Toward Promoting the *Water Cooler Effect* in Informal Learning Environments

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**Abstract:** Informal exchanges in workplace settings often occur at communal artifacts that encourage self-motivated interaction in a community. This phenomenon, the *water cooler effect*, is the resulting combination of the “space” augmented by the communal artifact and the “place” influenced by the activity that occurs here (Harrison & Dourish, 1996). We claim that the types of interactions that occur at a communal artifact may take the form of informal conversation, information transfer or knowledge exploration depending on the structure of the water cooler and the activity which prompted the interaction. If this same water cooler effect can be finely tuned to provoke more instances of knowledge exploration, then learning can be achieved more naturally—which is especially important in informal learning. This paper highlights the water cooler effect of Kitchen Science Investigators, an after-school informal learning environment, to suggest characteristics of the water cooler effect that encourage knowledge exploration.

**Introduction**
Kitchen Science Investigators (KSI) is an after-school informal learning environment where learners engage with science concepts through cooking and related experimentation. During a recent ten-week pilot study, we were surprised to find that many productive conversations occurred when learners randomly encountered one another—e.g., they could be found critiquing recipe results at the kitchen counter or talking about their scientific observations while note taking at the “poster wall.” We think these spontaneous interactions can be likened to the *water cooler effect* that workplace studies have identified (Schrage, 2005, Danskin, 2005). Because these unexpected interactions appear so constructive in informal learning, our goal is to identify what other *water coolers* might be valuable in informal learning environments for children. Our examples within KSI suggest that communal artifacts attached to particular activities may serve this purpose.

The *water cooler effect* occurs when two or more members of a community meet at a communal artifact, or *water cooler*, and engage in conversation that enhances opportunities for collaboration. But, why is this effect desirable in informal learning? Most informal learning shares the same goal: learners, inspired by their own epistemological and/or personal motivations (Resnick et al., 1996), should explore and build upon their existing knowledge in deep and meaningful ways. For this knowledge exploration to occur, learners must be given a certain degree of freedom. Of course, with freedom for exploration comes a constant informal learning challenge: how can the learners be encouraged to use their freedom to confront, explore, question and challenge their knowledge representations? This is why the water cooler effect is desired within informal learning venues; if well constructed, a water cooler can potentially create a sense of “place” (Harrison & Dourish, 1996) that encourages learners to explore their understanding with one another. In this paper we attempt to answer the question, how can we arrange an informal learning environment’s setting and activities to support the kinds of productive, knowledge-constructing conversations that occur at water coolers?
Background: Water Coolers

Harrison and Dourish (1996) stress that creating a three dimensional “space” is not enough to support and ensure certain types of interactions occur. Rather “place” is vital in order to properly frame interaction behavior within the proper context. Their principle, “space is the opportunity; place is the understood reality,” reveals that just because a space is designed for certain activities and interactions does not mean that participants in those activities will use the space as planned. Rather, the affordances of spaces are interpreted, or created, by participants as they engage in the actual social context.

Although water cooler analogies are often used in the workplace literature (Schrage, 2005, Danskin, 2005), the range and depth of the different types of spontaneous meetings that occur at water coolers has been incompletely identified. Our reading of the literature suggests three key types of interactions: informal conversation, information transfer, and knowledge exploration. The literature suggests that knowledge exploration will not occur until members of the community have established a level of comfort with one another; this is why socializing interactions, though not always intellectually fruitful, play an important role in promoting more substantial discussion during water cooler run-ins.

Informal Conversations

Nardi (2005) claims that informal conversations, which include “…greetings, jokes, gossip, polite inquiries, and ‘chatter’ of a low substantive content” are among the four types of communication – touch, eating and drinking, sharing experience in a common space, and informal conversation – that can help ready participants for further, more substantial communication. Although these seemingly “trivial” conversations may not appear to hold value within informal learning, the social bonds that can result from these interactions create a strong foundation that is necessary for promoting productive conversations.

Informal conversations may also serve as a motivator for participation within a community. In the workplace setting, van Meel and Vos (2001) recognize that many corporations have chosen to decorate with “socializing” gadgets or spaces like “…kindergarten-like ‘romp spaces’, coffee bars, gyms, day-care centres, pool tables, and dartboards…” to motivate cream-of-the-crop employees to stay or join the company. Socialization can also be used as a motivator within learning environments. Bruckman (2000), found that by creating a “richly social” environment, as she did with MOOSE Croosng, learners can naturally be motivated to participate.

Information Transfer

Information transfer occurs when participants speak of procedures, news and other administrative details of the community with one another at a communal artifact. Although information exchanges may not help to directly achieve community goals, they create a certain level of awareness within a community of its health, norms and practices.

Knowledge Exploration

Knowledge exploration exchanges occur when members discuss, question, challenge or explore a problem or issue directly related to accomplishing the goals set for them by the community. In an anecdotal account, Grebow (2002) details how, as a junior mail boy, he would run into his mailroom supervisor at the water cooler, chitchat, and then transition the conversation to ask advice about achieving one of his job responsibilities. His common tale stresses the importance of establishing a connection through socialization prior to delving into more substantial, work-relevant conversation. In an example from informal learning, more abstract versions of water coolers have been identified. Resnick (1998) describes how a green table became central to the Computer Clubhouse after-school environment; it served “…as a type of village common, where people came together to share ideas, views, visions, information, and even food.”
Setting: Kitchen Science Investigators

KSI is an after-school initiative where learners engage with chemistry and science through cooking and baking, with the goal of exploring the scientific reasoning behind cooking results. As an after-school program, KSI enjoys many of the benefits of informal learning where the social aspect is at the core of the learning; likewise, the learners’ genuine motivation and interest – not just the promise of assessment – helped learners to explore that focal topic (Wellington, 1990). In order for the learners to participate successfully in learning from cooking activities, we incorporate the guided inquiry of Problem-Based and Project-Based Learning into the environment, similarly to what is been done in a variety of classroom-based programs (e.g., Barron, 1998).

During the first few weeks of the study, we introduced simplified pizza, brownie, cookie and cake recipes to the KSI learners. Each cooking recipe was coupled with a science experiment so as to make the chemical reactions of the session’s featured ingredients more explicit to the learners. Following these initial introductory weeks (problem-based), learners were encouraged to improve upon a recipe by experimenting with the ingredients and/or the procedure of the original recipe (project based). Prior to retrying a recipe, learners had to justify the science or cooking reason for editing the original recipe and how they predicted the change would effect the outcome. In addition to cooking preparation, baking, and science experiments, the learners became “investigators,” taking pictures and recording their observations while cooking and discussing their experiences as a group to extract out the “hows” and “whys” behind the science. To help the learners keep records of their cooking and experiments and what they were learning, we introduced several different note-taking artifacts into the KSI setting: large posters, worksheets, software on laptops. Paper artifacts were used during the first 5 weeks; we introduced computer tools for note taking and planning during the last 5 weeks. For five of the sessions, the learners read off of paper copies of recipes and took notes and observations on large posters centrally located to the setting. In five other sessions, the learners viewed the recipe on a laptop at their workstation and used the software to edit their recipes and write down their observations.

Study & Methodology

The data presented in this paper was collected as field notes. Both during and after the collection process, the data was analyzed using an abbreviated and adapted version of grounded theory. Our analysis goal was to identify the types of scaffolding that would benefit participants’ collaboration within and across groups (intra-group and inter-group). The first phase of data analysis was largely deductive and was intended to find overlying patterns among the data. The differences between the uses of paper and computer media/scaffolding led us to notice the water cooler effect. Without the global display and collocation afforded by the poster wall, members of different groups did not interact as they once had. Soon we noticed that not only did these impromptu learner interactions occur at the poster wall, but also, this same water cooler effect occurred around several other KSI artifacts in the setting.

Results: The Water Cooler Effect in the KSI Pilot

The following discussion of the KSI study highlights the spaces in KSI, the activities that went on in these spaces and how the combination of the two often resulted in the water cooler effect. Some interactions discussed are exemplary displays of how establishing strong bonds between learners by informal conversation can lead to knowledge exploration. Other interactions did not lead to such productive conversations relative to KSI’s learning goals, but encouraged social interactions vital to maintaining learner motivation.
Articulation at the Poster Wall

Learners were encouraged to write down their observations while preparing their recipes and to articulate their thoughts and ideas in writing. In the first few KSI sessions, the learners recorded their observations on large posters that were on a visually-central wall of the setting (the “Poster Wall” in Figure 1). At every new step of the recipe, at least one learner in each group was responsible for writing observations on this poster. Participants from different groups often “ran into” one another randomly and frequently at the poster wall.

The interactions learners had at the poster wall took all forms: informal conversation, information transfer and knowledge exploration. Based on conversations learners had when they returned from writing on the poster wall, we know that they at least occasionally discussed KSI process (information exchange) and science (knowledge exploration) when they bumped into their peers. For example, a KSI team had the misconception that only one person was allowed to write down the group’s observations. Another learner at the poster wall told one member of this team that all were responsible for taking notes—not just the recorder. Without the opportunity to exchange questions and conceptions regarding KSI procedure with members of other groups, this learner might have been the only one of his group to reflect on his scientific observations; this information also allowed the recorder to realize that he could participate more fully in group activities – he did not have to be the only group member writing notes on the poster wall.

The central location of the paper artifacts had a second effect. Learners could see the poster wall from their workstations; this visibility allowed them to be aware of what steps other groups had completed. Some learners even began using the poster wall to compare their group’s progress to others’.

It is worthy to note that use of software for recording observations on laptops did not result in a water cooler effect. The learners’ inter-group interactions decreased while their one-on-one interactions with the computer increased.

The “Place” created by Food Preparation

Although food preparation is an activity and not an artifact, the sense of “place” that this activity created within the KSI community was so undeniable that it seemed that it had the power to transform the
actual space – from a small, busy school cafeteria to a lab for kitchen science. Informal conversation came easily during food preparation. Nardi (2005) highlights that sharing food and drink promotes strong social bonds; we propose that preparing food together promotes these bonds as well. (Possibly a plan to eat the food is also required.) In one instance, nearly all sixteen KSI participants starting singing “High Hopes” while mixing their ingredients, a song they had learned together in class. We think this silly socializing happened only because the learners felt so much “at home” while preparing food together in a place where they were comfortable.

Sharing Supplies at Food Preparation Tables

Each group had their own utensils, but packages of ingredients were shared across groups. While searching for these shared packages of ingredients, learners noticed the progress of other groups and the procedures they were using; during these visitations the learners would often consulted with and gave advice to members of other groups. On one occasion, when a participant visited another group in search of vanilla for his cookie recipe, he noticed that one group making cake was using a larger amount of sugar than his group had used in their cake recipe. His comment towards that group about the amount of sugar they were using might not have been voiced if each group had had their own ingredients. This learner brought up an interesting point since the group making cake had in fact increased the amount of sugar from the original recipe. While the conversation did not continue, inquiries such as this have affordances for leading to discussions of procedure and explanation. When learners have to share some supplies, they have more opportunities to confront one another at relevant times.

Sharing Ideas and Opinions at Adjacent Tables

Each group’s table was adjacent to one other group’s table (as in Figure 1). This small buffer zone between neighboring groups became a water cooler of sorts. Not only did this proximity allow groups to become aware of the status and progress of their neighboring groups, but they also often became contributors to these group members’ conversations, similar to what happens as a result of radical collocation in corporate “warrooms” (Teasley et al., 2000). In one session of KSI, the learners were to explore how eggs are emulsifiers, agents that can coerce incompatible liquids (like oil and water) so that they can remain together. To show this, they performed an experiment in which they added water, then oil, and finally eggs to a bottle while noticing the consistency of the liquids prior to and after adding the egg. One typical interaction that occurred involved Ryan who overheard Kendra saying, “Look the oil is on the top.” Ryan, at the adjacent table, chimed in and said, “Yeah it’s lighter than water.” Although exploring the density of these liquids was not among the day’s objectives, Ryan’s comment encouraged Kendra and her group to take their knowledge exploration in a new direction. This was evident when Kendra’s group made observations on the large poster regarding their science experiment (Figure 2). They not only noted that oil was lighter than water, but also that the egg was heavier than the other two liquids. These unpredicted knowledge explorations are displays of how table adjacency benefited this informal learning environment. Table adjacency also resulted in informal conversation and informational exchanges.

Figure 2. “Group #2 – The egg went straight to the bottom of the bottle; meaning that it is heavier than the water and the oil.”
Cleaning Dishes at the Kitchen Sinks

The largest and most surprising social bonding of KSI took place in the kitchen when the learners were washing the dishes. In the first week of KSI, cleaning was seen as a chore. Yet washing the dishes soon came to be seen as a social activity that many learners wanted to participate in. They would even playfully fight with one another over who “got” to wash the dishes, sometimes even “stealing” dirty dishes from other groups’ tables. After they had put their creations in the oven, many KSI participants could be found in the kitchen chatting or singing while washing their dishes at one of the five sinks – the kitchen sinks had quickly become the hotspot KSI’s informal conversations. One of the most obvious displays of the social popularity of this water cooler was when one learner mentioned, “Hey Ashley, you missed this last week! Bring the other stuff that needs to be cleaned.” Washing the dishes had turned into the activity that learners “missed out” on if they were absent for a KSI session. Unfortunately, for the learning goals of KSI, it did not appear that any deeper conversations occurred at this water cooler; its benefits were purely derived from increasing the social bonds among the learners.

Critiquing Creations at the Kitchen Counter

KSI participants would often find themselves in the kitchen as their food creations were transitioning to or from the oven. While they were waiting for the uncooked goods to enter the oven, members of different groups would often criticize or comment on the ingredients or presentation of other groups’ creations. On the very first day of KSI, all of the groups made pizza; two of the groups were at the kitchen table, waiting for the facilitators to put their creations in the oven. At this time, a member of one of the groups commented to the other group, “We put pepperoni on the pizza, and then cheese, and then more pepperoni.” Fueled by competition, the other group then decided to take this as a suggestion and add a cheese and pepperoni layer to their pizza as well. After the food had finished baking, the learners would often gather around the kitchen counter in expectation. As the food was removed from the oven, learners would “ohh”, “ahh” or “eww” at their peers’ results. This was especially apparent when the groups revised their own recipes, making the variations between the groups’ end products more obvious. These comments served to validate or criticize other groups’ techniques or changes in the recipes.

Discussion – water cooler changed to communal artifact

We’ve identified three properties that seem to contribute to the success of knowledge exploration around a communal artifact within an informal learning environment: relevance to learning goals, placement in the setting and the frequency of learner visitation.

Relevance to Learning Goals

The poster wall of KSI promoted knowledge exploration and information exchange conversations, we think, because its purpose was to encourage reflection and articulation of the learners’ activity-related observations. In contrast, the failure of the kitchen sink at promoting learning-related conversations was because the learners were not engaged in an activity relevant to their learning. This communal artifact was so far removed from their learning goals that the conversation around it was completely dependent on the learners’ own conversation objectives. It seems that juxtaposing a thought-provoking activity with a communal artifact puts learners in the proper frame of mind for discussing learning-related activities; hence, when they do encounter others in this space, they are likely to be on task and motivated to discuss focal learning topics.

Placement

If a communal artifact is “owned” by group of the community, interactions will be limited and constrained to those members in the community that hold more ownership stake. For example, the KSI learners interacted more frequently with their table neighbor than their peers across the room; we feel that this is partly because this region was there space. Additionally, it is important for the communal artifact to be in a public space so that the members of the community feel welcome to observe or join the
interactions that may take place within its space. In KSI, the learners eventually came to use the poster wall as a pacing method for their recipe preparation since it served as a public display of all groups’ progress; this type of heightened awareness due to the presence of a communal artifact has also been seen in the workplace (Becker et al., 2003; Huang; Teasley et al., 2000), suggesting that if a communal artifact holds or displays information that is relevant to the whole community, its placement in a public space is essential. Hence, a communal artifact should be placed in a more accessible place that is not owned by a subgroup of the community, but rather, owned by all members of the community.

Frequency of Visitation
Putting a communal artifact in a public space increases the likelihood that random learners will meet; choosing a communal artifact that encourages frequent visits increases the likelihood that learners will meet more often. Furthermore when visits to a communal artifact are frequent and integral to the main activity, learners seem to become aware of how important the activities at that communal artifact are to overall success. Interviews with KSI participants showed that they had come to understand that note taking and making observations are integral to becoming able to transform recipes for their own tastes.

Concluding Thoughts
By design, KSI was an extremely social and interactive informal learning environment. The communal artifacts that most successfully promoted knowledge exploration were relevant to learning goals, publicly accessible and “owned” by all. Those that were designed to be visited frequently were seen by learners as being integral to their success. All communal artifacts – the poster wall, the act of food preparation, sharing supplies, the adjacency of tables, the kitchen sinks, and the kitchen tables—promoted informal conversation, whether we had designed them that way or not. Opportunities for socializing around communal artifacts kept the environment fun while also motivating participation. Creating social bonds among participants was not among the challenges we faced in this enactment of KSI. The socializing we observed around these artifacts, however, convinces us that we must encourage social bonds among future KSI participants who don’t know each other as well as did those in our study and suggests several ways of using communal artifacts to encourage interaction.

End Notes
(1) We have collected and analyzed data in several different ways from the spring 2005 pilot of KSI, and it is presented in several papers submitted to ICLS, each with different goals. For this paper, we initially sought to understand the kinds of software that might be integrated into the environment to scaffold learning. For the “Promoting Learning” paper, we were trying to understand how to naturally promote learning in this informal learning environment. – difference in goals isn’t clear enough
(2) All of the learners’ real names have been changed.

REFERENCES


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