Digital Technology for Conviviality: Making the Most of Learners' Energy and Imagination

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Abstract

This paper contributes to the body of research on constructionist philosophy. It expands the conceptual framework by linking constructionism to Ivan Illich's notion of conviviality. The emphasis on conviviality allowed a systematic and theorized framework to identify and discuss the pattern in the developmental process of learning activities, which is an area in the constructionist framework that needs more study. I present a concept of dynamic equilibrium that allows different methods of learning and teaching to intertwine. I present a case study based on a five-week fieldwork conducted at a rural school of northern Thailand.

Keywords

Learning, Conviviality, Constructionism.

1. Introduction

This research is about experimenting with ideas that could deeply change learning environments. This paper 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 as follows:

- The basis of this paper joins many works (Papert, 1980), (Martin, 1994), (Resnick, 1996), (Cavallo, 2000), (Bers, 1999) in its constructionist philosophy (Papert, 1993). However, I put constructionism into the context of Ivan Illich's notion of conviviality (Illich, 1973).
- Although a relationship between Papert's work and Illich has been noted before (Falbel, 1990), (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 (Cavallo, 2000), (Harel, 1991), (Kafai, 1995). I make a more systematic and theorized approach that could identify patterns and strategies that would be useful to constructionist educators.
- I reveal patterns in the dynamics of the evolution of projects in a convivial environment. I describe carefully and in detail: the development of learning activities; how the activities can go though 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.

2. Theoretical Background: Conviviality

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). 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 a certain 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 though 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. A Learner's 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.

3. Implementation

A contribution of this paper is to convey the lessons and experiences learned from implementing the convivial framework in a place where traditional schooling had previously been the only mode of teaching and learning. While a convivial learning environment may sound casual and thus easy to implement, conviviality does not happen merely by removing non-convivial aspects of school. Conviviality is also not the inverse of school. For example, reaching out to each learner's interest does not mean there cannot be any intervention from the teacher. Such an extreme approach would lead to what John Dewey called the Either-Or philosophy, where "the knowledge and skill of the mature person has no directive value for the experience of the immature" (Dewey, 1938). In this work, I propose a concept of a dynamic equilibrium where the decision of what to do is highly contextual. I will present a detailed documentation and discussion of this process in the case studies.

I believe there are many ways to nourish conviviality in a learning environment. However, I suggest in this paper a practical framework that evidently shows a good result. The following are the design-decisions I made to carry out the case studies presented in this work:

3.1 Learning activities: Constructionism and Digital Technology

The activities were project based. Digital technologies (e.g. computers, Lego Mindstorms[1], and digital cameras) were the primary tools and were used to construct artifacts (e.g. computer programs, Lego cars, and electronic light switches). This

[1] A programmable device with sensors and actuators. See more information at http://www.mindstorms.com. Lego Mindstorms is often referred to as the RCX Brick.

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 environment (Papert 1993). Externalization of ideas has proven to be a preferred process in an environment that promotes learners' imagination and creativity.

3.2 Activity development: An Emergent Approach

Learning activities typically happened in the form of projects. The basis of projects was developed by probing the background, interest, and existing activities of learners and by observing the local cultural context. This emergent approach suggests means for project development that allows the learning activities to have more relevance to the learners' lives. 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.

3.3 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.

4 Case Studies

I present here concrete examples of a learning environment that was developed based on the framework presented above. I discuss the underlying ideas of the learning framework and present crucial issues that must be taken into account when a theoretical framework is transformed into learning activities.

4.1 Mobilizing Conviviality

4.1.1 First Contact: Diverting from Years of Traditional Education

When I walked into the computer lab on the first day of the program, all ten students were already waiting there. The atmosphere at that moment was similar to what one would feel at the beginning of a class lecture: students were waiting for the teacher to talk, everyone has a notebook, and the whiteboard was freshly cleaned. So, I told the students that this activity was an after-school club and not a special training program. They should feel comfortable to come and leave as they wish. They could work individually or in groups. They could work inside or outside the computer lab. My goal was to make the environment as casual and relaxed as possible. I could, then, get to know the students, see what they had already done, and start developing project ideas from there. Hence, I would be trying to build a convivial learning environment from the very beginning.

However, I felt that the students were not sure what I meant. They were waiting for me to do or teach something. I soon realized that I had to start working on projects right away. I had a few Lego Mindstorms sets with me. So, I opened the boxes and invited students to join me. Meanwhile, I made sure I mentioned to them that not everyone had to stay. Students who were not interested in Lego were free to work on other projects. But since it was their first experience with Lego Mindstorms, all the students were interested and wound up playing with Lego. Everyone appeared to enjoy experimenting with the new material. They made cars and added motors to make them run. I took that opportunity to talk to students and to get to know them better. The first day to me was a success! We were able to get past the traditional ways of teaching and learning. Little did I know about the tougher times that were coming.

Over the first week we ended up working on projects for the upcoming children's day festival. Students were building games for other students to play at the festival. One of the groups consisted of four students: Lek, Tan, Non, and Pan. Lek and Tan were responsible for constructing a Lego car while Non and Pan were responsible for a Lego elevator mechanism. Just when we were starting to make the game, I noticed that Tan had lost his interest with the Lego car. I was surprised because I remembered seeing him motivated during the first day. When I asked, he told me he does not enjoy using Lego. He preferred to go back to programming. Although he still wanted to be part of the car project, he kept his distance.

Non and Pan were not motivated as well. They were not so active since the beginning. At that point, they were doing the project just for the sake of having something to do. The fact that they were not familiar with Lego made the situation worse. On top of that, there were no instructions for them to follow. It was clear to me that they did not know how to tackle the problem. I tried to make them feel more comfortable by helping them divide the project into sub-tasks. I introduced them some basic Lego ideas. I hoped these ideas would give them schemes for building the structure. However, both of them were very passive and quiet. At that point, I was not sure how successful the project would be. Three out of four students were not motivated. The situation was awkward.

The twist came when all the game pieces started to come together. Non and Pan's attitude changed. They want to see their project work! They started to talk and respond to my questions and ideas. When their Lego mechanism broke, they created a more stable motor and gear structure. On the morning of the festival, the students became even more engaged. We discovered a few problems with the game. As time was critical, all three students dived in and tried to solve the problems. I jumped in to help them too. For me, it was a wonderful time. The situation was totally different from when the group started working on the project. Now, the project had real meaning to them. Non and Pan are not doing the project just to have something to do anymore. The questions and problems are still open-ended, but that did not matter any longer. The way they were thinking about the problems was probably as intuitive and spontaneous as the way they would think about other issues in their daily lives.

Figure 1. (Left) Pan, Lek, and Non (From left to right respectively) thinking of how to solve the problems they were facing. (Right) Pan adjusting the motors.

4.1.2 Source of Authority: A Dynamic Equilibrium

In the previous example, I should note that Pan, who lost his interest with Lego, never returned to the group. I told him that it would be okay for him not to work with Lego if he is not interested. One can argue that Tan should not avoid doing things that he does not like because it is not the way things are in real life. I do agree that it would have been better if Tan had stayed to help in any way he can. However, in my opinion forcing Tan to work on the project would definitely have been a mistake. The little more work gained would come at the expense of Tan's personal freedom and my peer relationship with Tan. Thus, it would not lead to a convivial learning environment. This is a dynamic tension that was mutually irresolvable.

A convivial environment does not mean anything goes. I had my own integrity of what was happening as well. When the game did not work properly at the festival, my role changed. I became much more active, less open to student's self-exploration, as we needed the project to work. Yet, my role was not like a teacher dictating what students should do. I was more like an experienced advisor.

4.1.3 Project Ownership

During the week, there were many design issues to be decided. Many of which I have my own preferences. For example, I could have showed Non and Pan a good elevator mechanism from the beginning. They might have finished the work much faster and much better. However, I chose to introduce many basic ideas instead. Though this decision gave Non and Pan a difficult time in the beginning, they gained a sense of ownership of the project. Even though the final product was not the best design, the process of creating the product was richer. With a sense of ownership, valuable learning processes such as building, rebuilding, and debugging become much more natural.

Again, I do not suggest that there should not be any teaching. There is a delicate balance that is highly contextual and personal. For example, when I saw Non and Pan trying to figure out how Lego gears work, I did not hesitate to teach them in a way similar to the teacher-teaching approach. However, the instruction was context-driven to supply what was needed.

4.1.4 Context

Based on the case study I have presented, there has to be a context or a goal built concretely enough to motivate the changes to take place. In this case students were motivated to build a game for the children's day festival. This motivation was what kept that learning environment going. Combining this motivation with the project that the students developed, the students were sufficiently engaged in the activities of the new learning environment. It was clear that by constructing artifacts (Lego mechanisms) and putting them into a meaningful context (the children's day festival), Non and Pan were able to eventually immerse themselves into the project. Non and Pan's example also demonstrates how a constructionist approach is preferred in an environment promoting conviviality.

4.2 Conviviality in Practice

The following cases further demonstrate the developmental process of a convivial environment and the interplay of source of authority, project ownership, and context.

I went to Tongtip School with a set of assumptions about the students, most of which were wrong. One of the assumptions was that the students would be interested in agriculture. It made sense to me because Tongtip School is located in an agricultural community. In fact, the main income of most students' families comes from rice. The following case study shows how reality differed from my assumptions, how I handled the situation, and how projects actually evolved.

4.2.1 A Disappointing Project?

After the Children's day festival, the students were looking to pursue new projects. I spent some time talking and showing tools that could be used in agricultural projects. I was expecting students to be interested and willing to try. However, after spending some time with them, I realized that the conversation about agricultural projects was not going so well. I did not know much about what crops or farms they had at home and the students did not know what to say about them. Talking about how to use the computer and sensors (such as temperature, light, and humidity) with agricultural issues seemed so abstract and alienating. I later realized that it was never the students' role to suggest ideas about agriculture to their parents. In the end, the students proposed to work on a door alarm system. They wanted to monitor the computer lab's entrance so that when someone would try to break in, an alarm would go off.

I did not like this project idea. It seemed like a typical school project; a project that is totally unrelated to the students' lives. Why would they want such a system? The project would never find a practical use anywhere. I tried to broaden the students' ideas, but they insisted on the door alarm project. I did not want to push them too hard. So, I agreed with the idea. I took the project on as a short-term experiment that would help the students develop their fluency with the tools. Then, hopefully they would move on quickly to something else.

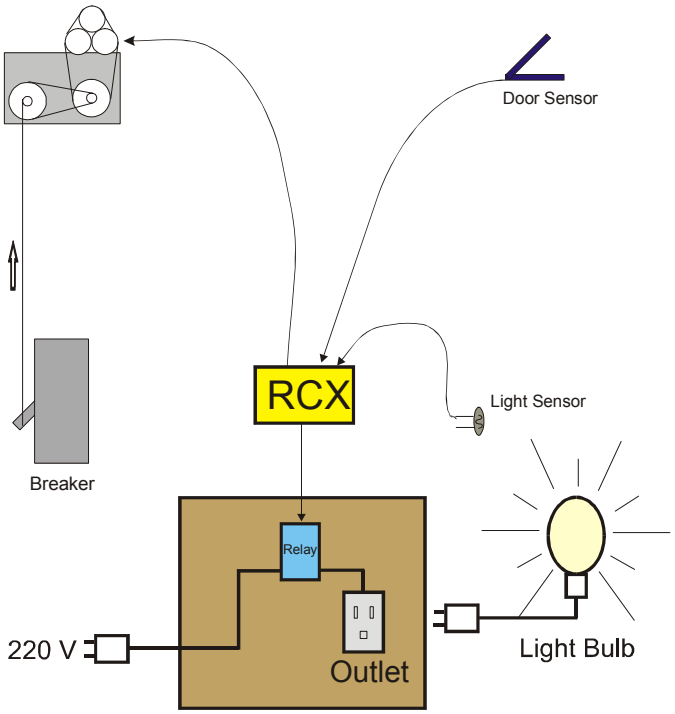

Figure 2. The Door Alarm System. This diagram shows how the system was designed. The RCX (Mindstorms) would monitor the door sensor. If someone would try to enter the room, The RCX would turn on the lights in the room by initiating motors that are arranged to snap the light breaker. The light sensor then tells the RCX whether the first mechanism had failed or not. A backup system (consisting of a light bulb) could be activated by triggering the relay.

Although I was not so happy with the project, I kept engaging students in discussions that could lead to a more sophisticated system and could be more challenging. To my surprise, the door alarm project turned out to be much more interesting than it first seemed. The students wanted to switch on the lights in the computer lab when the front door is opened. To do that, the students would build a Lego mechanism to trigger the lab's power breaker. I made comments about the mechanism's reliability. So, the students suggested a backup system. They would use a light sensor to test the success of the Lego mechanism. If the sensor did not detect light, the system will trigger a backup light bulb instead. Figure 2 shows a schematic of the design.

Many teachers would feel uncomfortable when their ideas were not well appreciated, as teachers are used to a position where they know what is better for students. Accepting students' ideas made me felt less secure about my performance. But it was a necessary and worthwhile sacrifice. The fact that I did not impose my agenda on the students kept the projects meaningful to them. It also opened up new doors and resulted in creative project ideas that were impossible to foresee. The door-alarm project became much more technically challenging than initially anticipated and, most importantly, it lead to Lek's fish farm project, which was one of the highlights in this research.

4.2.2 Lek and Her Fish Farm

Lek was one of the students who worked on the door alarm project. She was closely involved and became fluent with the tools and programming. Towards the end of the five-week activity, Lek wanted to use the RCX-controlled switchboard from the door alarm project to control lights at her fish farm at home. In Thailand, it is common for fish farms to have black lights installed to attract insects, which fall into the water and

becomes food for the fish. Lek's fish farm is located about one kilometer from her house. She or her parents have to travel to the fish farm at least twice a day to switch on the lights at dusk and switch it off two or three hours later when there are no more insects. Lek's idea was to automate this task. It would not only save her family the trouble of going back and forth between the house and the fish farm, but would also keep them away from dangerous creatures like snakes and scorpions (ironically, Lek's mother was stung by a scorpion on the day Lek started this project).

Figure 3. Lek's fish farm.

Lek's idea was to attach a light sensor to the RCX brick and use it to automatically trigger the black light on and off at the appropriate time.

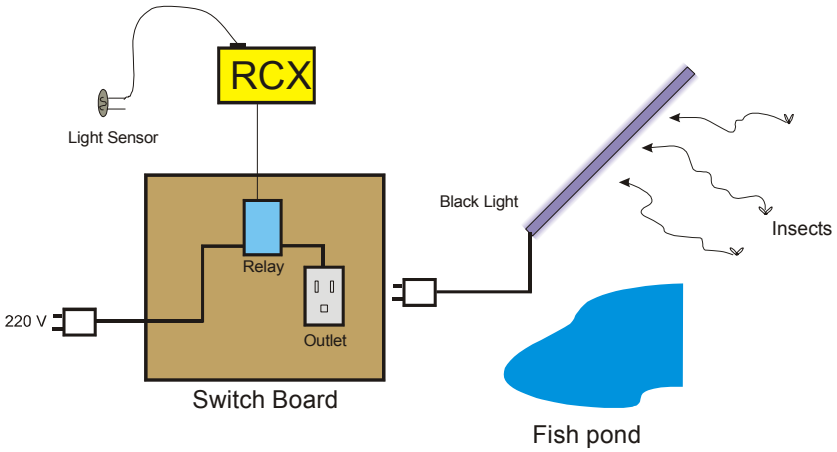

Figure 4. The switchboard was adapted from the door alarm project. A light sensor tells the RCX when to switch on the black light.

Figure 5. The switchboard in action.

It may seem that this project is technically straightforward and one can easily imagine using a simple timer instead of the RCX. But, if we look beyond the technical aspects and the end product, we would see that Lek has experienced a learning process that is profoundly different from regular schools and it is an environment that I would call convivial. Lek had gradually gained fluency with her tools from the children's day game and the door-alarm project. The learning environment did not impose her how the tools should be used. Rather, she felt empowered by the tools and was free to use them to enrich her environment according to her own taste. Lek learned to realize that she was not obliged to follow any kind of curriculum, but had the autonomy to define for herself what she saw as interesting and worthwhile for her to learn.

There was no test or scale that would define her as good or bad, better or worse than others. She defined her own success, which was accepted as her identity in her community. She recognized her ability to learn and realized that learning does not only mean being taught. She was confident that she could implement the fish farm project by herself and overcome obstacles she might encounter.

This project also changed the role of a child in a family. As I have mentioned before, it is not usually the child's role to suggest ideas about how their parents could do things differently. But in this project, Lek actually worked on the project together with her father.

5. Conclusions

I have presented a convivial learning framework based on the constructionist philosophy. I have shown case studies that illuminates the dynamics of evolving learning activities. I have shown examples of emotional phases relative to the learning activities (e.g. joy, depression, recovery from depression). I have suggested a concept of a dynamic equilibrium in which three dimensions were demonstrated: source of authority, project ownership, and context. Finally, I have analyzed in detail the quality of the learning process in convivial environments and how different it is from traditional schooling. It was observed that the notion of conviviality provided useful guidelines for teachers to help learners develop projects and to react thoughtfully to some challenging situations that may occur.

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