Wonderwalls: Facilitating a Child's Sense of Wonder through a Collaborative Communication Environment

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ABSTRACT

Wonderwalls connect students in an online or in-person class in real time and asynchronously to a persistent collaborative moderated communication environment designed to honor, encourage, and preserve the act of wondering. Participants compose and position text or graphical "post-its" on the Wonderwall. The Moderator/Teacher can attach answers to posts and stream real time audio.

The original Wonderwall was a large blank poster with colored markers. Visitors to the Children's Garden were encourage to write anything they wondered about throughout the day. The point was not to answer questions but to celebrate the asking. The electronic Wonderwall began with the same premise, evolving through user experience testing and designers' recognition of technological affordances.

Wonderwalls are specialized environments which facilitate affect (a sense of mystery, excitement, and importance) and cognition (reflection and formulating questions) at an individual and group level. The moderator can respond and encourage interactions, while gaining nuanced understanding of group mood and thoughts.

Categories and Subject Descriptions

User Experience Design / Experience Design (primary keyword) ; Computer-Mediated Communication ; Emotion and Affective User Interface ; Social Computing and Social Navigation ; Virtual Community / Community Computing ; World Wide Web and Hypermedia ; Children ; E-Learning and Education ; Interaction Design ; User Studies ; User-Centered Design / Human-Centered Design ; Product Design

Contributions and Benefits Statement

Describes a collaborative, persistent, real time moderated communication environment designed to influence participant affect and cognition. Explores how specialized communication environments can honor, encourage, and preserve the act of wondering

INTRODUCTION: WHY WONDER?

Cognitive theories of motivation assume people are "active and curious, searching for information to solve personally relevant problems." [1] Lowenstein equates curiosity with recognizing a need to know. Information gaps "produce the feeling of deprivation known as curiosity." [2] Maslow [3] theorized that "fulfilling the need to know and understand increases, not decreases, the need to know more."

Learning and affect are inextricably entwined; learners experience feelings of excitement and curiosity, frustration, accomplishment and satisfaction at different points in the learning process [4]. Recognizing the involvement of affect with learning, Picard suggests "the teacher that attends to a student's interest, pleasure, and distress is perceived as a more effective teacher than the teacher that proceeds callously."

In her seminal book, *The Sense of Wonder*, Rachel Carlson [5] wrote "If a child is to keep alive his inborn sense of wonder, he needs the companionship of at least one adult who can share it, rediscovering with him the joy, excitement and mystery of the world we live in."

Electronic Wonderwalls enable an adult moderator (most often a museum curators or online teacher) to sensitively nurture, share, and facilitate child or adult students' sense of wonder about particular topics. Wonderwalls transform wondering from private cognition to a collective, public, interactive social learning activity.

THE ORIGINAL (PAPER) WONDERWALL

The original Wonderwall was a long swath of blank brown paper taped to the wall and colored markers. Children on field trips visiting the Michigan 4H Children's Garden were encourage to write anything they wondered about throughout the visit on the Wonderwall. The point was not to answer questions but to celebrate the asking. Wondering motivates a desire to learn. Wonderwalls help define the act of wondering as pleasant, fun, important, and good.

Asking a question is the first step in science. Teachers might later take some of the questions and guide children to form testable hypotheses to try to answer those question. But Wonderwalls focus on generating questions.

The photograph in Figure 1 shows about one fifth of a physical Wonderwall generated during a class field trip to the garden. Throughout the four hour garden experience, children could approach the Wonderwall any time they thought of something they wondered about, and write or draw their thoughts. Examining this piece of wonder provides an interesting window into some of the visiting children's cognition and affect.

Figure 1. Photograph of Partial Paper Wonderwall

Some kids wondered about the children's garden itself (why did you make it, how do you water all of your plants). Some kids wrote silly things (why do flowers have pets). Some asked questions science teachers would love to engage (why do flowers need water, why do some plants close up, why do we need trees, why does a certain flower taste like mint). One child (Nicholas) simply announced his presence in huge letters.

Problems with preserving physical Wonderwalls are immediately evident. Storing 10 foot scrolls of brown paper is awkward; the paper gets folded and damaged. Labeling and retrieving Wonderwalls from particular events is inconvenient. Transcription to electronic text is time consuming and rarely happens.

ELECTRONIC ONLINE WONDERWALLS
Conceptual Description

Wonderwalls extend personal wondering. They tap distributed cognition and social learning. Getting to see what others are posting can stimulate other students' thoughts.

Electronic Wonderwalls give every child equal chance to participate because each is logged on individually. There is no need to grab a marker or summon the nerve to walk up to the poster.

Wonderwalls accommodate both task-driven and performance-driven learners. The task-driven students think hard about the field trip experience or the online course week's content and carefully consider to wonder about it. Performance driven students (also called ego-driven students) are more motivated by knowing their posts will be seen by the group and teacher. They are aware of the attention directed at their posts and the attention-getting result may be silly or deep.

The overall mix of full participation provides a fascinating daily snapshot of a field trip experience or a weekly snapshot into how a class is going, including occasional reminders of the larger contexts of the students' lives.

Designed to appeal to first graders and graduate students, the Wonderwall embodies a sense of fun. It is not the most efficient communication environment. But participants report it feels delightfully and sometimes annoyingly different than the more efficient, multifunctional, linear message boards. Deciding exactly where to place a colorful post on the Wonderwall often involves scanning everyone else's posts. Wonderwalls involve spatial performance in addition to text.

The Wonderwall has been in development for one year. It is evolving as we use it and discover in collaboration with diverse participants what works and what else might be needed.

Figure 2 (at the end of this manuscript) shows a screen grab of the Wonderwall at the end of the first week of an online class of 15 students. Participants choose their color. Text, drawn, and placed postings are visible. Three participants are currently logged in, represented by the name and lightning bolt cursors.

Technical Description

Wonderwalls are spatial persistent real time communication environments driven by an Administration system built with PHP and MYSQL. Two client interfaces (participant

and Wizard of Wonder-moderator) were constructed with Macromedia Flash and use the Flash Communication Server to allow synchronous and asynchronous data transmission among many client instances over the Internet.

Participants log in as themselves. They can create postings by typing, drawing, and placing images. The can zoom in and out of the Wonderwall to see closeup, intermediate, or full wide view. All participation in real time is immediately visible to other logged in users.

Each logged in participant is represented by a lightening bolt with their name attached. Collision of lightening bolts results in a short crack of thunder. On our first user test, we watched four kids invent a game of Wonderwall tag.

Posts are colorized – each participant selects a color and all of their posts appear framed by the color. You can change your color live anytime, and every one of your posts change. We have observed online users inventing football card block behavior, positioning nonsense posts strategically and coordinating color changes to form patterns.

The Wizard of Wonder has special powers including the ability to print a Wonderwall, post real time headlines, answer participants' posts, edit any content, and stream live audio.

Wonderwalls in K-12 Classrooms
Wonderwalls were initially conceived and are currently used to extend K-12 garden field trips beyond the actual visit to the Children's Garden. Classes which visit the garden can schedule Wonderwall events to reconnect with "Dr. Norm." Everyone may be synchronous, with the kids in the computer lab and Dr. Norm in the Garden. Or the students may be synchronous and Dr. Norm answers and adds comments later, for the class to receive next time they log on.

Wonderwalls in the Garden
A station running a Wonderwall is now present in the indoor garden for in person visitors to wonder, serving a similar function to the original paper Wonderwalls but easier to archive and available all the time instead of just for special events.

Wonderwalls in Distance Learning
Wonderwalls are also being tested in an online learning class. A required weekly assignment is for students to visit the Wonderwall for that week and make at least one posting about something they are wondering about related to the week's learning content or anything else they want to share with each other or the professor.

The Wonderwall provides a rich snapshot of both mood and cognition of the class each week. Sometimes students whine and complain. This is important feedback to the professor. Other weeks they are playful and engage each other in both on topic and off topic exchanges (one student logged on early in the week and asked what countries everyone had visited). Who posts first each week has evolved into an informal contest. Some wonder about the Wonderwall (I wonder why we have to do this) or express wishes about the Wonderwall (I wonder why I can't move posts). We have implemented many of their suggestions during the class. Students also wonder about aspects of the readings or assignments.

During the first 8 weeks of using Wonderwalls in an online class, participation has been almost entirely asynchronous by both moderator and students. In hopes of attracting a critical mass to experience and test more of the synchronous features of the Wonderwall, in the second half of class the professor will announce two one hour blocks of time each week when she will be present in the Wonderwall, and will encourage but not require students to show up at that time.

HOW WONDERWALLS DIFFER FROM PREVIOUS WORK
Computer Supported Collaborative Work applications have been organized into four main categories: communication tools (email, conferencing tools, instant messaging, chat, and MUDs), coordination support (meeting support, workflow, group calendars, awareness, repositories of shared knowledge), sociality (social filtering), and integrated systems (media spaces, collaborative virtual environments, collaboratories) [6]. Wonderwalls fall outside of this schema.

Nine issues successful online communities need to support include: grounding, communicating social presence, discouraging misunderstanding and aggression, preventing flames, forming relationships, encouraging empathy, encouraging critical mass, and discouraging social dilemma [7].

A Wonderwall is not intended, by itself, to enable the formation and practice of an online community. They are a specialized tool to be used by already existing, ongoing in person or online communities (particularly K-12 and university classes or distance learning classes). Thus Wonderwalls inherit common ground and ongoing relationships among the participants. Participation tends to be assigned, not voluntary, yielding critical mass either synchronously or asynchronously depending on the circumstance and assignment. The teacher/moderator's role in enforcing prevention of flames or aggression and encouragement of empathy and trust is an extension of the whole class experience.

Project Direction and Vision: Carrie Heeter, Professor of Digital Media Arts, Comm Tech Lab Director, and Creative Director for Virtual University Design and Technology and Norm Lownds, Associate Professor of Horticulture and Curator of the Michigan 4H Children's Garden, Michigan State University
Director of Software Development: Carrie Heeter
Lead Programmer and Artist: Ben Rhodes. Programmer/Artist, Virtual University Design and Technology, Michigan State University
Database Programming: Mihai Peteu, Michigan State University Honors Student
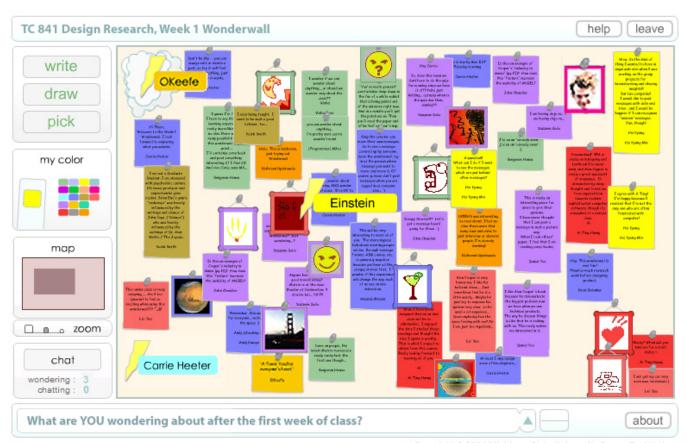**Server and User Testing Support:** Pete Maziak, Comm Tech Lab Manager, Michigan State University

CONCLUSIONS

Preliminary Wonderwall testing hints at the potential of highly specialized communication environments to impact cognition and affect, providing informal learning venues such as museums and gardens, online professors, and classroom teachers with a new means to encourage the act of wondering, to gain insights about mood and cognition of their group, and to facilitate peer to peer interactions. Further development and more research are underway.

REFERENCES

1. Woolfolk, A. *Educational Psychology*. Allyn and Bacon, Boston, 1998.

2. Lowenstein, G. The psychology of curiosity: A review and reinterpretation. *Psychological Bulletin*, 117, 75-98, 1994.

3. Maslow, A.H. *Motivation and Personality*. Harper and Row, New York, 1970.

4. Picard, R. *Affective Computing*. MIT Press, Cambridge, 2000.

5. Carlson, R. *The Sense of Wonder*. HarperCollins Publishers, New York, 1998.

6. Olsen, G. and Olsen, J. Groupware and Computer-Supported Cooperative Work, in Jacko, J. and Sears, A. *The Human-Computer Interaction Handbook*, Lawrence Erlbaum Associates, Publishers, New Jersey, 2003.

7. Preece, J., and Maloney-Krichmar. Online Communities: Focusing on Sociability and Usability, in Jacko, J. and Sears, A. *The Human-Computer Interaction Handbook*, Lawrence Erlbaum Associates, Publishers, New Jersey, 2003.

Figure 2. Wonderwall Example, Week 1 of Class