Peer-to-Peer Learning:

Experiences with One-to-One Computing

Jennifer Martino, M.A.

Introduction

There are many ways for children to learn to use the XO and the activities it offers. One model that has shown great promise is that of peer-to-peer (P2P) collaboration. When students come together to share their experiences with the XO, they have the chance to learn from peers while taking pride in their personal expertise on different aspects of the hardware and software.[1] The benefits of such an initiative go far beyond gaining familiarity with the XO itself – students are also provided with the opportunity to gain self-confidence and develop habits of teamwork.[2]

Seymour Papert has described other effects of P2P learning – the development of communication skills and challenging of traditional educational structures. When children engage in "debugging"[3] or problem solving with computers, Papert finds that:

> Students' bugs become topics of conversation; as a result they develop an articulate and focused language to use in asking for help when it is needed. And when the need for help can be articulated clearly, the helper does not necessarily have to be a specially trained professional in order to give it. In this way the LOGO [a programming language for children] culture enriches and facilitates the interaction between all participants and offers opportunities for more articulate, effective, and honest teaching relationships. It is a step toward a situation in which the line between learners and teachers can fade.[4]

The idea that a person does not need to be specially trained to assist others is fundamental to P2P initiatives. In a collaborative environment students will work together to "debug" or solve problems related to their work with the XO and beyond.

The purpose of this article is to share experiences with P2P learning in OLPC deployments and provide recommendations for the implementation of current or future initiatives. Emphasis will be placed on early Nicaraguan experiences with P2P learning. It is important to note, however, that various deployments use P2P learning models, some of which have been highlighted in the section entitled "Other Experiences".[5]

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[1] The XO runs Sugar, an open-source operating system designed specifically for children www.sugarlabs.org/

[2] For academic studies on the benefits of peer tutoring, see Sanders 2001, Slavin 1995, Choudhury 2002 and Johnson & Johnson 2004.

[3] "Debugging" refers to the process of finding and reducing the number of bugs, or defects, in a computer program and making it behave as you would like it to

[4] Papert, 1980, p.180.

[5] It is important to continue building an archive of P2P experiences so that others may learn from them. If you have an experience to share please do so at http://wiki.laptop.org/go/Peer-to-Peer_Learning

Case Study: Nicaragua

In January 2010, the Zamora-Terán Foundation[6] began its second round of XO handouts in seven primary schools in different regions of Nicaragua. A P2P learning program pilot was initiated as part of these proceedings, with the intention of providing students with the opportunity to a) share knowledge of the workings of the XO with their peers and b) develop skills that would help them to pass this learning on to teachers, relatives and community members.

Participant Selection

Teachers selected two students from each grade to participate in a Peer Learning workshop.[7] The basis for the selection was interest in the XO and willingness to help others. Teachers were asked to avoid emphasizing grade point average or popularity in their selection. One girl and one boy were selected from each class in order to maintain gender balance. Participant selection was made after observing each class, which led to discover of some unique cases. In a fifth grade classroom, a deaf child was accompanied by his younger brother who acted as his interpreter. In this case, the brothers were invited to participate in the peer workshop along with the boy and girl chosen by the teacher. The logic behind this selection was to facilitate further social integration of the deaf student in both the classroom and school community in general, by presenting him with the opportunity to demonstrate his familiarity with the XO and share his knowledge with other children. In another case, a student who had been identified as being socially "problematic" and at risk for dropping out of school was invited to participate in the peer workshop. The goal was to build the student's self esteem and social skills.

Workshop Format

The workshops usually took place outside of school hours, directly after class time. Some children requested the permission of their parents before attending the workshop, others were permitted to participate after verbal consent was obtained by parents who had come to pick up their children after class. In other cases, school directors requested that the workshops take place during class time.

Each workshop began with a brief explanation of the objective of the meeting and a thank you to the participants for their collaboration, followed by an icebreaker (many students had never met due to the wide range of ages). Next, a brainstorming activity was used to determine which XO activities the students were most familiar with or considered themselves "experts" in. The objective of this exercise was to demonstrate to the group that

[6] To learn more about the Zamora-Terán Foundation visit http://www.fundacionzt.org
[7] Students from grades 1 to 6 participated in the initiative

different students have different strengths and interests, just like in the average classroom. Students were asked to pay attention to the strengths and interests of their peer in their homeroom, and encourage other students to share what they know with friends and family members.

Based on the most popular activities identified in the brainstorming exercise, students were divided into groups of two or three and asked to share the following information about their favourite activity (program):

- Why is this your favourite activity?
- What do you like to do with this activity?
- What have you created with this activity?
- How did you create this?
- What are your doubts or questions about the activity?[8]

Groups were mixed various times throughout the workshop in order for students to get to know as many new people and be exposed to as many learning and communication styles as possible.

At the end of the workshop students were thanked again for their participation and asked to share what they had learned with their classmates, teachers, relatives and community members. Each participant received a certificate identifying him or her as a "Child Collaborator" (Niño Colaborador).

Results

The vast majority of student participants showed high levels of enthusiasm throughout the course of the Peer workshop. Most of the time we had to turn additional students away to maintain a manageable ratio of students to facilitators. Two facilitators were present at each workshop and the goal was to have no more than seven children to an adult. Participants of all ages generally cooperated with the facilitators and their peers, although it was more difficult for the youngest children (6-7 years of age) to maintain interest in the workshop and/or communicate with the older children.

Interestingly, the students with disabilities, be they physical or behavioural, consistently participated and contributed to the same extent as their peers. The previously mentioned deaf student proved to be an expert on the XO, likely due to long hours of virtual isolation in the classroom (neither his teacher or peers spoke sign language and he spoke very few Spanish words). He shared his knowledge with other workshop participants by using gestures and the XO screen to demonstrate various "tricks" with activities such as Etoys (a program that few other students had explored at all). The aforementioned student with behavioural challenges was also a great asset to the workshop, collaborating with his peers and demonstrating pride at his own knowledge. This behaviour stands in contrast to

[8] If the group didn't manage to answer the questions on their own they would ask one of the facilitators for help

experiences in his regular classroom, where he is significantly older than his classmates and is often made fun of.

Many participants expressed interest in participating in future workshops. Based on the collaborative spirit and knowledge of the XO demonstrated at this early meeting, the workshop facilitators felt confident in recommending that a local workshop leader be identified in order to continue the program.

Other Experiences

Another practical example of P2P collaboration with the XO comes from Westchester County, New York, where doctoral student Gerald Ardito studied the effects of a "tech team," comprised of twenty fifth and sixth grade public school students. Ardito found that many of the students who were trained to support their classmates and teachers to use XO "really embraced the machines," and were extremely effective in spreading information to their peers. He also identifies the XO as a motivational tool for students who had never shown "so much independence, autonomy or productivity" in other areas of their learning.[9]

Marina Bers and Claudia Urrea of the MIT Media Laboratory have also identified children as having the desire and skills necessary to share their technical knowledge with others. As part of a research program called Con-science (an English version of the Spanish "conciencia" meaning consciousness or ethical awareness), parents and children used constructionist principles to collaborate on the "building and programming of artefacts that reflect their sense of identity and values."[10] When students and parents presented their final projects, Bers and Urrea observed that children possessed the necessary skills and vocabulary to explain in detail the programming aspects of their projects and answer the questions of onlookers. They also found that even students who depended a great deal on their parents during the workshop took the lead when presenting the final product. Although the Con-science workshop was implemented before XOs were introduced to classrooms, the findings are relevant in that they show how constructionist collaboration among peers and family members encourage the development of technical and communication skills, while building self-esteem and habits of teamwork.

There is no doubt that many other P2P learning initiatives have been implemented in OLPC programs worldwide. If you have participated in such an initiative please share your experience at http://wiki.laptop.org/go/Peer-to-Peer_Learning.

[9] For more information see Ardito 2009.
[10] Bers and Urrea, 2000, p.2

Recommendations

Based on the Nicaraguan pilot experience with P2P learning and the findings of others, I would like to offer the following recommendations for current and future P2P initiatives:

- **Group size** – In the Nicaraguan case, it proved difficult for two facilitators to manage a P2P workshop with more than 15 children at one time. Some participants had many questions regarding the use of different activities while others required encouragement to share their knowledge and doubts with others. If a fair ratio of students to facilitators is not maintained, the student experience can suffer significantly.
- **Flexibility** – Although the Nicaraguan pilot began with a planned agenda, it was useful to remain flexible and alter the workshop according to the skills and needs of each group. For example, some groups required more time to get to know each other, and familiarity with the XO varied significantly from group to group requiring more or less facilitator support when exploring the different activities. Given that the principal objective of the workshop was to build communication skills, self-esteem and habits of collaboration, the specific tasks undertaken and time frames were secondary to allowing the children to build relationships within the group and explore the XO together.
- **Inclusion of children with disabilities** – Children with disabilities participated in P2P workshops in three different Nicaraguan schools (a deaf/mute child, a child with behavioural problems and a child with Downe Syndrome). In each case the students demonstrated skills and abilities far beyond those observed in the traditional classroom as served as assets to their peers in the workshops. I recommend that students with disabilities be considered for all P2P programs so that they may take advantage of an alternative environment in which to build social skills and connect with their peers.
- **Gender balance** – It is advisable to maintain as much of a gender balance as possible, in order to construct an environment in which members of neither gender are likely to dominate the discussion in large or small groups. This also makes it easier to allow students who feel more comfortable communicating with the same gender to do so.
- **Local leadership** – It is important to identify a leader within the school or broader community who will be responsible for the P2P program at their institution. It is difficult for the employees of the local OLPC project to take on the role of workshop facilitator long-term, and student participants express a clear desire to see the program continue at regular intervals. The positive experience of Bers and Urrea with parental integration into technological programs with students suggests that family members may be good candidates for this role if a leader cannot be found within the school itself.

Thank you for your interest in P2P Learning and OLPC. I look forward to hearing about your experiences with child leaders and the XO!

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