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Applying Self-Organised Learning to Develop Critical Thinkers for Learning Organizations: A Conversational Action Research Project

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Abstract: The information explosion characteristic of a knowledge-based economy is fuelled by rapid technological changes. As technology continues to permeate our lives, there will be fresh demands upon the conduct of learning and teaching to ensure that learners are equipped with new economy skills and dispositions for creating significant and relevant meaning out of the large chunks of transmitted data. In the spirit of building learning organizations, this paper proposes that a two-pronged strategy of promoting self-organized learning (S-o-L) amongst educators and students be adopted. As an enabling

framework based on social constructivism, the model of S-o-L, originally developed by Harri-Augstein and Thomas, is described and applied to an educational setting. For educators engaged in action research, S-o-L is suited as an approach for managing and reflecting upon change. The use of two such thinking tools, the Personal Learning Contract and the Purpose-Strategy-Outcome-Review (P-S-O-R) reflective learning scaffolds are considered. For students who are now expected to learn independently in situations requiring problem-solving skills, much akin to real life contexts, this paper also considers the application of Learning Plans as a conversational tool for personal project management. We conclude that S-o-L promotes skillful critical thinking through a systems thinking process of continuous reflective learning. We propose that these are essential qualities for citizens working in a technological age. Case study samples of the thinking tools used in this action research project are included as appendices and evaluated in this article.

Introduction

Even as the wave of telecommunications advancement continues to flood the world with a massive overload of information, teachers and students are already facing challenges seemingly insurmountable. Educators are expected to improve teaching practices in the light of newly developed educational theory, while keeping up with the pressing demands of policy makers in directing system-wide institutional changes involving a continuous state of personal change-management reorganisation. Likewise, students face increasing pressures to be prepared as knowledge workers for the so-called new economy through developing new skills for critical and creative thinking as a means of solving problems with the assistance of reflective technologies (Coombs, 2000 & 2002).

The key to coping in such an environment, which thrives on change, is to encourage learners to be constantly learning and re-learning. Even before the Internet started to take the world by storm, Thomas and Harri-Augstein (1985) aptly described this problem facing society:

> the exponential rate of change in today's world is making ever-increasing demands of on human learning and today's thoughts will become the chains of tomorrow's mind unless we face the problems of re-learning and continuing to learn throughout our lives. Freedom to construct our personal destinies by creatively adapting to change requires an ever-increasing capacity for learning. To achieve this, learning has become a consciously growing process rather than a ubiquitous part of life (p. xxiii).

This article reviews the principles of self-organised learning (S-o-L) developed by Harri-Augstein and Thomas (1991) and considers its value in developing skills and qualities suited for lifelong learning. It specifically considers the usefulness of critical thinking tools and templates in guiding the reflective process in this kind of systems thinking and learning, which Coombs (2002) refers to as a critical thinking scaffold. The three areas to be addressed are:

(i) How does S-o-L serve as an enabling framework for change-management and information management in a learning organization?
(ii) What qualitative thinking tools does S-o-L offer an educator engaged in conversational action research?
(iii) What pedagogical value is there in students' use of Learning Plans for managing curriculum-based projects?

The case study samples described in this paper are based on an action research study, which investigated the frustrations faced by 11 year-old school children, based in a local Singapore primary school, when completing projects using the World Wide Web as an information source.

The Action Research School-based Project

According to Elliot (1991), action research is "reflective practice which aims to improve the realization of process values" (p.51). Action research gives systematic attention and validation

to the importance of empirical data gathered from personal experience as a basis for reflecting upon how educational practices can be improved. As the fundamental aim of educational action research is to improve classroom practice, the onus is on the practitioner to acknowledge the need for improvement and hence to research on personal changes implemented and experienced. By taking control of the research agenda, the teacher-as-action-researcher becomes responsible for both defining and implementing the acceptable quality of outcomes, i.e. stakeholding through task-management. An action research staff development programme at St Anthony's Canossian Primary (SACP) was initiated as part of the project design. The purpose of this part of the project was to use a staff development forum to elicit from teachers the nature of the pedagogical problems being faced in the classroom and to operate as an action learning group (Revans, 1980) from which to rethink practice.

Having been both a student and a staff member at SACP, I (Vivien) was familiar with the school philosophy, which is based on equal opportunity for all and encourages forward-looking school improvement projects to provide high quality education. More importantly, I believed in this philosophy and felt that it would fit in well with my vision of an action research project focused upon change through school improvement. The leadership at the school is also very supportive, which is a crucial factor behind instigating institutional change. The Principal trusts her staff, is open to new ideas and, hence, supportive of continuing personal development efforts. She is committed to her cause as an educator, and was instrumental in influencing my original decision to join the teaching service. I also had friends amongst the staff whom I knew would be supportive of any project I might choose to undertake. As result of this style of leadership, the school culture that has naturally come about can be compared to a 'family' engaged in teamwork. I knew I would not be considered as imposing on them to help me complete my project for it would also become ***their*** project, thus satisfying Coombs' (1995) "social parity" teamwork ethic for conducting AR in a learning organization. There would be a genuine eagerness to help, as they become social partners and stakeholders of a common project goal, operating as "Task Supervisors" within the conversational learning organizations (Harri-Augstein and Thomas, 1991 and Coombs and Smith, 1998). I was certain that I would feel a sense of curriculum ownership encouraged by this vision and practice of school leadership. There would be an increased likelihood of organizational success, as applicable ideas would be recognized and integrated. Such a vision of permanent and positive organization change management is the primary social goal of any action research project based within a learning organization (Coombs, 1995). Finally, I am reassured by the knowledge that the Principal recognizes my educational potential to contribute positively towards the school's development.

As such, my roles as an action researcher within the school are to enable school improvement through curriculum change practices via an innovative programme of staff development. Much like an on-site professional development consultant with expertise in research methods, I worked along aside with the management and teachers to understand the contextual influences and the real issues behind the identified learning and teaching difficulties. For example, there were numerous open and honest discussions with the Principal over the prolonged period of ten months. Peer discussions were also carried out through informal conversations with the Head of Department for Science and the teachers. This provided opportunities for me to evaluate their understanding of self-organised learning (S-O-L) and learning plans (LPs).

These action research roles are summarised below:

- Operating as a Learning Coach within the conversational self-organised learning paradigm (Harri-Augstein & Thomas, 1991).
- Making sense of a body of professional knowledge elicited from scholars and researchers, and presenting it as meaningful and relevant material for classroom practitioners, and hence playing the role of Intentionality Manager (Harri-Augstein & Thomas, 1991).
- Responding to the complexity of the environment as Task Supervisor by allowing the forces of the evaluation to develop as the study proceeds, modifying purposes and methods where necessary to maintain high standards of social accountability in ensuring the rigour of AR as an academic exercise (Harri-Augstein & Thomas, 1991).
- Being a participatory action researcher and working alongside teachers in the school to help instigate social change (Coombs & Smith, 2003).
- Lastly, accounting for the focus with the reserves to sustain the focus as a driver of the project (Broadhead, 1989)

These 'pull' factors at SACP were all compelling reasons to approach SACP to explore the possibility of a partnership in evaluating critical thinking pedagogy to support primary school project work through an action research approach (see Appendix 3). Appendix 3 illustrates the use of a critical thinking scaffold first developed by Coombs (1995) based upon Thomas and Augstein's (1995, 2001) S-o-L Purposes - Strategy - Outcomes - Review conversational analyser. This P-S-O-R systems thinking tool can be effectively used by action researchers as a template from which to both analyse and manage action research field projects at any stage within the overall project management cycle. Indeed, we will later see how this P-S-O-R critical thinking scaffold is used to define the three reflective practice stages of the S-o-L Personal Learning Contract (PLC) project evaluation tool illustrated in Appendix 1. In the example illustrated in appendix 3, however, the P-S-O-R tool was used to help analyse and identify the unique pedagogical needs and problems of SACP and determine the initial action research strategy within the school.

Further to this, the Principal also raised the concern about whether the Canossian schools had misplaced their school philosophy, and if its school culture had been "diluted" with the times. She specifically asked if there was any educational theory that could provide a rationale for what the school believed in. Nicolai (1994) explains that its founder, St Magdalene of Canossa, meant for educational institutions to be "Schools of Charity". Welcoming all, schools were meant to work towards closing the social and economic divide by giving to all, especially "those who were found to be in greatest need…. (and) who have a real right to these schools specially instituted for them" (p.66). She further described St Magdalene as one who had "respect for the principles of personalization and adaptation (for) she took into account the limitations imposed on the pupils by family and environmental conditions" (p.77). Quite by chance, I did stumble upon a match of this philosophy when I was doing a preliminary literature review. Gore and Zeichner (1991) in justifying the case for action research argue:

> we support academic rigor, and technical competence as long as this rigor and competence do not exclude attention to an ethic of care and compassion, and as long as what we are being rigorous and competent

> about does not merely represent a white, male, western view of the world. We care deeply about academic literacy, technical competence, and developmentally appropriate schooling, but we want to see the benefits of schooling shared by all (p.121).

This moral commitment to upholding justice through equal opportunity for all was again expounded upon when Sirotnik (1990) described schools practicing action research as:

> … provid(ing) equal access to and equal receipt of a quality education for all students. Any structures or practices that interfere with the simultaneous goals of equity and excellence, that perpetuates pre-existing social and economic inequalities are subject to critique and elimination (p.121).

When these findings were presented to the Principal, she expressed enthusiasm for action research. Rather than the school being a source of data for experimental research, she was convinced that the partnership could lead to benefits for them in the form of genuine school improvement in the conduct of project work. In addition, it was also evident to her that the school in wanting to introduce and adopt action research was walking the way its leading founder saw as a vision of education (Lee, 2001). This support for action research meant that I could work with some flexibility to reap the benefits of the action research methodology over a period of eight months as the further sections highlight. This learning commitment was articulated through the use of a Personal Learning Contract (see Appendix 1). A partnership lasting six months had been initiated.

Self-Organised Learning Builds New Learning Organizations

To appreciate self-organised learning in the wider scheme of things, it is necessary to define what a learning organization actually is. This action research project assumed the change-management strategy of developing a primary school as a learning organization through the professional development of its teachers *via* the use of S-o-L personal project management tools. To understand such an approach Senge (1990) describes a learning organization as one:

> … where people can continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together, that would more than survive in this information age. The five disciplines crucial in building a learning organization are personal mastery, mental models, shared vision, team learning and systems thinking (p.1).

These five disciplines are also subsumed within the practice of self-organised learning: S-o-L is based on the group learning theory of social constructivism and collaboration as well as instructional design axioms that provide a practical set of thinking tools and templates that enable the construction of personal learning. Harri-Augstein and Thomas (1991) explain that all human learning within the S-o-L conversational paradigm is defined as the "conversational construction, reconstruction and exchange of personally significant, relevant and viable

meanings with awareness and controlled purposiveness" (p.23). To facilitate this, there exists a series of thinking tools that allow one to systematically reflect upon one's experience and to facilitate the making of personal meaning that is both relevant and significant to one's experience of life.

Deriving S-o-L's "structures of meaning" is based upon Kelly's (1955) Personal Construct Theory (PCT). From a psychological perspective of conversational systems-based thinking, PCT states that individuals construct knowledge and model concepts of the world experienced through a complex process of constructivist thinking. PCT assumes a thinking philosophy that regards individuals as operating like "personal scientists" and adopts a holistic world-view that links one's personal experience gained with societal influences and behaviours (Coombs and Smith, 1998). This alternative approach towards systems thinking is described by Senge (1990) as "a different way of looking at problems and goals – not as isolated events but as components of large structures" (p.78). In order to achieve this ideal, Senge also describes mental models where assumptions and mindsets are suspended to allow for an "open, flexible and non-judgemental environment which allows for creative paradigm shifts to take place" (p.67). Generating the organizational social conditions that encourage such states of mind to take place enables teachers to become open to problem solving and, hence, to re-evaluate their practice, which is therefore suited to Elliot's (1991) notion of an action research cycle of reflective practice based upon the experiential learning derived from a teacher's classroom.

In S-o-L, the Learning Conversation has a dual nature carried out by the "conversational individual" or "C-indi" (Thomas and Harri-Augstein, 1985). Two conversations exist; one from within our self, to our self, and another externally, with others. Coombs (1995) differentiates these two types of reflective learning psychological experiences as "inferential" and "referential" Learning Conversations. Harri-Augstein's and Thomas' notion of the conversational individual assumes "human beings as meaning, construing, negotiating and attributing organisms", which explains personal learning as a form of conversational knowledge construction. To Senge, the essence of such social constructivism is much akin to team learning: "discipline of practices designed, over time, to get the people of a team thinking and acting together". It further results in matching of one's individual perspectives with a common shared vision. He suggests that the most effective practice for team learning is that of the conversational dialogue, "a sustained collective inquiry" of one's experience in the immediate context. During the process of dialogue, the team that thinks together comes to a "collective sensibility, in which the thoughts, emotions, and resulting actions belong not to one individual, but to all of them together" (p.75). This shared vision, if communicated well, results in increased ownership and an ease of communication.

However, there exists an underlying assumption which suggests that for learning based on social collaboration and personal reflection to take place, there must be a degree of personal mastery in acquiring a dual awareness of vision and reality and the thinking skills to mediate the differences. The role of schools and teachers in S-o-L is to set the social context where students have time to reflect and to be proficient and skilled in making the choices that will help one arrive at personal mastery in reconciling and coping with the differences experienced. Such self-mastery is at the heart of managing personal change.

S-o-L pedagogy is therefore, a learner-centred approach to learning where one is responsible for one's own behaviour, while managing one's own actions and directions through critical thinking reflection (Coombs & Wong, 2000). This is achieved in both an individual and social group-learning context. This conversational psychology provides both a pedagogical and

systems thinking approach that fits into a social constructivist model of learning and explains knowledge construction through reflective elicitation and self-organisation of one's thinking experiences (Coombs & Smith, 1998 & 1999).

Self-Organised Learning as a Model for Conversational Action Research

Given the agenda of developing learning organizations justifies the case for the introduction of action research into schools, as does the UK policy by the Teacher Training Agency (TTA) that seeks school improvement through changes of teacher practice *via* appropriate programmes of continuing professional development (CPD). While researchers have often been regarded as impractical 'know-alls' of theory, who impose their opinions on classroom practitioners without an appreciation of the *real* social context, there is now a need for a change in this mindset, which was recently recognised by the OECD (2002) as a movement towards national governments levering "useful research" based upon institutional practice.

More than just a self-centred form of internal reflection, social constructivism also plays a role in S-o-L through Learning Conversations with other organizational stakeholders. By recognizing the researcher as a *mutual stakeholder* and a genuine partner of the change-management educational process, resources can be shared and problems resolved more efficiently and effectively. Through social collaboration with the other stakeholders in the school environment, shared meaning is achieved and the ideas generated are more relevant to the social context at large. Such sharing of resources allows for increased creativity in the solutions designed, accompanied by increased ownership, responsibility and acceptance of outcomes. Better yet, if the action researcher is a living, reflective practitioner directly immersed within the school environment as a fellow team player. Hence, the notion that school improvement can be achieved through social change *via* participatory action research that builds upon the positive social aspects of the Hawthorne Effect as reported by Coombs and Smith (2003). This policy of the action researcher operating with equanimity within the workplace and identifying 'research questions' based upon mutually identified needs drawn from problems to be resolved within the social situation, was identified by Coombs (1995). He described this action research process as "social parity" and recommended that *all* participatory action research studies within learning organizations implement this practice as both an ethical social policy and action research methodology that improves the honesty and reliability of qualitative data obtained. Thus, social parity across members of an action research participatory team operates as a core qualitative analysis design assumption that influences the nature and choice of the deployed action research field instruments. The nature of this kind of policy applied to social action and enquiry-based research is derived from the Rogerian (Rogers, 1967) assumption of generating a "climate of trust" across all action research team members and seeks to validate the process through an improvement in the quality and reliability of the conversational data obtained.

As such, professional partnerships ought to be promoted as essential forms of organizational social interaction and survival. This is so those participants' in a learning organization can cope with the ever-increasing number of change-management events resulting from the corporate effects of globalisation upon societies around the world. Schools are not insulated from this globalisation process, as National Governments quickly respond to international league tables of educational results and instruct their education ministries to come-up with quick reform packages and implementation cycles. A good example is the recent Third International Maths and Science Study (TIMSS), which placed the US unfavourably in the

international league. This, amongst other reforms, has resulted in the Californian Department of Education rapidly bringing in new forms of testing in schools in a bid to improve results-based "standards", which has placed extra burdens on teachers and administrators.

Given the intensity of change, and how our teachers rarely ever have the time to evaluate their own teaching, action research as reflective practice is a practical approach for the management of change and new information. With great foresight, Dewey (1933) identified two types of teachers, those engaged in routine action and those engaged in reflection. The routine teacher demonstrates habitual behaviour and tends to react to situations and is likely to be traditional and authoritarian. The reflective teacher on the other hand is selective and, hence, engaged in "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends" (p.6). In describing the reflective teacher, Schön (1983) distinguishes reflection-in-action and reflection-on-action, which is similar to Elliot's (1991) cycle for practitioner action research. Reflection-in-action is the process of review and analysis whilst on-the-job. To be engaged in reflection-on-action, the participatory action researcher must have left the classroom and is re-constructing and reconstruing events and actions from recent memory of the experience. Underlying these definitions of reflection is the notion of conversational constructivism (Coombs & Smith, 1998), where reflection on personal experience becomes a learning opportunity and operates as a valuable qualitative episode if used in conjunction with appropriate action research S-o-L tools.

To aid the process of reflection, S-o-L as a practical approach offers the action researcher "conversational tools" such as the Personal Learning Contract (PLC) and Purpose-Strategy-Outcome-Review (P-S-O-R) templates to help structure the thought process (see appendices). These tools are an effective means for making sense of disparate pieces of experiential 'data', as they offer an avenue to scaffold learning in a systematic reflective manner. With the experiential information organised, 'meaning making' takes place as new links are made and relationships formed between discrete ideas. From a critical evaluation of social situations, the action researcher is more discerning when making decisions. The knowledge constructed out of the reflective process therefore becomes meaningful to the action researcher and relevant to the problem at hand. Coombs (1995) describes such forms of knowledge creation, using S-o-L content-free technology to manage information, as knowledge elicitation systems (KES).

S-o-L as an approach toward problem solving and learning allows for one to reach new levels of professionalism and thereby cope with difficult change-management situations. As Harri-Augstein and Thomas (1985) expound, the principles underlying self-organised learning relies on the educator to be self-motivated, reflective, critical, flexible, creative and disciplined in the spirit of self-improvement and effecting positive educational change. Well-integrated and accepted by the *leadership and participants* within a learning organization, action research can become a natural and powerful extension of the professional duties of an educator. Hence the imperative to gain school leadership support towards adopting the critical reflection framework of participatory action research for teachers involved in school improvement through self-managed change of classroom practice.

Self-Organised Learning through Learning Plans for the Student

For students, S-o-L also provides project management resources in the form of the Learning Plan (LP), which Coombs (2000) describes as a user-friendly conversational tool that allows

for the skills of critical thinking to be modelled, resulting in self-organized learning on the part of the learners. As a student-centred and systematic approach of learning based on constructivism, LPs offer a flexible, content-free technology allowing students to scaffold and manage their own learning. This is possible as its learning points are derived from small tasks and activities related to real life applications of the concepts, principles and theories presented, hence simulating the real world. These learning tasks play an important social function of helping the learner to personally identify with the abstract concepts and model personal knowledge from the experiential event. Such a controlled reflective process gives voice to prior knowledge, designing experiential linkages between past and present learning, thus increasing meaning making to a greater depth of personal relevance (see the Learning Plan exhibit in Appendix 5).

More than just chance-based discovery learning, there is systematic reflective problem solving occurring in a well-focused activities-based learning environment. The independent decision-making process of a learner's action is a reflective method that is dependent upon one's prior learned experiences to achieve conceptual learning. In addition, the pedagogical value of LP is to also enhance the critical thinking abilities of students. Student-centred scaffolding is possible as the LP defines discrete learning pathways that gain access to what Coombs defines as the "Learning Nodes", that is, regular reflective milestones. Teachers operating as Learning Coaches (Coombs & Smith, 1998) can negotiate LPs with students and arrive at individualised, customised, student-centred solutions with scope for self-directed learning. They help the student to plan and focus their thinking actions through the tasks they will complete. They help students come to an awareness of their critical thinking and problem solving skills necessary for independent learning and inculcate a positive attitude towards critical thinking through empowering student control of the curriculum tasks to be achieved. As Learning Coach, the teacher guides and supports the learning process. LPs are thus a flexible project management tool with built-in definite curriculum goals and assessment opportunities.

From an information processing perspective, such a reflective learning approach has its basis in constructivism. It results in many reflective ways in which to experientially structure and frame the world. There are many meanings and personal perspectives from which any event can be conceptualised and there is no single or correct meaning that learners should accept, no ultimate shared reality (Duffy and Jonassen, 1992). Situating cognitive experiences in socially authentic tasks and increasing transfer between in-school and out-of-school experiences is an educational goal described by Resnick et al (1991) whereby the emphasis is not on the acquisition of knowledge, but rather on the learning of thinking process skills geared towards problem solving and meaning making in social situations requiring such skills. Put another way, such a curriculum provides transferable thinking skills that prepares our students to function effectively and efficiently in the working world. In the light of this theoretical framework, the action research project will be described in the following sections.

Action Research and the Development of Critical Thinking Scaffolds

Following the formation of the partnership with SACP, several key issues were raised during the first formal meeting with the Principal and the Subject Head for National Education. The first concern was with regards to the ability of the teachers to teach thinking skills for Social Studies project management as they were unsure of what to look out for when evaluating project work and hence did not feel confident supervising project work. The teachers had no pedagogical tools or professional development approaches to resolve this problem prior to the

project. As such, they were also uncertain about how much independent learning the students could be engaged in and how this might be properly self-managed.

Of greater concern was students' ability to deal with the massive amount of information available on the World Wide Web. While it was acknowledged that the Internet would be an excellent source of updated information presented in attractive multimedia formats, experience from previous projects had shown that students were generally unable to filter and use information from printed media to their advantage and this reduced the quality of learning outcomes. As such, following the negotiation of entry, students were identified to obtain further evidence and confirmation of the perceived problem at hand (see Appendix 2 for the preliminary survey questionnaire). 39 students from a Primary 5 class were selected to complete the questionnaire, and responses such as, *"... have to do a lot of thinking", "... do not know how to summarise the information"* and *"... not knowing how to use the ideas and information",* confirmed the preliminary recommendation that students needed to be taught how to identify and evaluate credible websites relevant to their project tasks. They clearly needed to be engaged in critical thinking when selecting, reading and adapting a piece of Internet-based information for use in their projects.

We decided as a team that the more urgent of these problems was that of helping students to overcome their "cut and paste" mentality when writing up project reports. It was agreed that the root of the problem was that students had no idea about how to think critically. They needed to be exposed and developed as natural critical thinkers. Teacher enthusiasm and skill development would follow naturally when one has come to a deeper understanding of the students' needs and a suitable solution has been identified to help them. Solomon and Morocco (1999) later confirmed this intuitive approach towards curriculum development.

In addition, this action research project also considered how educators in schools could cope with the rapid curriculum changes being imposed upon them by the Singapore Ministry of Education. Teachers' required a new form of personal pedagogical support and opportunities for professional development. This was so that they could operate effectively and efficiently within whatever newly reformed educational framework was required from top-down management within the school system. The action research aim was to provide team-based systems thinking support appropriate to empowering teachers' as task managers within their own learning organization. Coping with change through team-based task management acts ultimately to ensure high quality and responsive learning systems on their part through instigating bottom-up personal management skills within their newly defined organizational roles and tasks.

It was decided within the social context of this action research team that the key educational problem facing the teachers was the students' lack of critical thinking ability to manage large chunks of information. The school was interested in considering how critical thinking skills can be developed, tested and finally, evaluated for the primary school social studies curriculum. After the initial stage of research and planning guided by a Purpose-Strategy-Outcome-Review (P-S-O-R) reflective template, a pilot workshop was conducted with the Primary 4 students in November 1999 (see Appendix 4). Essential critical thinking skills such as brainstorming, classifying and analysing had been identified and they were imparted at an action research professional development workshop. Despite the hands-on opportunities provided at the workshop, further dialogue with the teachers indicated that students were not able to see the relevance of the skills in a real life context. They were therefore unable to *transfer the skills* across disciplines. Clearly, a refinement of the research focus was required.

This led to another cycle of reflection and review of literature. On further reflection, Learning Plans (LP) was identified as a potential solution to the problem. When the refined solution of using LPs was presented to the school's Principal, it was accepted with much enthusiasm. The action research team of teachers felt that a general approach of teaching using real-life examples would be more effective in the learning of information management skills. It was also felt that more than just critical thinking skills, it was *attitudes towards* critical thinking that should be imparted to students. Greater transfer of critical thinking across subject disciplines was expected as the pedagogical goal, which was also the desired action research outcome showing impact of student learning as an improvement of core practice within the school as a learning organization. It was also decided that the teachers themselves should be engaged in using this new technology and hence a S-o-L workshop was organised for the Primary 5 teachers in March 2000 to introduce the pedagogical and practical aspects of designing and authoring their own learning plans. The LPs were designed by the teacher in accordance to their *own* classroom needs and were implemented over a two-week time frame. Preliminary evaluation of the research feedback through observations, interviews and questionnaires indicated that the curriculum implementation of LPs had been successful in meeting the pedagogical objectives identified by the teachers.

Additional reflective tools used to help organise and capture qualitative data of the action research project were: the project scheduler; talkback sheets; and, a personal learning journal (Coombs, 1995). The regular conversations with the Principal were also recorded. This was necessary to ensure that the school's philosophy and objectives were continually being met. Another action research team partner in this project was the Head of Department for Science, who co-ordinated the administrative aspects and logistics of the project. Such collaborative efforts were crucial in coming to a deeper understanding and appreciation of the social context needs in which the action researcher and team was working within.

Improved Critical Thinking Dispositions

Following a review of the literature on critical thinking, the definition offered by Halpern (1997) was adopted for evaluation purposes as it had potential for generalisation across disciplines. According to Halpern (1997), critical thinking is "the use of those cognitive skills or strategies that increase the probability of a desirable outcome … describ(ing) thinking that is purposeful, reasoned, and goal directed" (Halpern, p. 4). More importantly, she further suggests that for critical thinking to be effective, the attitude and disposition of the learner needs to be developed. Good critical thinkers will exhibit the following dispositions or attitudes:

- Willingness to plan - (*developing a personal)* habit to counter impulsivity.
- Flexibility - willingness to consider new options, try things in a new way and reconsider old problems - suspend judgment, gather more information, and attempt to clarify issues.
- Persistence - diligence following the willingness to start.
- Willingness to self-correct - positive mindset towards feedback and improving upon feedback by abandoning ineffective strategies and subsequently coming up with improved solutions.
- Being mindful - also known as metacognition - an awareness of one's own thinking**.**

- Consensus-seeking - high-level communication skills to work towards putting thoughts into action (Halpern, pp.11-12).

Evaluating and designing pedagogical tools and procedures for improving thinking abilities, such as the attitudes and dispositions suggested by Halpern (1997), can be based on the *general structures of meaning* heuristic offered by Harri-Augstein and Thomas (1991). The three-step critical thinking criteria suggested includes: the elicitation of items of meaning; the sorting of relationships; and, the display of final patterns (p.271).

In this action research project, students who had been introduced to LPs were required to complete a questionnaire. In addition, interviews were also conducted with focus groups of teachers who had performed their action research roles as Learning Coaches for their classes. The qualitative data obtained was analysed for evidences of the thinking attitudes suggested by Halpern using the conversational Talkback Record Sheets (Coombs, 1995 and Lee, 2001). Some samples of findings from the student responses were as follows:

- Willingness to plan
  "I like lessons using learning plans because I can do what I plan".
- Flexibility
  "No need to listen to teacher and have freedom to think and do what we are thinking".
- Persistence
  "I like learning plans because they make me think more".
- Willingness to self-correct
  "You can refer to the learning plan if you still don't understand".
- Being mindful
  "It makes me use a lot of my brains".
- Consensus-seeking
  "We work in pairs so if we don't understand, we can help each other".

Some corresponding observations from the teachers were as follows:

- Willingness to plan
  "… they were able to carry out things quite independently. They actually understood what we have asked them to do".
- Flexibility
  "LPs benefit (as) they are in control of their own lives and in control of the lessons".
- Persistence
  "I see not being able to work independently as maybe a temporary hitch, okay, which they will overcome with more practice, more exposure, more of these sorts of lessons".
- Willingness to self-correct
  "Some of them realise the results aren't like this and actually go and do it again".
- Being mindful
  "… it does require thinking in the sense that students have to figure out what is required of them to construct their own information".
- Consensus-seeking

"… I can see one or two girls who were in charge and knew how to coordinate everyone's efforts…"

This action research evidence suggests that the use of LPs has resulted in students' increased interest in learning as it offers flexibility and, more importantly, improved learning. These outcomes are possible as the use of LPs help a learner to scaffold their own learning. By making learning objectives as simple and clear as possible, students are able to take control of their own learning experiences. If these attitudinal changes described are perpetuated, then in a wider context, this action research project has imparted to students the essential life skills of information management through approaching problem solving tasks with the right critical thinking dispositions. The increased confidence and thinking competencies acquired should be transferable to all other fields of learning over the long run.

Implications for Education

S-o-L clearly offers a comprehensive framework for educators and policy makers who are looking to implement school improvement reforms. As an approach to problem solving and learning, it certainly allows for one to reach new levels of professionalism. As Thomas and Harri-Augstein (1985) expound, the principles underlying S-o-L relies on the educator to be self-motivated, reflective, critical, flexible, creative and disciplined in the spirit of effecting positive educational change. Well-integrated action research can become a natural extension of the professional duties of an educator, a change which the Ministry of Education in Singapore has begun advancing. This is a change, which other education systems could also be looking into, particularly in the UK where the Office for Standards in Education (Ofsted) requires all higher education CPD programmes to provide evidences of school improvement through impact upon student learning.

Being a content-free technology, where the methods are independent of the topic learnt, Knowledge Elicitation Systems are intended for a wide educational audience, transcending disciplines and cultures. With emphasis on the processes of reflective learning, and with its basis of drawing upon the specific content of each user's experience as their own unique and necessary learning resources for personal growth and development, self-organised learning should have wide appeal to all educators and instructional designers. As a systematic procedure for "constructively recruiting" resources into learning, S-o-L provides validity and reliability *via* the reduction of personal prejudices, biasness, "disruptive feelings and wilful misunderstanding". S-o-L technology offers systematic thinking procedures "in which the personal meaning of the client can be collected, unadulterated by any need to simplify or translate it into a common or standardised language" (Thomas & Harri-Augstein, 1985, p.18).

As a thinking technology support for learners, S-o-L conversational tools can easily be integrated into administrative and curricular educational systems. Also espoused by Jonassen (1996), who describes pedagogical procedures for using computers in education as critical thinking "Mindtools", they work best when presented in the form of computerised templates (Coombs & Smith, 1999) which are easily adaptable to the specific needs of each user's set of learning tasks. For example, LPs as an aid to guide the students' research process is especially suited for younger students who are overwhelmed by the open nature of starting research from scratch and lack any form of psychological schema from which to manage such an open learning situation. The LP can, for example, complement the use of learning resources such as

a CD-ROM encyclopaedia, by providing guiding questions and instructions as to the relevant aspects of the content. This is important as it eases students into the use of technology rather develop discontentment or fear in dealing with massive amounts of data and this operates as what Coombs (2000) refers to as a critical thinking scaffold.

With regards to further action research possibilities, the Singaporean case study school has expressed an interest in developing new learning opportunities from having their primary-level school children work with older students in secondary schools and junior colleges that are already experienced in project work. By extending the learners' domain and introducing cooperative peer-based learning, further research into developing conversational tools such as a Group Learning Biography (GLB) could also be investigated (Thomas and Harri-Augstein, 1985).

Conclusion

Starting with a scenario of the educational challenges in the 21st century, this paper has attempted to craft a response to these new economy demands by highlighting the relevance of self-organised learning for educators and students. S-o-L has demonstrated the potential to empower learners whilst building upon their confidence to take control of their own learning. It can be said with confidence that the pedagogical principle of social constructivism will remain of great value in any model of instructional design.

From the teachers' perspective this action research project will contribute towards professional development in Singapore, for while action research is not a new field of educational research, it is an area that has, in general, not been widely implemented in Singapore's schools. It is timely that Singapore's Ministry of Education is now considering ways of actively promoting action research as an attempt to change the professional profile of the teacher. The classroom teacher is envisaged as a teaching professional engaged in active reflection, problem solving and more importantly, taking control of decision-making and risk-taking. Such a change in the professional development mindset is required if schools aspire to become learning organizations capable of embracing institutional change-management in an innovative manner (Senge, P., *et al*. 2000). In a 'borderless' world, there exist many possibilities for information exchange and intellectual globalisation and S-o-L pedagogy conducted through an action research paradigm is the appropriate response for both individuals and organisations to cope with these dynamic changes.

References

Broadhead, P. (1989). Working together towards a better understanding of the primary classroom. In Lomax, P. (Ed.), *The management of change: Increasing school effectiveness and facilitating staff development through action research*. pp.130-146. Clevedon, Avon, England: Multilingual

Coombs, S. J. (1995). *Design and conversational evaluation of an information technology learning environment based on self-organised learning.* Unpublished doctoral thesis, Centre for the Study of Human Learning, Brunel University, London.

Coombs, S. (2000). The Psychology of user-friendliness: The use of information technology as a reflective learning medium. *The Korean Journal of Thinking & Problem Solving*, *10*(2), 19-31.

Coombs, S. (2002). Using critical thinking scaffolds to support curriculum project work. In A. Chang & C. Goh (Eds.), *Teachers' handbook on teaching generic thinking skills*, Singapore: Prentice Hall.

Coombs, S. & Smith, I. (1998). Designing a self-organized conversational learning environment, *Educational Technology, 38*(3), 17—28.

Coombs, S. and Smith, I. (1999). Integration of critical and creative thinking skills into Singapore's IT post-graduate teacher training programme. *Change: Transformations in Education, 2*(2), 80-92.

Coombs, S. J. & Smith, I. D. (2003). The Hawthorne effect: Is it a help or hindrance in social science research? *Change: Transformations in Education, 6*(1), 97-111.

Coombs, S. & Wong, P. (2000). Supporting student-centred learning with IT, Chapter12 in Williams, M. (Ed.). *Integrating technology into teaching and learning: An Asia-Pacific Perspective* (Ed.) 1st Edition Singapore: Pearson Education Asia.

Dewey, J. (1933). *How we think.* NY: Dover Publications.

Duffy, T. M. and Jonassen, D. H. (1992). Constructivism: New implications for instructional technology in Duffy, T. M. and Jonassen, D. H. (Eds.). (1992). *Constructivism and the technology of instruction: A conversation.* Hillsdale, N. J.: Lawrence Erlbaum Associates, Publishers.

Elliot, J. (1991). *Action research for educational change.* Buckingham, UK: Open University Press.

Gore, J. M. and Zichner, K. M. (1991). Action research and reflective teaching in preservice teacher education: A case study from the United States. *Teaching and teacher education, 7*(2), 119-135.

Halpern, D. (1997). *Critical thinking across the curriculum: A brief edition of thought and knowledge.* Mahwah, New Jersey: Lawrence Erlbaum.

Harri-Augstein, E. & Thomas, L. (1991). *Learning conversations: The self-organized learning way to personal and organizational growth*. London: Routledge & Kegan Paul.

Jonassen, D. (1996). *Computers in the classroom: Mindtools for critical thinking.* NJ: Prentice Hall.

Kelly, G. (1955). *The psychology of personal constructs*, Volumes 1 & 2. New York: Norton.

Lee, V. (2001). *Evaluating critical thinking pedagogy to support primary school project work using an action research approach.* Unpublished MEd. thesis, Nanyang Technological University, National Institute of Education, Singapore.

Nicolai, M. (1994). *Magdalene of Canossa – Educator*. Rome: General Curia, Canossian Institute.

OECD (2002). Organisation for Economic Cooperation and Development (OECD) and International Centre for Educational Research (CERI) review: *Educational Research and development in England*. Published by OECD-CERI CERI/CD(2002)10, September

2002, (http://www.des.gov.uk/research/downloads/OECD_Review-Educational_Research_and_Development_in_England.doc).
Resnick, L. B. and Levine, J. M. and Teasley, S. D. (Eds.). (1991). *Perspectives on socially shared cognition.* Washington, DC: American Psychological Association.
Revans, R. (1980). *Action learning: New techniques for management*. London: Blond & Briggs.
Rogers, C. (1967). On becoming a person: a therapist's view of psychotherapy. London: Constable.
Schon, D. A. (1983). *The reflective practitioner.* NY: Basic Books.
Senge, P. M. (1990). *The fifth discipline.* New York: Currency Doubleday.
Senge, P., et al. (2000). *Schools that learn.* London: Nicholas Brealey Publishing.
Sirotnik, K. (1990). Society, school, teaching and preparing to teach. In Goodlad J., Soder R. and Sirotnik, K. (Eds.) The moral dimensions of teaching. San Francisco, CA: Jossey Bass. In Gore, J. M. and Zichner, K. M. (1991). Action research and reflective teaching in preservice teacher education: A case study from the United States. *Teaching and teacher education, 7*(2), 119-135.
Solomon, M. Z. and Morocco, C. C. (1999). The diagnostic teacher. In Solomon, M. Z., (Ed.), *The diagnostic teacher: Constructing new approaches to professional development*. 231-246. New York: Teachers College Press.
Thomas, L. F. and Harri-Augstein, S. (1985). *Self-organised learning: Foundations of a conversational science for psychology.* London: Routledge & Kegan Paul.

Appendix 1 The Personal Learning Contract Conversational Template, CSHL©

Action Researcher's Project Evaluation Report

Name	Vivien Lee	Tutor	A/P Steven John Coombs	Date	31/10/99
Project Title	Evaluating critical thinking pedagogy to support primary school project work through an action research approach				

	Future vision of project	On-the-job reflection of project	Reflective analysis of project
Purpose	**What is my purpose?** My purpose is to impart a set of thinking skills which students may use to support the research process during project work – enabling students to think critically when dealing with massive information loads. My vision was one where students could feel empowered and confident and to have these tools /skills formally integrated into the curriculum.	**What became my purpose?** Given the constraint of my limited contact time with students and their general lack of interest in learning CT skills, a hands-on experiential learning approach will be used instead. Through learning plans that function as scaffolds, tasks are broken into manageable bits giving students control. Together with mini-projects, students will be immersed in a real life learning context.	**Describe essential differences** Rather than teaching critical thinking skills out of context, an immersive approach was used instead. Rather than skills, attitudes such as consensus seeking, persistence and flexibility were promoted through hands-on mini-projects related to the real world via a subject identified by the teacher.
Strategy	**What actions shall I take?** Through conversations with the principal and the subject head, I determined the problems faced by the school. This was followed by a survey of literature to identify the tools that students required. These were tried out at a preliminary workshop for a sample of students with the intention of identifying the relevant skills, the appropriate level of difficulty and students' initial experiences to the skills.	**What did I do?** Through self-reflection and subsequent follow-up with my supervisor, it was decided that students prefer more independence. The problem also lies with project work at the design stage. A workshop for teachers to introduce them to PSOR and learning plans will equip them to design tasks for project work. The templates introduced may function as tools that teachers may use to assess for evidence of critical thinking.	**Differences between plan & action?** Rather than taking the teaching tasks into my own hands, the responsibility for imparting these critical thinking attitudes was passed on to the teacher who knows the class best. This gave teachers ownership of the problem. With a vested interest in improving classroom practice, teachers identified the objectives for the lesson and considered how critical thinking could be imparted.
Outcome	**How shall I judge my success?** Through the feedback of the students – conversations, emails and response during the workshop. Evidence of success - students continued use of the tools, good work submitted, interest and enthusiasm. Further sharing with the supervisor, principal and teachers will be necessary to discuss which tools to disseminate at the teacher's workshop and to adopt permanently.	**How well did I do?** The success of learning plans will be gathered at a post-workshop follow-up with the teachers who will provide feedback on how their students responded to the learning plans. Greater acceptance and enthusiasm from both management and teachers. Convinced about the usefulness of LPs. Students also enjoyed the opportunity for discovery learning.	**Essential differences** Semi-formal interviews conducted with teachers and students after learning plans were implemented. A formal questionnaire was also completed by the student sample. LPs clearly a better solution to support critical thinking.
Review	**What were the strengths?** Teachers self-initiating the problem solving process in view of the specific problems their classes encounter with an independent researcher such as myself being adopted as a resource person. Teachers have a set of easy to use templates to facilitate reflection.		**What improvements are needed?** Would have been good if teachers had more time to reflect on the current classroom practice and increase familiarization with LPs. To encourage teachers to integrate LPs as a tool for teaching on a regular basis, rather than as a once-off project.

Appendix 2 Preliminary Survey Questionnaire

1. Do you enjoy doing project work?

2. How do you go about doing project work? What are the steps you take?

3. What do you like about doing project work?

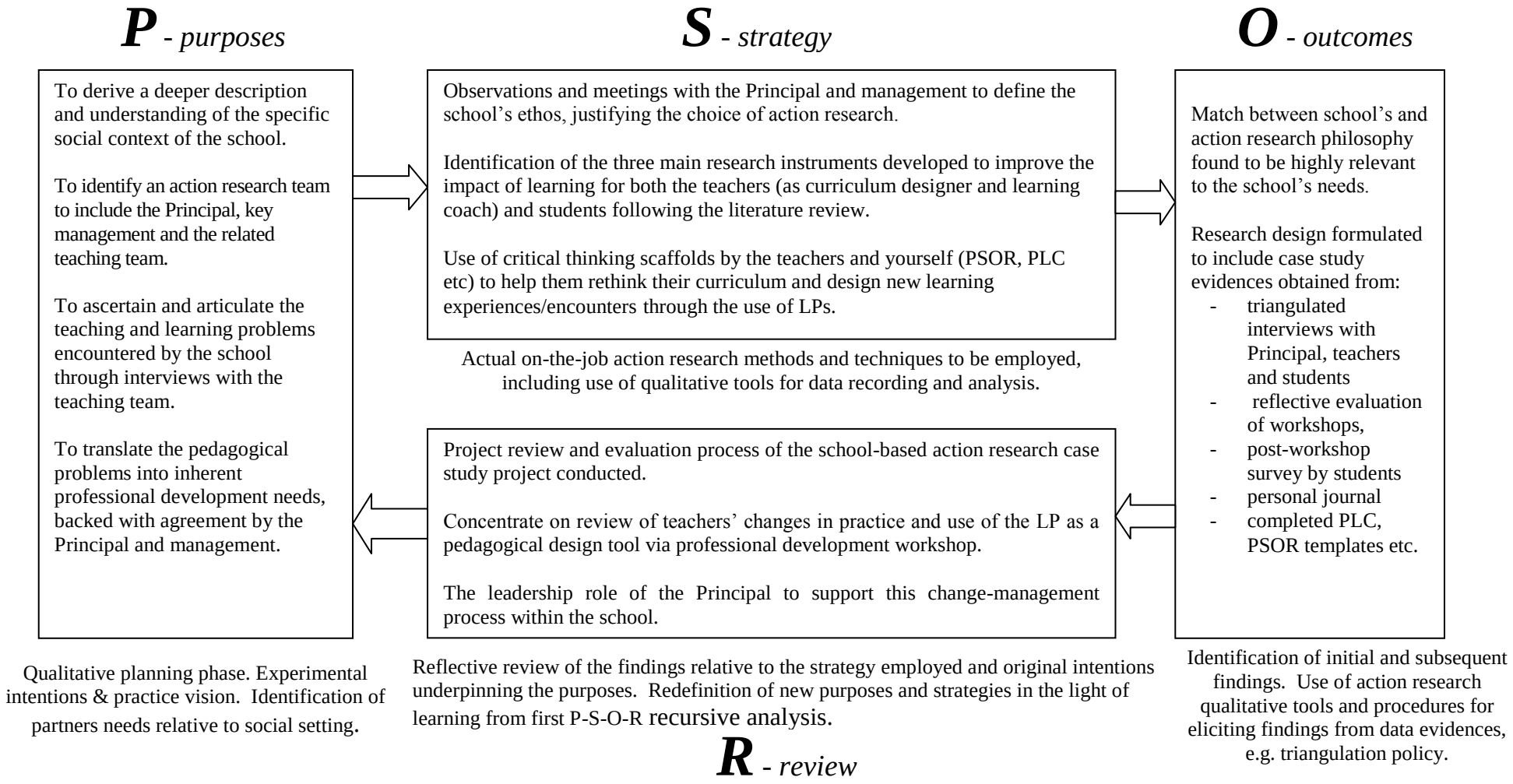
4. What do you dislike about doing project work?

5. What makes doing project work difficult?

Appendix 3 P-S-O-R Conversational Template for Action Research Project Management

Organizational Chart for Eliciting Qualitative Data

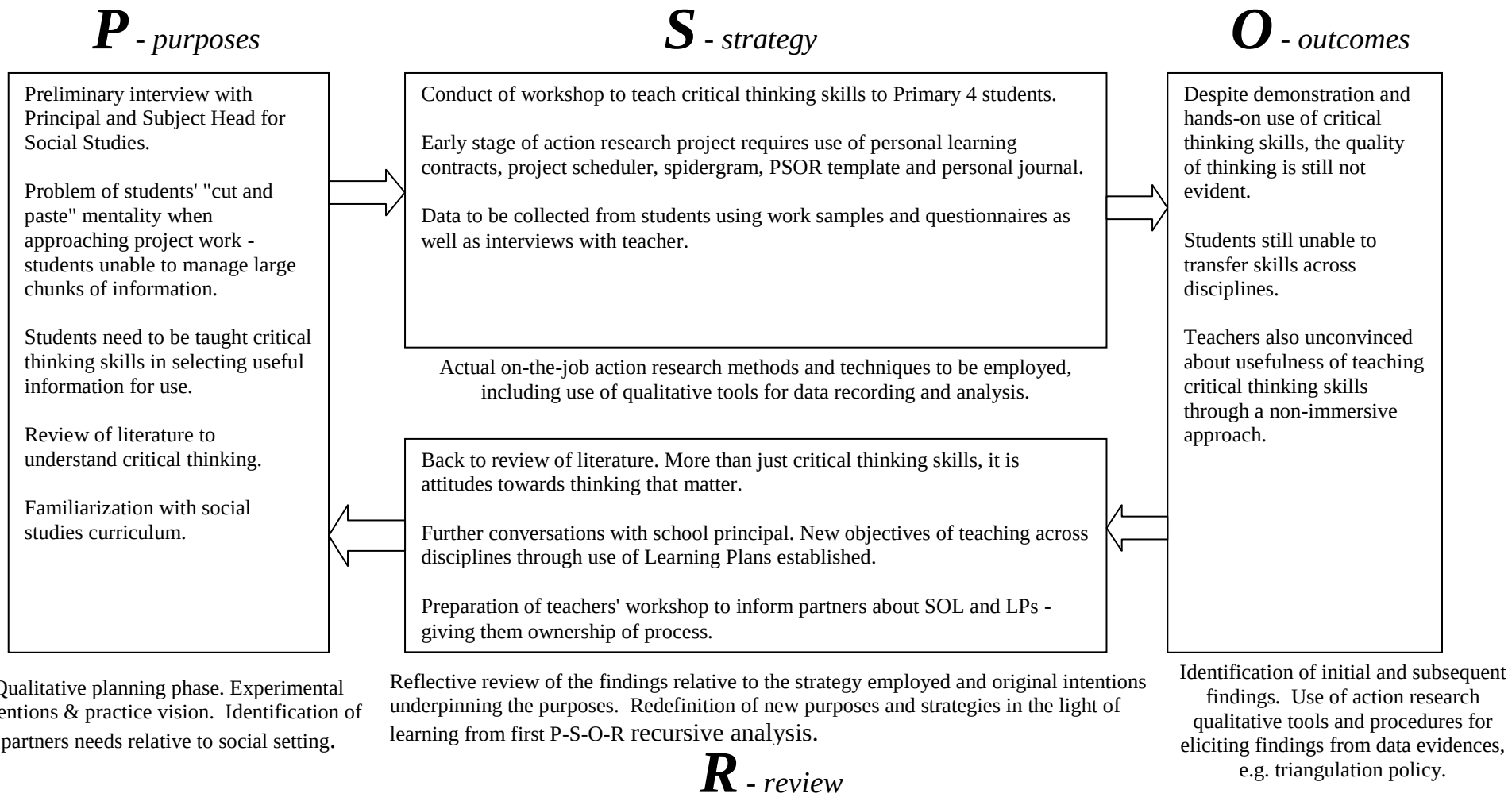
Action Researcher:	Vivien Lee	Project Title:	Evaluating critical thinking pedagogy to support primary school project work through an action research approach
Organization:	NIE/NTU	Date elicited:	28/8/99



Appendix 4 P-S-O-R Conversational Template for Action Research Project Management

Organizational Chart for Eliciting Qualitative Data

Action Researcher:	Vivien Lee	Project Title:	Evaluating critical thinking pedagogy to support primary school project work through an action research approach
Organization:	NIE/NTU	Date elicited:	28/8/99



Appendix 5 Learning Plan

Learning Objectives

By the end of this workshop, you should be able to:

1. List examples of evaporation.
2. Infer that when water evaporates it goes into the air as water vapour.
3. Explain how wind affects the rate of evaporation.

Tasks 1 and 2 are to be completed with your partner. Complete Task 3 individually.

Task 1: Review of concept

Collect the resource basket from the teacher's desk and take 20 minutes to complete Task 1.

1. Study the photograph samples:
   Sample A: Drying of puddles of water
   Sample B: Drying of clothes
   Sample C: Drying of vegetables, fruit
   Sample D: Drying of our kin after bath and perspiration
   Sample E: Loss of water from aquariums/ponds

Record your answers in the worksheet attached.

2. Identify the similarities amongst the photographs.
3. What process has taken place?
4. Next, put a drop of rubbing alcohol on your fingertip.
5. What has taken place?
6. Write your conclusion in the space provided.

Task 2: Factors affecting the rate of evaporation

You have 35 minutes to complete Task 2. Task 2 is an activity in which you will determine how wind will affect the rate of evaporation.

1. In the basket, you will find two handkerchiefs. How are they alike?
2. Wet the two handkerchiefs completely.
3. Hang the two handkerchiefs in the classroom on the line provided by your teacher.
4. Note the time on the clock and record this in the worksheet.
5. Use a fan to blow on one of the handkerchiefs for 10 minutes.
6. At the end of ten minutes, stop the fan. Record the time in your worksheet.
7. Feel the handkerchiefs and record your observations about the wetness of the two handkerchiefs.
8. Record the time.
9. Continue blowing at the same handkerchief for another 5 minutes.
10. Feel the handkerchief after 5 minutes. Record your observation.

- What do you think has taken place?
- Where has the water gone?
- Why do the two handkerchiefs feel different?
- What conclusion can you make?

Bonus - Task 3: Use of CD-ROM

1. Complete the quiz in unit 3 of the CD-ROM.
2. Record the time you took to complete the quiz and your score in the worksheet.