Wonderwalls: Playful Peer to Peer to Expert Collaborative Learning Spaces
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1   Introduction

Wonderwalls connect learners, teachers, and visitors in real time and asynchronously to persistent, playful, moderated, spatial communication environments designed for collaborative learning. Participants compose or upload and position text or graphical "post-its" on the Wonderwall. Moderators can attach answers to posts and stream real time audio.

The original Wonderwall was an 8 foot by 3 foot large blank paper with colored markers. Visitors to the 4H Children's Garden were encouraged to write anything they wondered about throughout the day. The electronic Wonderwall began with the same concept, evolving through user experience testing and recognition of possibilities and technological affordances. Wonderwalls are specialized environments which facilitate affect (a sense of mystery, fun, excitement, and importance) and cognition (reflection and formulating questions).

Wonderwalls are currently used extensively by elementary school classes to connect the class with "Dr. Norm" as they follow up on science field trips to the Children's Garden. K-12 kids welcome dive into Wonderwalls with a sense of glee, crashing their lightning bolts into each other. They are excited to have scientists from afar "visit" their classroom When fourth graders voluntarily log in over the weekend to do more science, teachers smile.

Wonderwalls are also used in graduate and undergraduate online and face to face classes. For example, a weekly participation assignment is for students to visit the Wonderwall to post things they wonder about from that week's readings. Students are encouraged to post as themselves, respond to each other, and to whimsically yet plausibly impersonate the textbook authors.

2   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, moving between feelings of excitement and curiosity to frustration to accomplishment and satisfaction [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 curator, scientist or online teacher) to sensitively nurture, share, and facilitate child or adult students' sense of wonder about particular topics. Wonderwalls transport wondering from private cognition to a collective, public, interactive social learning activity.

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

Designed to appeal to fourth graders through graduate students, Wonderwalls are more like a physical bulletin board than a discussion forum. They feels distinctly different than the more efficient, multifunctional, linear message boards and they are used differently.

3   Technical Specifications

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 and choose closeup, intermediate, and full wide views as they navigate the Wonderwall. They can create and position content by typing, drawing, selecting or uploading images. All participation is real time and 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 the 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. Participants can change their color live anytime, and every one of their posts change.

The moderator has special powers including the ability to print a Wonderwall, post real time headlines, answer participants' posts, edit any content, and stream live audio. Figure 1 shows the upper right corner of a Wonderwall with sample child posts asking about plants. An (imaginary) young Carl Sagan wonders, How many plants are there? Billions? A young Jakob Nielsen asks, "What plants are most usable and why?
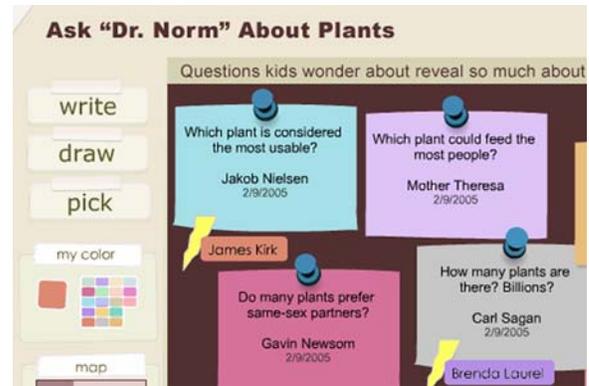

Figure 1: Upper right corner of a Wonderwall zoomed in all the way

4   Differences From Previous Work

CSCW applications can be 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 to, by itself, 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 relationships among the participants. Participation tends to be assigned, not voluntary, yielding critical mass. The teacher/moderator's role in requiring and encouraging participation, enforcing prevention of flames or aggression, and facilitating empathy and trust is an extension of the whole class experience.

5   Conclusion

Wonderwall installations demonstrate the potential of a highly specialized communication environment 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. Students gain a sense of what their peers are thinking about, stimulating new ideas.

6   References

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