue booking, posters, printing & photocopying, conference, publication cost, etc.	HK$4,059
4. Contingency:		**$2,790**
	Grand total:	**HK$560,800**

Asset usage Plan:

Category	Asset/Description	No. of units	Total cost	Proposed plan for deployment
Hardware	B	5	HK$21,500	*for use by Department of Mathematics & Information Technology in other similar projects/learning activities upon project completion to sustain the project impact*
	B	5	HK$31,500	
	B Mat	5	HK$2,000	
	D	8	HK$20,000	

Expected Project Outcome

10. Evaluation

For each learning task, the class is measured on their understanding of the topic by a pre-test. With the findings of the pre-test, teachers tailor-make coding activities. After class, pupils' understanding of the topic (the dependent variable) is measured by a post-test. The collected quantitative data aim to provide evidence for analyzing the student performance. In addition, a sample of pupils will be interviewed at regular intervals to gauge their attitudes towards the new teaching approach (the dependent variable) by adopting a "one group, time-series" design.

In order to evaluate the impact of the intervention on pupils, we will use a variety of other data-collection methods, including classroom observations, structured and semi-structured teacher questionnaires and interviews, and student interviews. Process data will be collected at different times in the project to document the effects of the implementation phases as the evaluation of the project.

11. Deliverables and Dissemination

At the end of the project, we will make available a set of professional development materials, together with protocols for their use, including:

(1) Teaching Materials
The draft teaching materials about coding have been preliminarily developed (Figure 9). We will produce a rich set of teaching materials about the good practice of coding activities, including curriculum plans, lesson plans, , which are suitable for Hong Kong primary pupils at lower and senior levels (grade 2 to grade 6). The themes and topics to be covered include the pedagogies and assessment strategies of coding education, implementation of coding activities with robots, block-structured programming, algorithms, control structures, etc. This will be invaluable in developing models further and implementing at scale.

(2) Website
We propose to build a website that will reinforce the materials of workshops and meetings and generally complement the face-to-face communication that is critical to the project. The most distinctive feature of the website will be its simplicity. This website will be spare, practical and with a very narrow focus - supporting teachers in coding activities. Although we expect the design of the website to evolve over the duration of the project, we currently envisage three distinct elements. The first will be an online forum that will provide space where teachers can pose questions, post answers, and raise issues. The second will be a "topical" area, where themes raised in the meetings can be highlighted. The third component will be an archive area where copies of articles, accounts by teachers, and other resources can be accessed. This will include a database of the techniques developed to date with commentaries from teachers about their experiences.

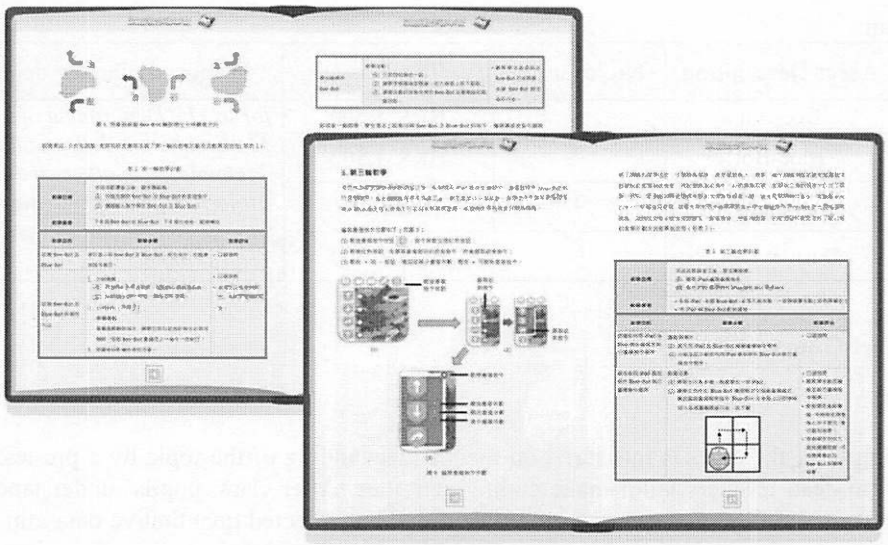

Figure 9. The Draft Teaching Materials

(3) Seminar / Workshop to disseminate project outcomes

The project team members and teachers will prepare to conduct seminars or workshops to share their experience of implementing coding activities in the project. All Hong Kong primary school teachers will be invited to attend the seminars or workshops.

Details of Seminars / Workshops

- Topic: Coding As Learning with Robots
- Speaker/Trainer: Project teachers
- Frequency: 2 (1-2 hours for each session)
- Content:
  - Introduction of coding education,
  - Design and implementation of coding activities with robots,
  - Sharing of good practices.
- Targets: about 100-200 primary school teachers

12. Sustainability

The project is designed to benefit the education sector as a whole by creating and disseminating models of good practice in coding. The project is expected to extend beyond the participating schools to all schools across the territory through the seminar, workshop, sharing sessions, website and wiki platform. As " sites" is a free and easy-to-use wiki service that facilitates cooperation among teacher participants, it will be adopted as the project website and can be maintained by teachers themselves after the project. PI and the project teachers are responsible for monitoring and updating the information of the website after completion of the project. The number of visitors/downloads will be recorded regularly to understand the interest/needs of users and review the need to adapt the project materials. The curriculum and teaching materials will also be linked to the website of Department These conduits will be vital for the improvement of teaching models, dissemination and publicity purposes.

At the end of the project, the principal project supervisor will submit a final report. It is expected that a conference paper will be written to share the innovative practices after the completion of the project.

Report Submission Schedule

My team commit(s) to submit proper reports in strict accordance with the following schedule :

Project Management		Financial Management	
Type of Report and covering period	**Report due date**	**Type of Report and covering period**	**Report due date**
Progress Report 1/2/2018 - 31/7/2018	31/8/2018	Interim Financial Report 1/2/2018 - 31/7/2018	31/8/2018
Progress Report 1/8/2018 - 31/1/2019	28/2/2019	Interim Financial Report 1/8/2018 - 31/1/2019	28/2/2019
Final Report 1/2/2018 - 31/5/2019	31/8/2019	Final Financial Report 1/2/2019 - 31/5/2019	31/8/2019

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Appendix 1. Curriculum Plan

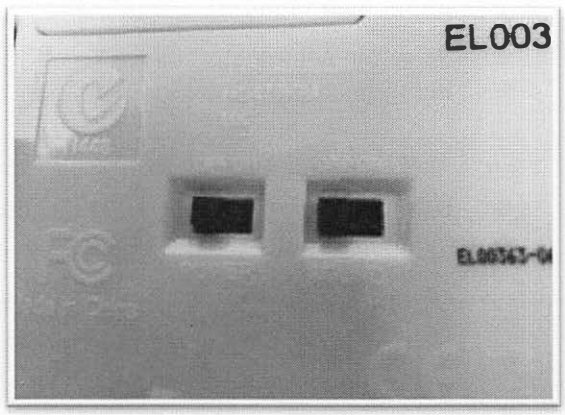
Grade	Lesson	Contents
Lower level: (Grade 2 or Grade 3)	3-4	*1. Introduction to Bee-Bot and Blue-Bot* ● Identifying the commands of B and B Bot; ● Sequencing commands for controlling B and B Bot.
		2. The Basic of Coding ● The basic stages of programming; ● Coding algorithms on the app.
		3. Simple Coding Control Structures ● Repeat function of the Б Bot app for creating counted loops; ● Controlling B Bot by the REPEAT command.
Senior level: (Grade 4 to Grade 6)	5-6	*1. Introduction to Dash & Dot* ● Identifying the commands of D & D ; ● Controlling D & D with .
		2. The Basics of Block-structured Programming ● Understanding the basic code block; ● Block-structured algorithms on the app;
		3. Problem-Solving Procedure ● What is problem-solving procedure? ● Introduction to flowcharts.
		4. Basic Coding Control Structures ● Sequence control structure; ● Selection control structure; ● Iteration control structure.
		5. Coding as Learning ● Integrating problem-solving skills into coding activities; ● Integrating other knowledge into coding activities.

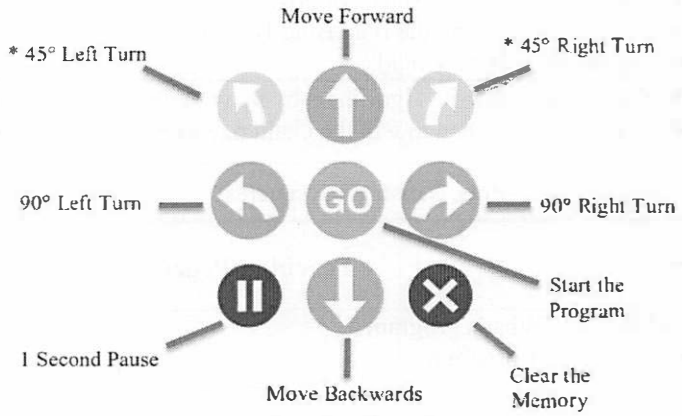
Appendix 2. Lesson Plan (Sample)

Subject: ***Computer***
Grade: ***2nd grade***
Module: ***Coding of B Bot and B Bot (3 lessons)***
Objective: ***To enhance students' knowledge and skills in coding***

Lesson 1

Learning Objectives	Upon completion of this lesson, the pupils are expected to be able to: ● identify the commands of B Bot and B Bot; ● press a sequence of commands to control B Bot and B Bot.
Coding Activities	● Pupils try to put the arrow signs on the mats for designing the routes; ● Pupils try to press commands to control B Bots and B Bots to move along the default routes.
Preparation	7-8 B Bots, arrow signs, 7-8 mats (3x3 squares).

Learning Objectives	**Teaching Process**	**Assessment**
The pupils are expected to know B Bot and B Bot.	Introduce B Bot and B Bot:  Bee-Bot and Blue-Bot can be controlled by pressing a sequence of commands.	Oral questioning
The pupils are expected to be able to identify the commands of B Bot and B Bot.	1. Power switch and sound switch:  (B Bot and B Bot can be shown to pupils by projector.)	Oral questioning

	2. Commands  (Note: * the command of B Bot App)	
The pupils are expected to be able to press a sequence of commands to control B Bot and B Bot.	Coding Activities: • Pupils try to put the arrow signs on the mats for designing the routes; • Pupils try to press commands to control B Bots and Blue-Bots to move along the default routes.	Observation Oral questioning

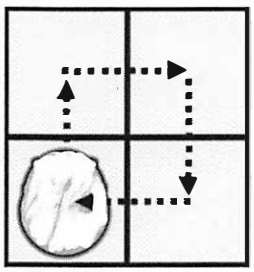
Lesson 2

Learning Objectives	Upon completion of this lesson, the pupils are expected to be able to: ● understand the basic stages of programming; ● write algorithms by the B Bot app; ● control B Bot by
Coding Activities	● Pupils learn to write algorithms by playing the challenge game of B Bot app; ● Pupils who succeed to win the challenge game can try to control B Bots by
Preparation	, 3-4 B Bots, 2 mats (5x5 squares).

Learning Objectives	Teaching Process	Assessment
The pupils are expected to be able to understand the basic stages of programming.	1. What's program? A program (1) is a sequence of commands; (2) should be provided to the computer in order to instruct the computer to complete a specific task; (3) will be fetched by the computer and the commands will be executed one by one. 2. The basic stages of programming Input → Process → Output 3. Stored programs Stored programs enable computers to do tasks automatically, repeatedly and accurately.	Oral questioning
The pupils are expected to know how to write algorithms by the B Bot app.	1. Show and explain how to write algorithms by the B Bot app. 2. Show and explain how to control B Bot by	Oral questioning
The pupils are expected to be able to control B Bot by	Coding Activities: ● Pupils learn to write algorithms by playing the challenge game of B Bot app; ● Pupils who succeed to win the challenge game can try to control B Bots by	Observation Oral questioning

Lesson 3

Learning Objectives	Upon completion of this lesson, the pupils are expected to be able to: ● use repeat function of the B ·Bot app to create repeats within algorithms; ● control B Bot to move in a square by repeated commands.
Coding Activities	● Pupils cooperate to create repeats within algorithms by ; ● Pupils cooperate to control B Bot to move in a square by repeated commands; ● Pupils who succeed to control B Bot to move in a square by repeated commands can join the competition of writing algorithms.
Preparation	, B ·Bots and B ·Bots, mats (3x3 squares).

Learning Objectives	**Teaching Process**	**Assessment**
The pupils are expected to know how to create repeats within algorithms by .	1. Show and explain how to create repeats within algorithms by . 2. Show and explain how to control B Bot by repeated commands.	Oral questioning
The pupils are expected to be able to control B Bot to move in a square by repeated commands.	Coding Activities: ● Pupils cooperate to create repeats within algorithms by ; ● Pupils cooperate to control B ·Bot to move in a square by repeated commands. For example: 	Observation Oral questioning
Catering for individual differences	Coding Activities: ● Pupils who succeed to control B ·Bot to move in a square by repeated commands can join the competition of writing algorithms.	Observation