
Title	Project work: Background and future research
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Source	<i>ERAS Conference, Singapore, 19-21 November 2003</i>
Organised by	Educational Research Association of Singapore (ERAS)

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PROJECT WORK: BACKGROUND AND FUTURE RESEARCH

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Abstract

The introduction of Project Work (PW) to schools in 1999 could be seen as an attempt to prepare students for the challenges posed by a knowledge-based economy. This paper hopes to present the background of PW and share some concerns related to the implementation of PW in schools. It also hopes to suggest potential areas of educational research into PW.

Background and Rationale of Project Work

As Singapore progresses into the twenty-first century, more emphasis is now placed on the development of thinking, process and communication skills to prepare future workers of Singapore to meet the challenges of a knowledge-based economy where:

*perhaps the most significant force altering the face of economic competition is the **emergence of knowledge** itself as the basis for **competitive advantage** of organizations and states.*

(MOE, 1999, 13)

This shift in focus has caused an impact on the various strata of our education system. Since 1997, there has been structural and content changes made throughout the system. The three once-initiatives in our curriculum: National Education (NE), Information Technology (IT) and Thinking Skills (TS), forming part of realizing our vision of “Thinking Schools Learning Nation” (TSLN), have spearheaded educational reforms and provided a platform for future broadening of Singapore’s educational goals to meet our societal and economic needs.

Having an in-depth knowledge of a particular area of discipline may not be sufficient for our Singapore workers today. Increasingly, there are demands for people who can incorporate ideas from different areas of specialization. Learning, no longer confined to discrete compartments of isolated subject content, can now take place at the crossroads where different disciplines interact. A more holistic approach to teaching can be expected. Subsequently, alternative forms of coursework in schools involving interdisciplinary collaborations may play an important role in contributing towards a knowledge-based economy in Singapore.

An example of such alternative tasks “repackaged” for introduction to the Singapore primary and secondary schools beginning 1999 is Project Work (PW). With its “inter-disciplinary outlook”, PW provides students with opportunities to “appreciate the relevance of multiple banks of knowledge, and acquire practical, problem solving skills” (MOE, 2002b, 3).

Though teachers have had long experiences in planning and implementing PW within their subject areas, these projects were often subject-specific and product-oriented (Yeo & Ng, 2003). There might be very little structure available to help monitor research, learning and teamwork during implementation of these subject-specific project tasks (Goh, 2002, 16).

In some instances, oral communication skills, might not be highlighted. Moreover, design and assessment of such projects might have varying purposes across teachers, subjects and levels.

There was hence, a perceived need to streamline PW such that it would serve as an opening for students to combine their knowledge from different disciplines and find connections between topics and among subjects (CPDD, 1999a, i). Being one of the efforts to realize Singapore's vision of TSLN, PW was seen as a "good avenue to inculcate core skills" essential for students in a knowledge-based economy (Chang, 2000, 3). These core skills are: character development, literacy and numeracy, social and cooperative skills, communication, information gathering, knowledge application, thinking and creativity (*The Straits Times*, 16 March 2000).

Project Work: Learning Outcomes

According to Chang (2000), the learning outcomes of PW also match the "Desired Outcomes of Education" (MOE, 2000). The framework for PW, drawn up by the Ministry of Education, Singapore, is shown in Table 1 below (MOE, 2003d):

Table 1: Domains and Learning Outcomes of PW

<i>Domain</i>	<i>Learning Outcomes</i>
Knowledge Application Skills	<ul style="list-style-type: none"> ▪ Search for and access information from various sources: print, non-print and electronic ▪ Apply and transfer knowledge and skills learnt across disciplines ▪ Recognize the relevance and inter-relatedness of what is learnt
Communication	<ul style="list-style-type: none"> ▪ Communicate ideas clearly and effectively
Collaboration	<ul style="list-style-type: none"> ▪ Collaborate with others
Independent Learning	<ul style="list-style-type: none"> ▪ Monitor own learning ▪ Demonstrate a positive and responsible attitude towards learning and work

Knowledge application requires students to respond meaningfully to the scenario presented in the PW task through critical analysis of information collected from various sources. The process and product (CPDD, 1999a, IV-5) of PW completion are monitored. Records of progress can involve drafts and notes on meetings. These are kept in the group project file. Products of PW task can include written reports, artefacts, graphic and visual presentation and, even live performances.

Both written and oral aspects are considered in the communication domain of PW. Students' clarity in speech, confidence in delivery, ability to engage audience, and respond to questions posed by audience can be commented upon after their oral presentations.

Collaboration among students in PW involves them working in groups of 4 or 5 to complete the task together. In the process, they may learn to negotiate for common understanding, respect the views of others and support their peers in work.

Students are encouraged to be independent learners in PW. They set goals for themselves, chart their progress using journals and notes and, reflect upon their learning using reflection logs.

Features of Project Work and Nature of Tasks

Key features of PW include specified learning outcomes as well as instructional, implementation and assessment requirements of PW tasks:

PW

- is interdisciplinary
- involves collaborative learning
- requires an oral presentation
- focuses on both process and product
- builds just-in-time skills instruction
- is carried out during curriculum time
- has standards of performance made transparent

(CPDD, 1999b, 3-5)

Just-in-time skills instruction (JIT) was perhaps coined to describe situations where teachers have to provide skill-based assistance to meet students' needs during the process of working at the right time. Abstracting, analyzing parts and whole, deduction and generating possibilities (MOE, 2003c) are a few of such skills taught.

About 20 to 25 hours of curriculum time a year for primary and secondary schools, and 30 to 35 hours for pre-university level (CPDD, 1999b, 33) are to be set aside to facilitate the implementation and monitoring of PW. Standards of performance expected from students are made transparent at the beginning so that proper scheduling of tasks can be done.

Initial examples taken from the Project Work Secondary Resources Package (CPDD, 1999a) have also reflected elements of TS and NE, indicating a more streamlined curriculum. Schools interested in crafting their own PW tasks are advised to take into consideration the following:

- Clear delineation of expected learning outcomes and quality of work
- Inter-departmental collaboration
- Sharing in order to add value to project

(CPDD, 2001a, iv)

Role of Teachers

As the nature of PW requires inter-disciplinary collaborations among subject teachers, the role of PW teachers is multi-faceted one. A supervising teacher and a resource teacher are usually assigned to guide students in their tasks. Combination of content, research, management, counseling and social skills of the teachers may have to be tapped upon in order to facilitate the completion of PW tasks. These can probably be illustrated through descriptions of the stages of PW.

Stage 1: Formation of groups

Ideally, PW groups should comprise of a mix of abilities, personalities and racial backgrounds. There can be occasional differences in opinions and prejudices among group members which require teacher's intervention and counseling. Thus, as Wong (2001) in her

study on the effects on learning and teaching of PW in a primary school has noted, it can be useful that students are taught social and communication skills, especially on how to comment on peer's work "without being too critical and judgmental towards the persons" (p. 78). In addition, Wong also saw the need for teachers to teach students receiving feedback from others to be more gracious and objective about the issue.

Stage 2: Defining the project focus and task requirements

Here, teachers may have to decide on the amount and type of scaffolding to provide to students with, bearing in mind the application of integrated content knowledge and skills. Ensuring the fairness of instructions and assistance to groups doing the same task and yet matching teacher input to the level and ability of the groups can be quite a challenge. Teachers may also be obliged to guide students in preparing work schedules and duty allocations. Leadership and logistics skills may have to be taught as well.

Stage 3: Information gathering and processing

Monitoring of students' progress in PW is an on-going process. Students have to draw upon content knowledge of different subjects during the process of data collection and analysis. Various processes and problem solving skills such as those of summarizing, making comparisons, and identifying relevant areas for further research have been highlighted by Wong (2001) as lacking in a number of primary students during PW. Indeed, it would be wise for teachers to show students how to extract relevant information from those available so as to allow for a more succinct and clear presentation of work. Providing JIT instructions in order to steer them further into their research work but also keep within the scheduled time frame for completion of tasks can be the key focuses of teachers at this stage.

Stage 4: Communication

During this stage, proof readings on written reports can be encouraged to promote reflection and metacognition in students. Rehearsals for oral presentations may be arranged to fine-tune students' oral communication skills. Students should make provisions during their presentations to target at the needs and level of maturity of the audience.

Stage 5: Reflecting on performance and learning

Finally, at this last stage, teachers may choose to offer some scaffolding to help students focus on the pertinent learning points in the project. Wong (2001) has also discovered in her study that many primary school students were not aware of their own thinking and were "weak" in learning from advice on their work (p. 80).

Generally, the degree of attainment of the learning outcomes in each PW task depends very much on the roles teachers play. When PW teachers are seen as supervisors, "facilitators" and "guides", there may be "more opportunities to see the capabilities of the students and become more aware of their needs" (Wong, 2001, 88). Thus, there can also be extra demands on teachers over and above those general skills and knowledge identified during the basic PW training. Flexibility, good management techniques and scheduling of events by teachers (e.g. Neo & Ho, 2002) may be needed to ensure that tasks get done within the given time frame. It would be best if teachers have a holistic view of the purpose of the task and the ability to manage different aspects of this long-term project. As Chang et al. (2002) in their report on the implementation of PW in their secondary school advised, teachers should be "familiar" with the requirements of the project task as well as be "competent" to guide students through "every step of the process" (p. 13). Keeping a

comprehensive record of pupils' progress conscientiously may be valuable in the final fair assessment of each student's effort and learning.

Training for Project Work

Basic training in PW was provided for primary and secondary teachers in phases by PW specialists from the Ministry of Education between 1999 and 2003. Since April 2002, all primary and secondary schools were expected to conduct PW as a "learning activity in the initial years" (CPDD, 1999b, 37) for at least one level (P3, P4, P5, Sec 1, 2 & 3) on a non-assessment mode.

Teachers were familiarized with the rationale, objectives, features and the likely benefits of PW (CPDD, 2001b) during basic training. Suggestions and samples on the implementation, monitoring and feedback of tasks were presented during the training workshops. In addition, teachers also crafted PW tasks in inter-departmental teams to experience the nature of such tasks.

Though basic PW training has stopped in early 2003, briefings for PW coordinators in schools as well as sharing sessions among schools (see Chang et al., 2002, Goh, 2002 & W. Y. Tan, 2002) organized by the Ministry and schools have continued. On-line resources in the Ministry's intranet presented ideas on JIT skills and, the implementation and assessment processes. Teachers can also register for specialized, more advanced courses in PW (MOE, 2003c) to further broaden their repertoire in the area.

The National Institute of Education (NIE) began to offer PW courses in its July Semester 2002. Since then, primary school trainee teachers in the Diploma in Education (General) Programme have been attending compulsory education studies module on understanding process and product of PW. The Postgraduate trainees are offered elective educational studies module on PW (NIE, 2003) and are encouraged to attend enrichment talks on it.

From the amount of training time and effort contributed by educators, it is quite clearly perceived that the goals of PW will be part of the long-term education plan of Singapore.

Perceived Advantages of Project Work

The perceived advantages of PW can perhaps be examined from three points of view.

Students:

For students, PW offers an "alternative integrated learning experience" (CPDD, 2001b, I-3) compared to that of the traditional, subject-specific mode. Proper implementation of PW may educate students in areas like cooperation with others, taking responsibility for their work, respecting people and good time management (Wong, 2001, 82-83). Students may also pick up practical research skills, especially those pertaining to the use of IT (see Goh, 2002). Group discussions can give rise to creative ideas, adding more angles for deeper thinking into the task. Learning to sieve through the immense information generated about topic and verifying the information found may even help promote critical thinking. NE can be infused in PW, allowing opportunities for students to appreciate the multicultural aspects of Singapore.

Teachers:

Having an aerial view of the interconnectedness of various subject disciplines may appear to be more prominent among primary teachers. However, for secondary school teachers, perhaps the gain in knowledge of different subjects besides those of their own area of specialization in the course of interactions among colleagues and with students can be viewed as beneficial to their future teaching. Goh (2002) in her report on her primary school's PW efforts found that collaborations among teachers during PW had prompted them to work even more closely than before.

Schools:

Taken as a whole school approach (e.g. Nair, 2000 & Goh, 2002), schools may also stand to gain during the implementation of PW as there can be better collaboration between departments in the sharing of teaching approaches, resources, manpower deployment and workload analysis. Various departments in the school can streamline teaching of content to cater for PW topics.

Project Work Implementation: Some Concerns

The Ministry of Education has put forth suggestions on the implementation of PW in schools (see CPDD, 1999a, 1999b & 2000b). In 2005, PW will be included for university admission (MOE, 2001). The "Proposed Revised Junior College Curriculum Framework" (MOE, 2002a) has been generated in hope of better developing "thinking, communication and other process skills" and, engaging students in "greater breadth of learning" (MOE, 2002c) using PW as one of its means. Hence, it is essential to examine several concerns regarding the implementation of PW.

PW lessons in secondary schools are usually incorporated in the timetable (Chang et al., 2002) for at least one semester. Some schools have allocated one PW task per level every year, with a weekly double-period PW lesson slot. There are also schools who allocate "PW weeks" within their curriculum where the formal time-table was put aside for special PW skills-based instructions (e.g. W. Y. Tan, 2002).

Limited local studies on PW (e.g. Wong, 2001) revealed that the time allocated for PW was still insufficient for teachers to manage 8 – 10 PW groups in a class. This could be because extra time was often required to equip students with selected basic skills to get started them with their tasks. Besides, students also needed additional time outside curriculum to work with their classmates to complete the project and seek advice from subject teachers.

In the area of teacher training and deployment, informal discussions among educators brought to light that though basic PW training for teachers seemed adequate, time was needed for them to perform pedagogical and mental switches from the traditional role of dispensing knowledge to that of facilitating. As basic training was conducted in a once-off manner and NIE only offers elective modules on PW for postgraduate trainees, teachers new to PW, especially those in the secondary schools, may need time to learn some of the important process skills essential in PW. Furthermore, there can be teachers who may not be confident in their new roles as project supervisors and are not in touch with research skills.

Lee (2001) in her research on evaluating critical thinking pedagogy to support primary school PW found that primary students' "over-reliance" on spoon-feeding from teachers

resulted in their lack of perseverance in completing PW tasks (p. 62). These students also did not have prior experience of working independently. Teachers would often have to step in to ensure that correct content had been retrieved and learnt from the information sources. Feedback from teachers in Lee's research study emphasized the crucial contribution of sound knowledge base of concepts and skills towards increasing the quality of learning in PW.

To add on, Wong (2001) found that although students' progress in PW tasks was monitored through various means, the reflection of "group dynamics" and actual learning as a result of it would still be hard to capture and grade (p. 87). It may take time to change students' mindset that PW is not just about the end product but also the processes. Many had not encountered projects done in this way.

Performance in PW can have an impact on the final examination scores of students too. While conceptualized as a non-examinable learning activity, a few schools, however, award grades to PW (e.g. W. Y. Tan, 2002; Siau, 2002). To adapt to the task requirements of school-crafted PW tasks, several schools have modified their assessment tools. This involved teachers having to think differently from what they were used to. According to Goh's (2002) report, many teachers in her school had difficulty doing so because the education system they had undergone initially had "inculcated the mindset of using subject marks to determine the abilities of our pupils" (p. 18). Moreover, the parents of students in Goh's school were apprehensive of PW being conducted through school-wide implementation, fearing adverse effects on academic results as a consequence of this.

Project Work Implementation: Some Strategies

Yeo & Ng (2003) in their sharing on educators' perspective of PW implementation in Singapore schools commented that some schools have chosen to

- create "block periods" for PW lessons;
- reduce the number of subject-specific projects per year if they are not part of syllabus requirements; and
- draw up schemes of work to ensure that a realistic number of skills, both on content and thinking, were taught across subject areas before certain PW tasks were done

in order to maximize curriculum time for PW.

A number of recommendations can be considered in response to the concerns raised by educators. Firstly, more PW teachers can be invited to attend sharing sessions between and within schools. Though there are specialized, advanced PW workshops conducted by the Ministry, they can be further customized to meet the needs of teachers at different stages of PW implementation. Such workshops can include the monitoring of students' work in the area of critical questioning, techniques for teaching higher-order thinking and research skills. More workshops on PW understanding, process and assessment, both during pre-service training and in-service training can also be considered. On school level, a PW committee (see Nair, 2000) can be set up to provide assistance to PW teachers. Parents can be briefed on the rationale of PW, its framework, the school's implementation schedule and the progress of their child. This may perhaps help them better understand the nature of such assignments.

Implications for Future Research in Project Work

Singapore's education scene in recent years has seen progression from three initiatives in TSLN (1997) to the implementation of PW (1999). Current moves to further consolidate

these educational ambitions have resulted in the birth of the “Innovation and Enterprise” (I & E) vision (MOE, 2003a & 2003b).

In the light of the implementation of PW, limited local research has been done on issues related to PW. Among them, a study on students’ collaborations during PW was done by Quek & Wong (2002). They have reported results of teachers’ and students’ perceptions of their PW collaborative environments and suggested how these results could assist in the development of strategies to enhance collaborations in PW classes. Two other research studies have focused on the effects of PW on learning and teaching in primary schools (Lee, 2001 & Wong, 2001). Another study on average to higher ability secondary students (T. L. S. Tan, 2002) has explored the impact of using PW as a motivating factor in lower secondary mathematics but this was done in the context of using problem-based learning (PBL) approach. Local articles on PW have also reported instances of PBL incorporated into PW (e.g. Chang et al., 2002; Neo & Ho, 2002).

Studies from the international perspective related to PW have concentrated mainly on PBL (e.g. Gallagher et al., 1992; Barron et al., 1998; Bereiter et al., 1999) and subject-specific project work (e.g. Allinger et al., 1999).

Drawing from some of the concerns mentioned about the implementation of PW, future research into this largely uncharted field in Singapore education scene can be from a variety of perspectives:

- (i) teaching and learning
- (ii) cognitive processes
- (iii) roles of teachers, school and parents
- (iv) classroom environment & group dynamics
- (v) assessment
- (vi) task design
- (vii) attitudes and achievement
- (viii) teacher education

On the teaching and learning front, investigations on the effects of PW on the learning of core skills can be carried out. Techniques and strategies of PW implementations and monitoring in class can also be explored. Longitudinal studies which trace students’ progress from primary schools and beyond in order to get an insight of the independent learning and self-reflections that have taken place with the help of PW tasks can be considered. It would also be interesting to look into the cognitive processes undergone by students during the process of completing PW tasks in the areas of thinking and creativity (see *The Straits Times Interactive*, 30 November 2002).

Teachers may want to embark on professional reflection by conducting action research in PW. They can contemplate broadening their teaching repertoire and instigating changes to their interest areas. Factors contributing to a conducive environment promoting learning through collaborations can be another area worth studying. Schools may wish to add their views on general PW implementation guidelines after examining the nature and constraints of administrative and structural support given to PW and perhaps research into various ways of working with parents to help scaffold students’ learning in PW.

The assessment of PW tasks can be another area worthy of further research into. This may involve probing into the provision of a fairer and more reliable set of standards for grading the process and products of PW. Developing sets of criteria for the assessment of thinking in PW as proposed by Mau (1997) can appeal to some educators as well. Educators may find the issue of maintaining the scope and breadth in the task and yet catering to content rigour in designing PW tasks a challenge. Schools can also examine the possibilities of incorporating I & E ideas in PW tasks (see Chang et al., 2002).

A holistic framework for PW implementation and monitoring, from primary to junior colleges, can be studied too, especially in areas related to attitude towards self-direct learning and scholastic achievements. Last but not least, the reflections and learning of teachers conducting PW can be looked into as part of research in teacher education

Indeed, research in PW has the potential for further extension. More local PW research in the form of comparative studies, intervention techniques and action research may play a significant role in shaping the future education scene of Singapore.

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