

Computers and Young Children

Using Technology in Reggio-Inspired Long-Term Projects

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INTRODUCTION

The philosophy and approach to early childhood education found in Reggio Emilia, Italy, which incorporates the use of long-term projects and the documentation of children's learning in these projects, has inspired many early childhood programs in the United States (Gandini, 1994; Hendrick, 1997; Trepanier-Street, Gregory, & Donegan, 1998). Using various forms of technology (e.g., computer, computer software, digital camera, video camera and recorder, video printer, and scanner) to implement and document classroom long-term projects can positively influence the learning-teaching process for the children, teachers, and parents. Long-term projects enhanced by technology can promote significant growth in children's thinking and social development. Using technology to document these projects can be a valuable tool for teacher reflection on children's development and the teaching process and can result in significant teacher professional growth. An additional advantage of incorporating technology into long-term projects is that it can be both cost and time effective for the teacher and the early childhood program. In this article we describe and provide examples of how we have utilized technology in the implementation and documentation of long-term projects conducted in a multi-aged (4½ to 6 years) preschool/kindergarten classroom.

In long-term projects children explore in-depth a topic of interest from many perspectives for an extended period of time (Katz & Chard, 1989; Trepanier-Street, 1993). Projects begin and continue with the teacher carefully documenting the children's interactions with materials, with their peers, and with the teacher, as well as the language used by the children during these interactions. The continual documentation of the long-term project serves many purposes for teachers, children, and

parents. The teacher can examine the documentation to determine the children's interests, understandings, and misunderstandings about the project topic. From the documentation the teacher can determine possible materials, activities, and teaching strategies that may be introduced to further the project. By creating documentation panels that contain photographs of children's actions, children's drawings, child and teacher language, and teacher commentary on project activities, the process of children's learning can become apparent to the teacher. A study of the documentation can reveal the types and the quality of child-child and child-teacher interactions that are occurring in the classroom and what teaching strategies could further these classroom interactions. The teacher in the documentation can obtain assessment information about individual children as well as about whole group progress.

Children have the opportunity to use documentation of projects to examine their own thinking and the thinking of others on the project topic. Such examination permits the children to clarify, deepen, and reevaluate and change their thinking about the topic (Katz & Chard, 1996). Using documentation to revisit prior activities, the children and teacher plan together what aspect of the project they wish to pursue next. Careful and attractive documentation can convey to the children that their work is valuable, worthwhile, and is taken seriously by adults (Katz & Chard, 1996). Documentation panels, serving as the children's memory of their project work, can be used for revisiting activities with large groups of children. These documentation panels can be organized chronologically on the computer so that the children and the teacher can see their progress over time and reflect upon their personal growth and classroom experiences.

Through documentation posted in the classroom, parents can become aware of what the children are doing and learning in the classroom. Classroom projects can be a concrete focus for parental involvement and for parent-child conversations about the child's interests and school day. By reviewing previous documentation pan-

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els parents can observe their child's development throughout the year. Also from the teacher's commentary about the children's learning on documentation panels, parents can become more aware of how young children learn and the developmental process. For all concerned, the children, the teacher, and the parents, project work and the documentation of children's learning in projects is a source of accomplishment and pride.

In our initial documentation of long-term projects, we documented children's actions in photographs using either a 35-millimeter camera or Polaroid camera and recorded children's language using teacher-written notes or audiotape recordings. Using this type of camera for photographing children's actions was often time consuming and costly due to the cost of film, the cost and time required for developing the film, and the waste of an ineffective photograph not discovered until processed. The teacher's written notes, while valuable, depended on her original accuracy. There was no opportunity to reexamine the children's language or actions for accuracy or for a different perspective. While audiotapes permitted the replay of a language sequence for accuracy, they did not capture the nonverbal language of the children or teacher. Also often it was difficult to hear a particular conversation when taped in a busy classroom environment.

IMMEDIATE DOCUMENTATION WITH THE DIGITAL CAMERA

Although we still use photographs, teacher-written transcripts, and tape recordings of classroom activities and conversations, we have included some other methods of technology to document classroom long-term projects. Currently, instead of using a 35-millimeter or Polaroid camera, we now use a digital camera. Photographs taken with this camera can be easily downloaded into a computer file. The teacher can take a picture of the children's actions, see the picture in the viewfinder on the camera, and determine whether the picture truly captures the action of the children. If it does not capture the desired action, the picture can be retaken. The desired picture is then entered into a computer file and can be either printed out immediately or stored for later use. The quality of the photograph, that is, the clarity and color, can be excellent. In fact, as seen in Figure 1, it may even capture small details and motion. If the teacher wants to highlight a particular aspect of the photograph, the teacher can crop or enlarge the desired aspect of the photograph. Photographs can "tell a thousand words" about children's thinking. Also a sequence of

photographs can reflect various stages of exploration in the project.

Digital camera photographs can be used to document the project process in multiple ways. Photographs can be immediately printed and the children and the teacher can discuss with each other their actions and their thinking. This potential for immediate use is not possible with a 35-millimeter camera that requires film processing. The storage of old and new photographs can permit children to revisit previous and present activities, to compare and contrast their ideas, review the progress of the project, and come to new understanding about the topic. Revisiting of photographs can be conducted either directly at the computer as seen in Figure 2 or by using a documentation panel as seen in Figure 3. Another particularly useful method of documenting project activities is to use transparencies made from the stored digital photographs. Transparencies of stored photographs can be printed using a color computer printer. This process is very easy and less costly than making a transparency from either a slide or photograph from a standard camera. The transparencies, in conjunction with an overhead projector, can be used for revisiting previous activities and are easily seen by a large group of children.

A final form of documenting the project using digital photographs is to create a classroom book. Using a computer software package, children can add written language to describe the photograph or to write a story about a sequence of photographs. Their language can appear on the same page as the photograph to create a wonderful book about the project. An example of selected pages of a classroom book containing digital camera photographs and computer software generated written language can be seen in Figure 4.

REVISITING WITH VIDEOTAPES AND VIDEO PRINTS

In addition to the use of photographs and the written transcript recorded by the teacher, children's activities and language can be documented on videotape. While it is time consuming to view and transcribe the videotapes, a definite disadvantage, videotaping can provide many benefits and valuable documentation of the project. It is often hard for the teacher to capture in writing all of the children's actions and oral and nonverbal language at the same time she is facilitating the children's activity. However, with videotaping it is possible to capture all of the details of the interaction (i.e., the entire language sample), the context of the interaction, the nonverbal behaviors, the intonations of the language, and the actions of all those involved. By replaying the

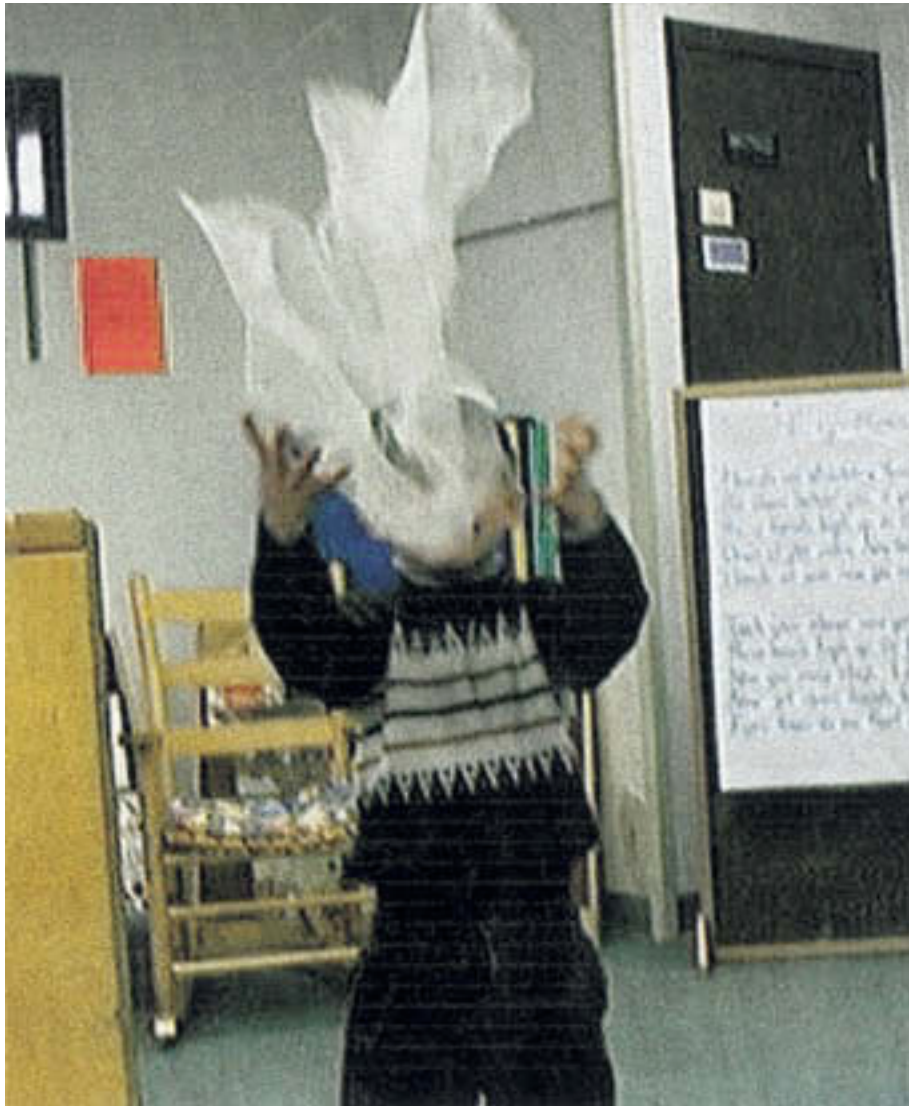


Fig. 1. The child is dancing with a scarf. The digital camera photograph captures the movement of the scarf.

videotape it is possible to gain new insight into the activity. The teacher may obtain this new perspective directly by reviewing the videotape or by collaboratively reviewing and discussing the videotape with a colleague. The process of reviewing videotapes collaboratively can lead to an understanding of children's present development and potential opportunities to expand their development. This level of reflection is not possible at the time of the activity.

Videotapes serve a purpose not only for the teacher but also for the children and parents. Children can revisit with the teacher the section of the videotape that contains a significant advancement in their learning. Such

revisiting can help children connect their previous learning with their current project exploration. Videotapes can also be shared with parents and families. The sharing of videotapes permits them to observe project activities and to see their child participating in these activities.

A recent improvement in video technology has been the development of the digital video camera. The digital video camera allows immediate and convenient documentation and revisiting. The digital video camera records images and sounds on a diskette in digital format which can be stored and manipulated in a computer file. Once entered into the computer file, small sequences of action can be captured and printed for analysis by the



Fig. 2. Children use the computer to revisit a prior activity during a group discussion.

teacher and included on the documentation panels. Another advantage of the digital video camera is that instant revisiting can occur by using the camera's LCD display. Selected sections of recorded activities can be replayed and seen immediately on the camera's LCD display. For example, when a teacher videotapes a child's learning encounter, the teacher may notice a teachable moment and instantly play back to the child the learning encounter through the LCD display. This instant revisiting can promote and deepen the children's learning while their interest is sustained.

Another valuable technological addition to videotaping is the video printer. When reviewing the videotape, there is often a particular action sequence that needs to be documented visually. The video printer permits that to happen. Photographs of children's actions can be printed from the videotape using the video printer. Because the videotape records continuous action and the video printer can capture 30 frames per minute, it is possible to capture extremely small changes in ac-

tion (microsequences) in photographs. Such microsequences and level of detail are not possible to capture using the digital camera. Also, the action may not even be noticed by the teacher during the classroom activity, but rather is observed only after viewing the videotape. An analysis of these microsequences by the teacher can reveal the specific cause and effect of children's actions and the continuity in their learning. From this analysis, the teacher can develop activities and questions to provoke new learning in children. These same video prints can be used to create documentation panels. Overall, the video printer used with videotaping can add valuable information to the documentation and revisiting process.

DOCUMENTING GRAPHICS WITH THE SCANNER

In connection with the computer, the scanner has been an invaluable tool for implementing and documenting projects. Consistent with the Reggio philosophy,



Fig. 3. Children revisit a documentation panel board.



John compares bulbs from other flowers to the Amaryllis bulb.

1



Scarlett draws a picture of the bulb.

2



Sara and Monica take a bulb apart.

3

Fig. 4. Photographs and children's drawings can be combined to make a project book.

during the course of the project children regularly represent their thinking about the topic in their drawings. These drawings can be included into the project computer file using a scanner connected to the computer. Scanning the drawings has some definite advantages. Children's original artwork scanned into the computer keeps the original drawing intact and still in the possession of the child (avoiding the potential conflict over taking a child's prized work). Also scanning the picture can preserve the original color and detail of the drawing and is a better option for copying than using a copier machine. Often color copiers are not readily available and the cost of a color copy is high.

Like the digital photographs, scanned drawings can be used in multiple ways. Children can compare their drawings on the computer and discuss their differences. New pictures can be added as new ideas emerge. Written language descriptions or written stories can be added to the drawings. Pictures can also be combined with others and become a project book to be added to the classroom library. Drawings can also be made into transparencies for large group discussion purposes.

The scanner may also be used to scan all sorts of other pictures or written materials. For example, when implementing a project about wild flowers, the teacher scanned in a photograph from a book of wild flowers, and the children compared their flower drawings with the photograph of a real flower.

USING COMPUTER SOFTWARE AS A TOOL FOR REPRESENTING IDEAS

In addition to storing children's free hand drawings, the computer and computer software can be a medium for children to produce drawings and represent their thinking. We have found that for some children their drawings may be more detailed and at a higher level of representation when constructed at the computer because the computer and software may better accommodate their learning style or their special needs. The computer may require less refined or different fine motor skills than drawing free hand. For some children drawing on the computer may maintain their interest and, therefore, they include more details in their computer drawings. Figure 5 contains an example of one child's free hand self-portrait and the self-portrait he created using computer software. Many more details and self-characteristics were included on the computer picture than on the free-hand drawing.

Using computer software children can also represent their ideas in written language. They can use the

computer software to write stories, descriptions of their pictures or photographs, or signs or directions to accompany their dramatic play. While letter recognition and some fine motor control is required for computer writing, their writing is not constrained by the tedious fine motor skills required to form written letters on paper. Again, the novelty, the possible accommodation to their special need, and a feeling of success may result in children being more attracted to and more competent in writing on the computer.

USING THE INTERNET TO RESEARCH AND COMMUNICATE

Information obtained from Internet connections on the computer can enhance long-term projects. The teacher may research the project topic on the Internet and use this information in classroom activities. While much Internet information and web sites may not be developmentally appropriate for young children, the teacher can guide the children to appropriate web sites. Some suggested educational web sites that may be resources for project topics are Exploratorium (<http://www.exploratorium.edu>) and Encarata (<http://www.encarata.msn.com>). Also interesting conversations with an expert on the project topic, who is not normally accessible to the children, can be available through the Internet. For example, when the children were doing a project on iguanas, the teacher investigated various web sites on iguanas. The children then found out many interesting facts and details about iguanas from the teacher-selected web sites. The children prepared questions to ask the iguana pet owners (what do iguanas eat, where do you keep your iguana, how big is your iguana) and then e-mailed the owners these questions. Iguana pet owners replied to the children by e-mail and sent pictures of their iguanas. The children gained much additional information on this project topic by using the Internet.

Creating a classroom web page on the Internet can be a valuable tool for implementing and documenting the project. On the classroom web page, project activities can be displayed and described. Parents can access this web page on their home computer and learn about classroom activities. Given the busy schedule of parents and the rush that often occurs at pick-up and drop-off time, parents may have little time to review the documentation panels posted on the classroom walls. They may however, have some time at home or at work to access the classroom web page and learn more about the classroom project. The teacher may include on the web page ways that parents may extend the classroom project

Handwritten Drawing



Computer Drawing



Fig. 5. A comparison of self-portraits drawn by hand and by using computer software.

and participate in the classroom, for example, doing project-related activities at home, contributing materials or offering their expertise, or helping with classroom field trips. A classroom web page may be a wonderful vehicle for communicating to parents and including them as partners in their child's learning in the classroom.

CONCLUSION

Because we have used the described forms of technology for only 2 years, we continue to learn about the full capabilities of this equipment for enhancing the implementation and documentation of long-term classroom projects. Although there was cost involved in the original purchase of this equipment, we believe that the benefits accrued from using the technology far outweigh the cost. (A list of the equipment acquired can be found in the Appendix.) The use of this technology has greatly enhanced the learning-teaching process for the children,

teacher, and parents in this classroom. These long-term projects and their technology-enhanced documentation have resulted in increased cognitive and social development in the children, increased teacher reflection, improved quality of teaching, and increased parental involvement and participation in the classroom.

Technology is constantly improving and offering new possibilities for enhancing the educational experience of young children. We will continue to explore new forms of technology to promote children's learning in Reggio-inspired long-term projects. We anticipate that future technological advances will make the process of documenting children's learning easier, more convenient, and time and cost effective. New technological advances may offer additional opportunities for the teacher to reflect on children's development and the teaching-learning process. These advances may also facilitate further communication between the school and the home and encourage parental involvement in classroom long-term projects.

APPENDIX**Equipment Used in Classroom**

Computer: Power Macintosh 6500
 Digital Camera: Quick Take 200, works with AA batteries
 Printer: DeskJet HP 870 CXI
 Scanner: Flatbed Color One 600/27
 Software Programs: Kid Fix, HyperStudio 3.0 (1996)
 Transparencies and Overhead Projector
 Video Printer: Sony

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REFERENCES

- Gandini, L. (1994). What can we learn from Reggio Emilia: An Italian-American collaboration. *Child Care Information Exchange*, 96, 50.
- Hendrick, J. (Ed.). (1997). *First steps towards teaching the Reggio way*. Englewood Cliffs, NJ: Prentice-Hall.
- Katz, L., & Chard, S. (1989). *Engaging children's minds: The project approach*. Norwood, NJ: Ablex.
- Katz, L., & Chard, S. (1996). The contribution of documentation to the quality of early childhood education. (ERIC Document Reproduction Service No.ED 393608)
- Saltz, R. (1997). The Reggio Emilia influence at the University of Michigan-Dearborn Child Development Center: Challenges and change. In J. Hendrick, (Ed.), *First steps toward teaching the Reggio way* (pp. 167-172). Englewood Cliffs, NJ: Prentice-Hall.
- Trepanier-Street, M. (1993). What's so new about the project approach? *Childhood Education*, 70, 25-28.
- Trepanier-Street, M., Gregory, L., & Donegan, M. (1998). Collaboration among early childhood teachers and faculty through a Reggio inspired long-term project. *Journal of Early Childhood Teacher Education*, 11, 183-191.