A New Learning Environment
The NeoMuseum/Children's Media Museum Prototype

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The NeoMuseum in Yoshino, Japan is a prototype for a childrens media museum , an experiment in collaborative research with the goal of creating a multimedia-based learning environment for children. The name NeoMuseum reflects the goal of exploring new roles for childrens museums made possible by new educational technologies. The purpose of the NeoMuseum is to design and develop socially shared electronic media environments for children that exploit constructivist models of interactive learning, and to develop methodologies to account for and foster situations where children become active learners. This paper describes the NeoMuseum and the philosophy behind its development in the context of childrens learning and interactive media.

1. Introduction

The NeoMuseum as an Interactive Learning Environment The NeoMuseum as Research Laboratory

The NeoMusem, a non-profit private research museum constructed in 1990, is located on the banks of a river in the small mountain town of Yoshino. The museum is easily reached by train or car, but its remote setting provides opportunities for concentrated work away from the frenzy of Tokyo, Osaka, and other urban centers in Japan. Students, faculty, and researchers from nearby and not-so-nearby universities and research laboratories visit the NeoMuseum to collaborate on experiments on childrens learning with interactive multimedia and software development. The NeoMuseum provides both equipment and physical

space required to cary out this type research. It provides also the opportunity to work uninterruptedly and concentratedly for extended periods of time. Finally, and perhaps most important, by attracting talented individuals from a variety of fields, the NeoMuseum provides opportunities for cross-fertilization and transdisciplinary development of ideas. Thus, the NeoMuseums role as a part of the research infrastructure in the development of future learning environments is perhaps its most important aspect. In addition to laboratory and performance space, the museum also contains an apartment for a researcher (artist)-in-residence, and a tea-house and garden for traditional ceremonies. The expressive architectual design by Hidetaka Hara, the well-appointed media laboratory, and the beautiful surroundings combine to make the NeoMuseum an exciting place to visit and to work. The architectural design for the NeoMuseum is based on the premise that both physical space and the organization of information must work together to support childrens exploration in an information-rich environment.
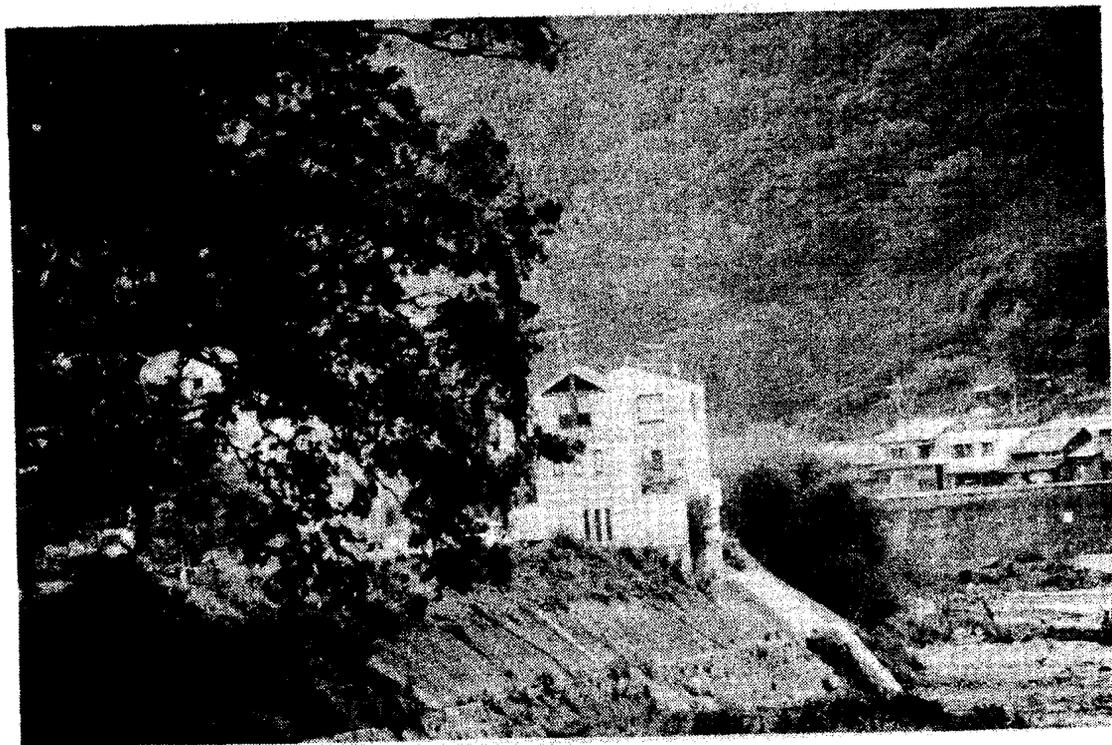
Figure 1. The NeoMuseum in Yoshino, Japan.

The NeoMuseum is a real-size model of a learning environment where children can learn to express their ideas using a variety of multimedia tools. We call the NeoMuseum a real size model because we focus on small experimental workshops for research, rather than providing everyday activities for museum visitors. The development of the Neo-Museum is based on ten years of experience in Japan with LMT, a community electronic media workshop, and on several inspirational educational media projects in the USA. We begin (section 2) with a review of the NeoMuseums historical background and the projects that influenced its development. We then present (section 3) the concept of the Neo-Museum, an interactive learning environment where children can use electronic media for creative expression. We discuss (section 4) ongoing activities at the NeoMuseum, and conclude (section 5) with our wishes and dreams for the future.

2. History of the Museum

The NeoMuseum is the latest realization of a ten-year ongoing experiment in providing a dynamic, social and collaborative participatory environment for children who can make various expressions through multimedia technologies. Since 1981, until moving to the new location, Yoshino, we have been serving both as a place for children to experience creative opportunities offered by new media technologies as well as a collaborative work-place and laboratory to carry out projects. Through the experimental activities, we gained powerful insights from educational innovations in Americas unique projects.

Roots of the NeoMuseum

The NeoMuseums philosophy and ideas of learning environments came from the authors (Ueda) personal experiences in children and media researches over last eighteen years. In particular, Sesame Street of the Childrens Television Workshop and the Logo and LEGO-Logo projects at the MIT Artificial Intelligence Lab and later the MIT Media Lab provided influential models for childrens learning environments based on electronic media.

Sesame Street

Sesame Street was a rigorous experiment which explored the use of TV as an educational medium (Lesser, 1974). The Sesame Street experiment demonstrated the use of the medium (TV) for teaching by fusing significant educational content and entertainment. Twenty years ago, television was the most influential electronic medium for children. We can see many successful elements in the Sesame Street experiment. First, Sesame Street involved a collaborative approach to research and software production. That is, content specialists (i.e. educators, psychologists), production specialists (TV producers, musicians, and puppeteers), and research specialists (formative evaluators) worked together to implement the program. Second, Sesame Street was founded on a clear statement of educational objectives. The program developers translated initially vague educational goals into specific behavioral objectives. Third, Sesame Streets producers and researchers used a systematic and iterative aproach to design and evaluation. In particular, a formative evaluation method (Flagg, 1990) was used to provide feedback to Sesame Streets TV producers and

modify program segments based upon childrens responses to pilot segments. These unique approaches for developing an educational media environment gave powerful insights for the creation of our museum.

Logo

The Logo philosophy and experiment, demonstrates how, using electronic media, children can become the constructor of their own learning and knowledge (Papert, 1980). Thus Logo is a powerful experiment of the computer as a learning environment. The original Logo project was in part a reaction to the limited interactivity of teaching machines, programmed learning, and Computer Assisted Instruction (CAI), which dominated educational technology research programmes in the 1960s. In developing the Logo environment, Papert and Feurzeig aimed to produce an open ended computer based learning environment that children could use to construct, test, and express their own ideas. In requiring children to test and debug programs, Logo is constructively interactive. Throughout various phases of Logos twenty-five year development (robot turtles, screen turtles, Sprite Logos color animation, Music Logo, and most recently LEGO Logo), emphasis has always been on providing a programming system where the child can produce and control real-world behavior. In Logo, no preprogrammed interaction sequences drive the learning process; rather, Logo is an interactive programming environment in which children can experiment freely. Control of the learning environment is in the hands of the child.

These projects philosophy and innovative approaches are fed into our experimental childrens media museum projects in various ways. In addition to media projects, research in cognitive motivational theory (Dweck, 1986; Ueda, 1989) and social cultural approach to learning (Wertsch, 1991) gave much insight for the creation of the LMT project.

LMT and The Social Creation of the Self

The LMT project (Ueda,Taetsu, & Chaiklin, 1988) began in 1981 as the Laboratory of Music Technology. We chose to explore music as a domain of expresssion through new computer-based technologies. Inspired by the projects described above, LMT aimed to provide an environment for children to explore musical expression through interactive technologies in a guided learning context (Rogoff & Lave, 1984). We emphasize doing or making music rather than merely learning music. LMT provides a dynamic, social, and collaborative participatory environment with the assistance of professional musicians and technical help for people who want to express their ideas through music and computer media technologies. The main goal of the LMT project was to use collaborative music making activities to affect peoples conceptions of making music and their personal theories of the self as maker. The image of the self is created in the social context of collaborative making. The LMT project was based on the belief that participants can expand their scope of individual and collaborative creativity and develop a more competent image of the self as a music maker.

Social Creation of Learning / Zone of Potential Confidence / joint competence

Novice and coach work together to generate a collaborative atmosphere at LMT. Especially, the coach helps the novice to gain confidence in making music. We view the LMT as a living laboratory where we can develop our theoretical understanding of the process of learning. We are particularly interested in collaborative learning, both from a cognitive and a motivational point of view. We stress the importance of social interaction for the development of cognitive skills. That is, we create a constructive environment where dynamic interaction occurs between coach and novice. We have found that not only novice musicians, but also coaches, can gain interesting insights about a theory of making music and theories of themselves as makers, through collaborative music-making activities. Novice musicians begin to realize their Zone of Potential Confidence, and to believe that, if I work with a coach, we can achieve so much more together. We believes that this kind of conception of ability, social or joint competence, will grow through the collaborative activities.

Making Music in Context: Situated Confidence in Collaborative Music Construction

Just as recent cognitive science research emphasizes that knowledge is situated (Brown,Collins, & Duguid, 1989; Ackermann, 1990), the LMT learning environment is based on the idea that peoples sense of confidence is also situated. Our collaborative model of situated confidence has two distinct aspects. First, the novice learner has a creative role that cannot be replaced by the coach. Rather, the coach must work collaboratively with the novice learner to help bring forth the novices ideas. This interaction takes place   · around a musical object. Second, it is important that the coach sees a real project to work on. Often in our work at LMT, a coach will become very excited with a students project. Because the coaches are challenged, they cannot use the traditional teaching style of posing problems for the students in which the coach knows the answers and the students must try to discover them. The students can sense the excitement and motivation of the expert musician as the coach starts to work with the project the student has proposed. This excitement helps students to become motivated in the work. The novices confidence of making music grows in this collaborative context.

New Way of Making Music: Editing-in-Action Computer as a Reflective Medium

At LMT, people design and make their own musical expressions through interactive electronic media environments. Based on recent advances in music technology, LMT participants can experiment with new approaches of making music. Specifically, MIDI (Musical Instrument Digital Interface) and digital sampling technologies have radically changed our way of making music. For example, a MIDI-based computer-aided composing system enables the novice to design and edit music and explore musical ideas more freely and reflectively. That is, one can make music by playing the synthesizer while the computer records what one is playing. One can receive immediate feedback by listening to the computer play the music; editing becomes editing-in-action. If there are discrepancies between ones intuitive sense of how the music should sound and the way it actually does sound then one can examine the music reflectively and change it. In this way, computers have changed

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our way of making music and have made possible more explicit reflective conversation with musical ideas (Schoen, 1983). Digital sampling techniques also enable us to sample natural or acoustic musical instrument sounds and musical phrases just like taking a picture. The uniqueness of both these technologies is that users can freely edit music and sounds to their taste. They dont have to compose music in a linear fashion nor generate sound from scratch as with a traditional instrument or synthesizer. The new technologies suggest a collage approach to music-making, in which sounds from various sources can be gathered, arranged, and rearranged until the music-maker is satisfied. Our early experiences with new ways of thinking and making music in the LMT project have led to our current hypermedia projects, which extend our previous ideas.

The author (Ueda) renamed the LMT to the LMT NeoMusuem in 1984 to reflect our belief that LMT should be a new type of learning media museum rather than merely a music laboratory. Beginning in 1987 the LMT NeoMuseum has been expanded to include a video editing environment, where music and visual expressions can be merged. And in 1990, we moved to a new location and began to redesign our research directions toward a multi-modality media museum.

3. Concept of the NeoMuseum

Theoretical Framework of Design, Media, and Learning in the NeoMuseum

Expression and Communication as Design Expression is the one-way process in which an individual tries to bring out, or shape, an idea or concept into an external medium. Communication is the two-way process by which two parties work together to develop a shared realization of an idea. So long as an idea remains in the mind, we can maintain the illusion that it is clear and well-worked out. Expression challenges the learner to articulate an idea clearly so that others can engage in critical conversation. Through expression one may come to realize that the idea is formulated only vaguely, that one needs to learn more about the idea before it can find proper expression But as we force ourselves to express the idea in an external medium, we must confront and overcome any vagueness in our minds. Thus expression, the bringing out of ideas into media, plays an essential role in learning through reflection in action. The editing in action mentioned earlier is a good example of this.

Media - Interacting with Media/Media as Tools for Communication

Hypermedia as an expressive medium At the NeoMuseum we are interested in using interactive hypermedia as an expressive medium, to provide a learning environment where participants use software tools, both individually and in groups, to construct and annotate their own documents. Unfortunately most hypermedia systems in widespread use today do not provide for user input and user programming; that is, they do not support construction and annotation by novice users. Rather, they offer novices control only over the programming sequence and extent of information accessed from a pre-authored hyperdocument. Thus the authoring system is distinct from the reading system. This fails to recognize one of the most powerful and interesting aspects of hypertext as originally envisioned by Engelbart

and Bush, the ability to support real-time annotation, extension, and construction of ducu-
ments. In Constructively Interactive Hypermedia, the users role is not limited to pressing
buttons to access pre-stored information. Rather, users can add information and structure
to the hyperdocument as well as navigating and exploring previously authored portions of
the document. Therefore, one topic of research at the NeoMuseum is the design and
development of simple tools for children to author and edit multimedia documents (see
below, section 4).

Learning - A Model of Learner and the Learners Mental Model

To make effective learning environments we must consider the learners mental model of
the self. Seeing oneself as an innovative and creative thinker and problem-solver is an im-
portant step towards attaining those characteristics.   A positive image of oneself as a
learner fosters the motivation to work hard and enjoy learning. The goal of the Museum is
to encourage children to see themselves as capable and creative, and to motivate them to
achievement through this empowering vision of themselves. Namely, the main theme of
the NeoMuseum is to strengthen childrens conception of how to make things and express
their ideas. At the NeoMuseum children construct and extend their personal theories of the
self as an active expressionist through collaborative expression-making activities. The Neo-
Museum embodies a model of learning which focuses on the learners self-image as an ena-
bling force motivating achievement, curiosity, and innovative expression (thinking).

4. Activities of the Museum

The NeoMuseum is a participatory project oriented learning laboratory, a kind of place
where people can come and work. It is also a kind of school workshop where teaching and
learning take place through interactive multimedia projects.

The NeoMuseum provides facilities for electronic music, video, desktop publishing, and
multimedia projects, and it attracts people with a wide range of experience and expertise.
With a good mix of novices and experts teaching and learning is always going on. It can also
be a place for collaborative projects where two people, each expert in different skills, col-
laborate on a project and learn from one another. For children there may be special, more
structured workshops where a coach or instructor leads a group through some exercises.
The NeoMuseums idea about education is to provide an environment rich with oppor-
tunities for learning. The mode of learning is informal but effective and exciting. In order
for this informal model of learning to work, it is essential to have experts around to super-
vise the apprentices.   In order to attract expert practitioners who can serve as coaches, the
NeoMuseum provides good facilities for making electronic music, video, and multimedia
projects. This attracts experts, who then serve as masters to help apprentices who come to
Museum to learn and play. Thus the NeoMuseum serves simultaneously as a community
work-space, a learning-space, and a performance-space.
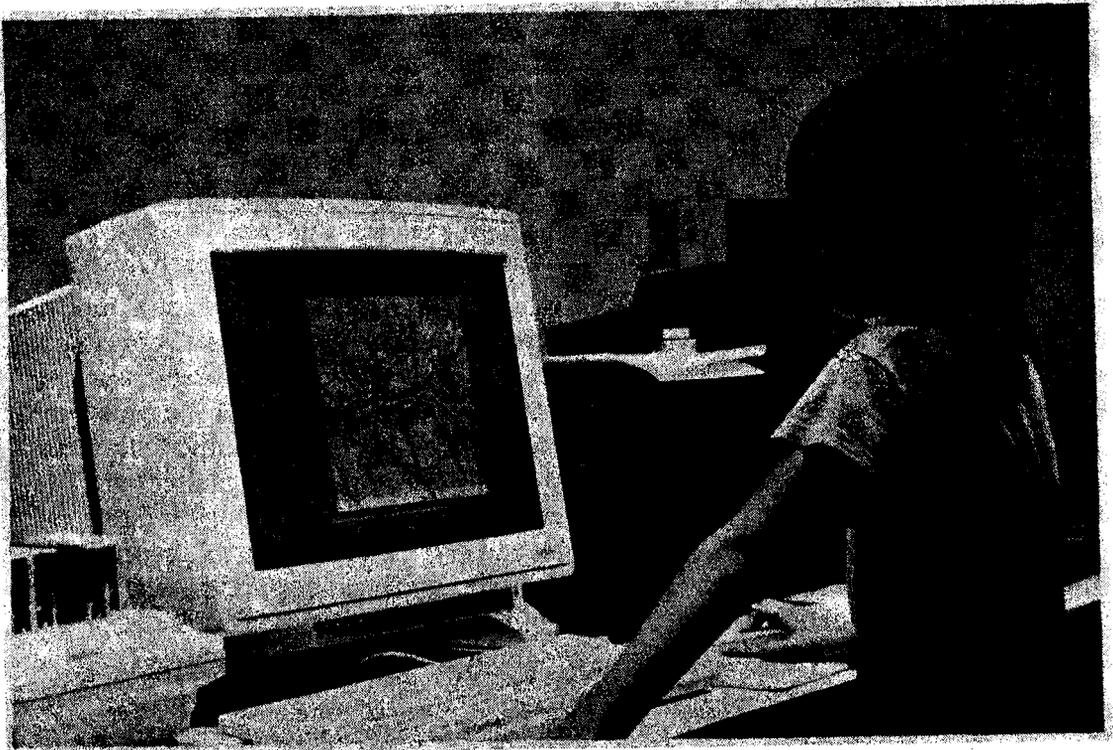
Figure 2. Children work with multimedia at the NeoMuseum.

The NeoMuseum depends on having enough people with a shared interest (electronic music, graphics, or video) to begin to establish a community. Our experience with LMT suggests that by providing facilities, workspace, and a supportive environment, a community can easily form. We concentrate on the domain of expression and communication and we equip the lab with a useful range of tools to support this domain. In theory, of course, the same principles or concepts apply to many domains, but to put the theory into practice, we have limited our scope to a small program with a sharp focus.

Research Two projects are currently underway at the NeoMuseum. The Animemo project, an experiment in animation as a story-telling medium is being carried out in collaboration with the Research Institute of Media Sciences in Tokyo (Maeda & Sabiston, 1991). The Yoshino Mapmaking project is being developed in collaboration with local residents interested in using new media to represent information about the history and geographic features of the Yoshino district. These two projects serve to illustrate the kinds of research activities that an experimental media museum can foster.

The Animemo Project - Children as Formative Evaluators

Animemo is a program being developed at the Research Institute of Media Sciences in Tokyo and tested and employed at the NeoMuseum. The Animemo program is a simple authoring tool that children can quickly learn to use to make animations. Our experiments with children using Animemo suggest that animation is a powerful way for children to engage in interactive storytelling without the usual constraints of text or still pictures. In developing the software, the implementor observed children using the Animemo prototype. In light of the childrens experiences and discussion, the software was interactively revised during testing at the NeoMuseum. Thus the Animemo project is a good example of the collaboration possible between museums and other research and educational organizations.

In preliminary Animemo experiments with groups of children, we found that children enjoy both entertaining, e.g. showing the animations they have made, and being entertained, watching other childrens animations. Thus collaboration is fostered naturally in the NeoMuseum learning environment. We have also informally observed that childrens confidence in their ability to use Animemo as a storytelling vehicle grows rapidly.

The Yoshino Mapmaking Project

In the Yoshino Mapmaking project we are exploring hypermedia authoring and personal database making by children. A map of the mountain village of Yoshino and the surrounding areas forms the user interface to a hypermedia database. The database contains textual, graphic, audio, and video information about places of interest in the town. In addition to reading, viewing, and hearing information already stored in the map, children can add their own annotations and information about places they know.

Through this project children can gain better information about their own town or local area, and they can access knowledge put into the map by others. Children are asked to interview older residents and to put what they learn into the map database. Later, other children can access this information. Thus the hypermedia map can serve as an intergenerational communication tool. Through this process of making and browsing this hypermedia map, children can naturally understand otherwise difficult hypermedia concepts.

5. Conclusion

Construction of the NeoMuseum was completed at the end of 1990, and our first round of projects is just getting underway. It is therefore too early to report on the results of our research. Nevertheless, we are confident that the NeoMuseum can fill a valuable niche in learning environment research by offering the physical space for formative evaluation, testing of prototypes, and development. Especially in Japan, where a highly competitive educational environment tends to discourage learning that is not focused on scholastic achievement, highly interactive multimedia learning environments can provide alternative educational, expressive educational experiences. The NeoMuseum is a working, life-size model for how to develop these multimedia environments, in collaboration with univer-

sities and other research institutions. As we have stressed above, constructive interactivity, the participation of learner-users in structuring hypermedia, is of particular interest to the NeoMuseum.

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