1.1 Overview

This research is about experimenting with ideas that could deeply change learning environments. This thesis presents a new learning framework and a case study based on a five-week fieldwork conducted with a group of eight-graders at a rural school in northern Thailand. This research develops new discussions both in the theoretical and empirical level.

1.1.1 Theoretical Contributions

The basis of this thesis joins many works\(^1\) in its constructionist philosophy [Papert, 1993]. However, the ideas presented are unique in the following ways:

- I put constructionism into the context of Ivan Illich’s notion of conviviality [Illich,

\(^1\) Examples of these works are [Papert, 1980], [Martin, 1994], [Resnick, 1994], [Cavallo, 2000], and [Bers, 1999].
Although a relationship between Papert’s work and Illich has been noted before (See [Falbel, 1990] and [Segall, 1990]), I believe that my development goes further and has a unique character.

- Constructionist writers generally give importance to projects. However, only few have paid attention to features in the development of a project conducted by school-aged students (See [Cavallo, 2000], [Harel, 1991], and [Kafai, 1995]). I specifically use and add to the idea of emergent design [Cavallo, 2000] in my framework. I make a more systematic and theorized approach that could identify patterns and strategies that would be useful to constructionist educators.

- I give special attention to the role of tool-making in project work and use the making of tools in a double role: as tools and as projects. I focus on the area of electronics and mechanics as well as programming.

- I synthesized and developed from the idea of conviviality a concept of dynamic equilibrium in the interplay between different modes of learning and teaching.
1.1.2 Empirical Level Contribution

- I illuminate patterns in the learning environment that are specific to a particular (Thai) culture and how they effect the implementation of the learning framework.

- I reveal patterns in the dynamics of the evolution of projects. I describe carefully and in detail: the development of learning activities; how the activities can go through phases; effects of the existing culture; importance of trust and respect. The emphasis of this research is on the initial reaction of learners who have never been exposed to any learning styles other than the traditional practice of schooling.

- I probe the complex relationship between a child’s work and real community applications.
1.2 Motivation

The basis of this thesis is to present a qualitative analysis of a learning environment that is different from and often runs counter to the traditional education paradigm. The general tone for the framework follows the belief Papert and Cavallo have that [Papert and Cavallo, 2000]:

- Digital technology is a powerful force that is already changing practices of learning.
- Though the movement is massive, it is unacceptably limited.
- The fundamental limiting factor is the deficiencies and rigidities in thinking about learning.

According to Papert and Cavallo, the development of digital technology has outpaced the development of cultures that make effective and humane use of technology in learning environments. The learning framework presented in this thesis is intended to contribute to this overlooked area. The hope is that this work, together with many others, would serve as evidence that a learning revolution is possible and would contribute to the public realization of the time, effort, research, resources, and commitment required for such revolution to come about.
1.3 Conviviality

1.3.1 General Idea

Conviviality is the term that Ivan Illich uses to define a society that prefers the maximization of individual’s creativity, imagination, and energy to the maximization of outputs, where the latter usually leads to an industrial mode of production. The traditional schools are clearly the opposite of conviviality, as it focuses on the production of students in an industrial mode [Illich, 1973; P.19]. Students are put through a standardized process that would transform them into an educated person. Thus, in order to be educated, a person is required to spend x number of years in schools, to study what they are told, and to pass a set of test. Anybody who can manage to handle this process deserves to be called an educated person.

In a convivial environment, the emphasis is the opposite of shaping and squeezing people through a standardized process. Conviviality aims to reach out to each person’s diversity and make the most of the interest, energy, and imagination each has. Learners’ primary motive in a convivial environment is not to gain a higher social status through the acquisition of an education degree. Rather, learning takes place by the desire to know
more about the world and to enrich their environment with their personal meaning.

### 1.3.2 Implementation

In addition to the theoretical framework, I need to decide how to form the implementation of the learning activities. I believe there is more than one way to build an environment that nourishes conviviality. However, I suggest in this research a practical framework that evidently shows a good result. Here are the design-decisions I made to carry out the case studies presented in this thesis:

**Learning activities:** The activities were project based. Digital technologies (e.g. computers, Lego Mindstorms\(^2\), and digital cameras) were the primary tools and were used to construct artifacts (e.g. computer programs, Lego cars, and electronic light switches). This constructionist approach resonated with Illich’s emphasis on using tools to promote conviviality. By constructing artifacts, they were engaged in planning, problem solving, and reflection of their work. These activities promoted a process of externalization and re-internalization of learners’ ideas, which were based on their interaction with the physical object and the

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\(^2\) See more information about Lego Mindstorms in Chapter 4
environment [Papert 1993; P.142]. Externalization of ideas has proven to be a preferred process in an environment that promotes learners’ imagination and creativity. The case studies presented in chapter four shows examples of what I mean.

**Activity development:** I focus on the interplay between different modes of teaching and learning. Though activities that emerge from the students are preferred, it does not mean the teachers’ interest and knowledge should not have any valuable influence. Thus, though the final decision of what to do belongs to the students, I concentrate on developing relationships in the learning community that leads to a collective and collaborative development of ideas. Only few researchers have focused on this process (as mentioned in 1.1.1). I present a detailed documentation and discussion of the process in chapters four and five.

**Time and participation:** The learning activity was carried out as an after school program. Participating students were able to come and leave as they wanted. This arrangement was necessary. An environment that learners are forced to participate would not provide an ideal condition for students to develop projects that are personally meaningful and that exercise their energy and imagination.
1.3.3 Tool Construction

One of the important contributions I have made in this research was my emphasis on identifying activities that involve tool construction as a theme that fosters a convivial environment particularly well. In chapter two, I discuss how learners’ fluency with their tools and how their interaction with their community play an important role in the development of conviviality. The case studies suggest these two aspects happen felicitously in tool construction projects. For example, one student built a programmable power switch. Because it was supposed to be a general-purpose tool, the student had to generalize the design not to include any features that would tie the use of the tool to any specific device. It was a process that made the students go one step further in the design process thereby gaining more fluency with the tools used to construct the switch. Towards the end of the five-week project, the switch was used at a fish farm to control lights that attract insects. The project involved student’s parents who benefited from the use of the switch. Thus, the use of the tool created an interaction between the toolmaker and his or her community, which was beneficial to both parties.
Tool construction also benefited students in the learning process. For example, students’ tools served as a tangible unit that contained the toolmaker’s ideas and experiences. Since the tools were meant to be applied in different situations, the embedded ideas and experiences were portable and conveniently reusable. New ideas were built on top of existing ones for each new use. In addition, because tools were most likely to be used by many people, they created a feedback loop for the toolmaker. The feedback allowed the toolmaker to reflect and to further develop his or her ideas in the making of the tool. Examples of these benefits are shown in the case studies.
1.4 Case studies.

In chapter four, I present a concrete example of a learning environment that was developed based on the framework presented above. Chapter five reflects the underlying ideas of the learning framework and presents crucial issues that must be taken into account when a theoretical framework is transformed into learning activities. These issues include the reaction from students, mindset changes of teachers, resource constraints, and cultural behaviors. Some examples of the case studies include:

- Situations where the teacher and the student have different motives and how positive outcomes can happen when the teacher is opened to students’ ideas and let go of his or her total authority. This is a case of a dynamic tension [Cavallo, 2000] that the teacher has to deal and has to make decisions based on the specific situation in order to keep students ownership over their learning activity while not losing the opportunity to learn new ideas.

- How a student that failed completely in the traditional school could perform and learn extremely well when he is given the respect of his
learning interest, pace, and style. I document how I gradually develop a relationship of trust and respect that leads to the change.

- How teaching can still be part of the learning activities without depriving students’ from their ownership of the learning activity. I discuss how teaching is used in a convivial way. That is, teaching is used to empower the students based on what they need and not as an activity imposed by someone else.