

# Personalizing the Collaborative Learning Environment with Pictures

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## ABSTRACT

The Internet and Web-based technologies, as well as rapid globalization, are changing the way businesses communicate. Continuous progress in Information Technology (IT) enables effective and efficient communication, particularly with the use of collaborative systems. Such systems have many different types of interfaces and attributes, and one such attribute is the use of visuals. This research assesses the usefulness of participant pictures in a collaborative exchange. To evaluate the usefulness of such pictures, participants were asked a series of questions regarding the use of pictures in CAMS, a collaborative environment. The results suggest that, in a collaborative setting, the use of pictures is valuable in enhancing a "sense of community," particularly in cases where participants have not met face-to-face.

**Keywords:** Collaboration, Learning Environments, Visual Cues, Collaborative Technologies.

## INTRODUCTION

Technology, specifically the Internet and Web-based technologies, as well as rapid globalization are changing the way businesses communicate. With this increase in globalization, there has been a significant rise in the number of telecommuters. Additionally, with the increased number of mergers, acquisitions and multinational firms, the likelihood of being part of a geographically dispersed team has significantly increased. Therefore, the use of collaborative tools within the work place is increasing at a significant rate. Some researchers believe that the future success of multinational firms hinges on the ability of the employees of the corporation to collaborate effectively [1]. Geographic distance has an impact on how efficient and effective a team can operate. According to [2], distance affects collaboration because teams may fail to disseminate information appropriately, and thus, may miss opportunities, or even redo tasks that are already complete at other organizational units.

Continuous progress in Information Technology (IT) enables effective and efficient cooperation, communication and coordination on all types of projects involving team members

that are geographically and time-dispersed [3]. Making the most efficient use of time is critical in today's fast-paced world. Collaborative software can expedite the ability of groups to develop a shared understanding of a problem or task and move towards a solution. According to [4], new technology should be developed in such a way that it enhances the existing culture. That is, such technology should be developed from within the organization, rather than being pushed down from upper management [4]. Technologies should not just adapt to the existing culture, but should help the organization change the existing norms; otherwise such technologies are likely to fail [5],[6]. To be effective, these technologies must do more than automate existing practices; they should improve processes not only in the business organization but also in educational settings [6],[7]. Therefore, educators must emphasize collaborative tools in the educational environment and make use of technology that supports collaboration, so that such collaborative experience is then passed on to future business professionals. According to [7], "there are few educational programs that include an explicit focus on providing students with practical training in distributed collaboration" and this is an essential skill for future success.

## LITERATURE OVERVIEW

### Collaboration and Learning

Collaboration means many things to individuals, depending on the environment. It can simply mean communication to some people, but according to [8], collaboration should mean more than just communication, as it encompasses coordination and production also. In general, the definition of collaborate is "to work together on a project for a shared goal". In a business environment, collaboration is used to work on or solve a problem. Working collaboratively allows people to do something jointly with shared outcomes. Where better can an individual learn collaborative techniques than in the educational setting?

Collaboration is a very important part of learning, and as such there is a greater awareness of the benefits of collaborative learning methods [9]. Learning is more than just knowledge acquisition; indeed, it is a process of interaction that occurs in social relationships within a community [10]. Collaboration, whether supported by technology or not, makes a difference in

such relationships, and relationships are what business is built upon [11]. Communication, conversations and relationships are also the keys to learning, and as such, can be enhanced with collaborative technologies [12]. New technologies should allow participants to engage in communication and collaborative activities that lead to an improved learning process [6]. As noted in [13], education has traditionally accepted some forms of new technology quite easily, but in spite of this, the role of IT has not been considered as central to the learning process as it should. According to [14], computer-mediated communication (CMC) is particularly suited to collaborative learning strategies and approaches, and as such, should help in the development of a sense of community among the participants [15]. This assumes that the participants are able to feel comfortable with each other and the environment, as cooperative learning is based on voluntary participation in the learning community. According to [16], if collaborative learning is to take place successfully, then it is crucial that the participant feels part of the community. Furthermore, the participant's contributions should add to the common knowledge pool, and thus a community spirit is fostered through the interaction. Also [17] stresses the need to "humanize" the class in a collaborative environment, while [18] suggests that it is imperative to create an "image presence". This creates a warm, open and personal presence when using collaboration tools [18]. Thus, collaboration technologies that don't emphasize the ability to personalize the environment are more likely to alienate the participant.

**Levels of Collaboration**

Five levels of collaboration are defined in [19], Level 0 through Level 4. These levels are defined in Table 1. This research focuses on two of the five levels of the collaborative process; Level 1, where functions such as meetings, video and audio teleconferences occur, and Level 4, where real-time interaction takes place.

Level	Type	Function
0	No Collaboration	No sharing of information
1	Conventional Collaboration	Meetings; video and audio teleconferencing, FAX
2	Data Collaboration	USENET, Listserv, e-mail, corporate databases, file servers, WWW sites.
3	Interoperable Software	Middleware; technologies that allow automatic workflow processing
4	Presentation Sharing	Real-time interactions, synchronous, domain-specific processing

**Table 1:** Levels of Collaboration

**Interface Issues**

In reference to the user interface, it should be simple and intuitive to the users [20]. In the view of [21], the user interface is the most important factor when using IT within an organization. According to [22], user engagement and effective responses to the user interface have significant influence on user satisfaction, as well as on usability of the system. User interfaces should be "realistic, easy to use, provide opportunities for exploration, engagement and learner control" [10], and the result should be "a

collective intellect and mutual accountability" for the participant [23]. Furthermore, collaborative technology must be much more than a digital information delivery system [24].

Guidelines are proposed in [25] for interface design in accordance with ISO 14915 standards [26-28]. While these standards specifically address multimedia interface design, they may be applied to any collaborative design interface as well. Contextual communication is one factor that comes into play when designing computer-enhanced educational environments for collaboration. According to [29], Western cultures are defined as low-context cultures, meaning the verbal content of a message is much more important than the setting in which such message is delivered. However, in populations that are made up of a large percentage of individuals from Middle Eastern and Eastern cultures, context plays a much more important role in communication. Therefore, special consideration must be given to methods of adding context to the communication medium. Face-to-face communication involves much more context, including the use of body language and emotion, as well as facial expressions to assist in the process where one person helps another understand a message [30]. In other words, technology has not replaced the need to look collaborators in the eye [5]. Replacing these context-rich forms of human interaction with low-context communication technologies, like e-mail, instant message or chat, may put the high-context individual in an unfavorable position [31]. That is, the lack of body language and the inability to accurately assess emotion is considered by many participants as a major disadvantage of low-contextual collaborative communications. Therefore, many techniques that incorporate visuals have been tested in collaborative environments including using the videoconferencing features of software such as NetMeeting (NM), which allows participants to share applications, whiteboards and chat at the same time [32]. However, many of these technologies have limitations on the number of users who can be connected within the same session, due to technical issues such as the availability of bandwidth or hardware specifications.

**Static Pictures, Streaming Media and Virtual Environments**

Desktop videoconferencing is one technology that is used in a collaborative environment that the business world is quickly adopting. However, according to [5], videoconferencing is a "slick" tool and requires care when implementing it in collaboration environments because of its phenomenal bandwidth requirements. As participants to a session may be connecting through multiple venues, (i.e., dial-up, LAN, ISDN, DSL, or cable modem), much of the web conference may appear patchy, where movements may be hard to follow because they are either slow or missing. Each of the above mentioned delivery methods has different and inconsistent delivery speeds. Furthermore, in many systems, only two or three participants are able to communicate using online videoconferencing on the same circuit. For example, in NetMeeting (NM), participants must be connected to a Multipart Conferencing Unit (MCU) with limited video connections, and thus, only a few individuals are allowed to participate in a meeting at any one time [32]. Additionally, NM is limited to use within a firewall [33]; that is, external participants may not participate in the meeting, even if they are at another business unit of the same organization. Additionally, Rosenberg [34], found that information is lost "if attention is paid to one person, while another is simultaneously communicating something important." Thus, videoconferencing was found to

yield relatively marginal added value to the meetings in which it was used [32].

Collaboration is usually event-driven, that is, changes in the environment are based on specific events that trigger action. According to [8], event messages do not play a role in controlling the environment; instead they are used for distributing updates to collaborative teams or participants. When using any type of desktop videoconferencing, all interactions are transmitted at a high priority, even if an event has not occurred. This requires a substantial amount of bandwidth and prevents other data from traveling through the circuit, as streaming media has a higher priority. Thus, the use of videoconferencing may create a bottleneck in the network. Therefore, many feel that videoconferencing is not extremely beneficial in a collaborative environment because of its bandwidth needs.

Alternatively, virtual collaboration is the next phase of collaborative software. Unfortunately, it is plagued with many of the same issues as streaming media. According to [35], 3-D or virtual collaboration is extremely resource-intensive, not only in terms of bandwidth, but also in terms of the CPU and it requires a high resolution, memory intensive graphics card on the local PC. Additionally, only a limited number of participants are able to use the system at any one time. And thus, the substantial cost of hardware and software, added to the cost of developing and maintaining the systems, may be prohibitive to some organizations. Similar to videoconferencing, quality may be low without the full support of multicasting and the availability of high bandwidth. Furthermore, research and training on virtual work is still lacking. This means that users of such systems need to develop their own approaches regarding the best collaborative method.

Not much research has addressed the use of participants' pictures in any collaborative environment. According to [19], other attributes, besides the business card information, need to be added to identify participants, and one of them is a participants' picture. Furthermore, a dynamic participant roster is important; ideally, if a photograph is available, it should be displayed as a participant joins the collaboration session [19]. Both [25] and [36] agree that the use of personality in media to attract and persuade can be in the form of a static human image or photograph. According to [37], almost everyone understands pictures regardless of nationality, culture or background, and thus, tools that incorporate graphics emerge as powerful techniques. The use of animated agents for the personalization aspect is explored by [38], suggesting that the addition of a visual, like an animated agent, into the user interface provides elements of embodiment, visibility and personality. As stressed by [39], it is the perception and awareness of others within the collaborative environment that is important. This awareness can be enhanced by the incorporation of the pictures of participants into the user interface.

A plethora of research has been conducted in the fields of educational technology and collaborative learning to determine which methods help or hinder the collaborative environment. Many tools exist to help educators bring the collaborative experience into existing programs, such as WebCT, Blackboard and several "home grown systems", such as CHIME (Columbia Hypermedia Immersion Environment) and CoWeb (an unstructured collaboration space used at Georgia Institute of

Technology). This paper incorporates an overview of the basic features of a unique course management system, developed by faculty at a large Midwestern university, which uses collaboration, interaction and participant ownership as fundamental building blocks. The premise of this research is to determine how participant pictures can be used in a collaborative environment and specifically, how pictures are used in the Community/course Action/interaction Management System (CAMS) to help personalize the environment. Participant reactions to the use of such pictures are evaluated. Finally, we summarize what has been discovered by using the participant's pictures in the CAMS environment.

## COLLABORATIVE TOOLS

In general, collaborative tools are divided into two categories: synchronous, where communication is occurring at approximately the same time, and asynchronous, where communication may or may not occur at the same time [4], [8]. Distinction should also be made between direct and indirect collaboration. In the case of direct collaboration, a participant has the capability to post or modify information and other participants can reply back and/or modify the posted information. In the case of indirect collaboration, a participant has the capability to post or modify information and other participants can only display or access such information. An example of direct collaboration is when an email is sent to a specific recipient and that recipient replies to the email. An example of indirect collaboration is when a message is posted and another participant posts a response after reading several messages. Additionally, collaboration can be structured or unstructured. For example, in the case of structured collaboration, the instructor/facilitator can specify the parameters of the discussion (and monitor it), whereas, in the case of unstructured collaboration, the participants choose the direction of the discussion. Using the above information, a three-dimensional structure is generated (see Figure 1) labeled with the following three dimensions: synchronous/asynchronous, direct/indirect and structured/unstructured. Additionally, two other aspects of collaboration, i.e., ownership and empowerment, may be incorporated. For example, the owner of information can add, edit, share and delete information, whereas, a participant is empowered to access the information owned by another participant.

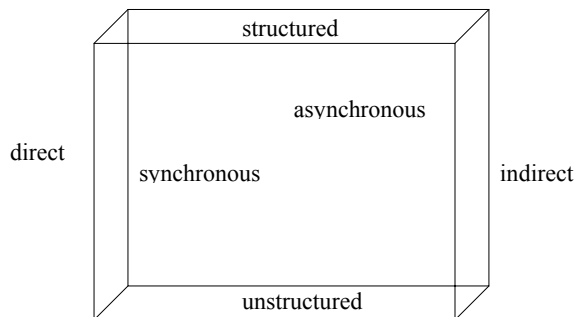


Figure 1: Modes of Collaboration

## COLLABORATIVE LEARNING TOOL

The Community/course Action/interaction Management System (CAMS) was used in this study because of its extensive use of participant pictures. For a detailed description of CAMS refer to [4]. A participant-centric system needs to be user-friendly, while providing the user/participant with the ability to customize the environment. In this way participants are able to take ownership of their environment. According to [40], technologies that focus on personalization and support learning are important in the process of developing openness. Community-oriented systems enable the users of the system to interact together (collaborate), whether on a one-to-one basis or in larger groups, and provide a means for getting to know others in the group.

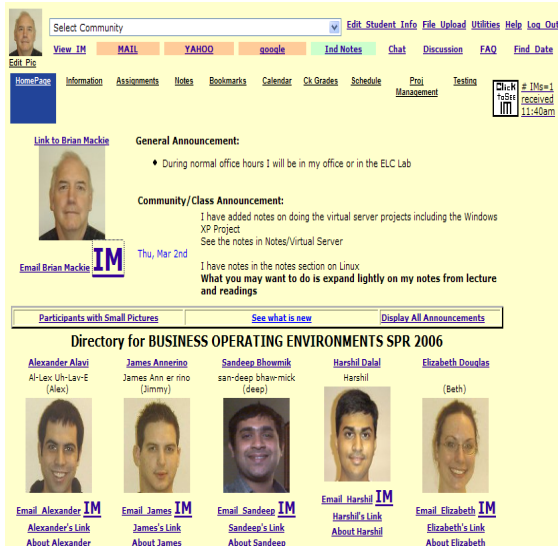


Figure 2: Community Homepage

CAMS includes numerous features and functions that incorporate the use of pictures, including a community/course homepage with relevant announcements and access to all participants' information within the community. This information includes the participant's picture, phonetic spelling, nickname, email address and any other information that the participant wishes to share with the community. Additionally, links are provided to assignments, notes, schedules, calendar, projects (with project notes and project chat), CHAT, Instant Messaging (IM; check, send and reply), threaded discussion, grades, book exchange, and testing.

The idea is to draw the participant in and keep the participant engaged in the community. This focus starts when the participant logs into the system. The participant's picture is displayed, as he/she is welcomed to the system. A list of courses and/or other communities that the participant is involved are displayed and the participant selects the community or course in which they wish to participate.

The community homepage includes a picture of the facilitator with links to email or Instant Message (IM) for instant communication (see Figure 2). In addition, the pictures of all currently logged in community participants are displayed. Other systems attempt to allow participants to personalize their

environment by allowing them to either create a web page for other participants to view, as is done in Blackboard, or by creating a picture book. Thus, in most systems the picture of the participant is not immediately available; it is necessary to go into some other specific function in the systems to access the picture and information about the participant, if it is included. Therefore, in order to view the pictures of more than one participant in such systems, then a user may need to access several web pages. By including photographs and additional personal information for all the participants within the class or community, a more engaging interface is created. It is hypothesized that these features make communication between participants easier and increases their sense of community. According to [38], achieving a sense of community is not easy or insignificant; it is not guaranteed by the interaction, but must develop out of the interaction.

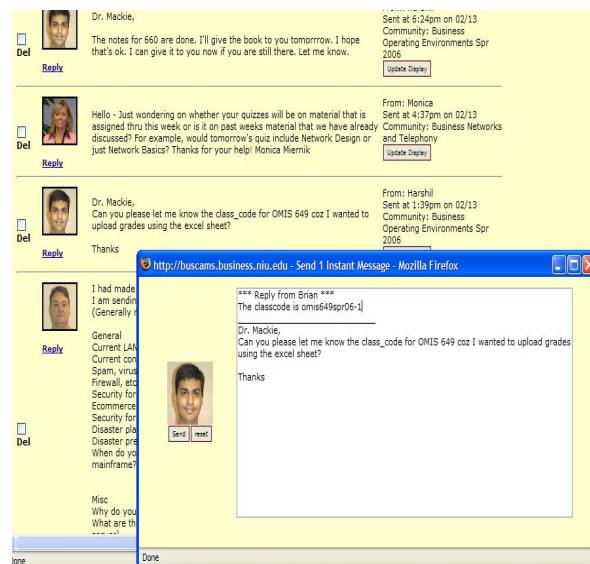


Figure 3: Instant Message View

Within the bulletin board function, faculty and/or students can create both topic areas (threads) and messages within a given topic. Once a participant adds a topic or message, it is displayed with the participant's picture and name. As participants post messages, the other participants can see the messages, as well as the picture of the individual who has posted the message or created the topic.

The availability of the participant pictures is also used to facilitate IM communication. Participants are able to click on the IM icon next to any other participant's picture to send them an instant message; this ensures that the correct participant receives the message. Receiving participants not only see the message, but additionally the picture of the participant who sent the message, together with their name and the time the message was sent (See Figure 3). Note: The IM feature in CAMS does not require all participants to be online; it can be asynchronous or synchronous.

CHAT can be used to communicate with other participants and the facilitator in real-time. The photos of all those currently participating in CHAT are displayed on the right side of the

screen (Figure 4). Additionally, the photo of the sender is displayed next to their message, thus adding a personal touch to the interaction. Furthermore, the project management function uses the bulletin board function to enhance communication. Once a project is created, modifications to project notes can be done by multiple participants at virtually the same time. Project members interact via project CHAT in approximately real-time and again the pictures and names of participants are displayed to all project members, which provide more context to the communication.

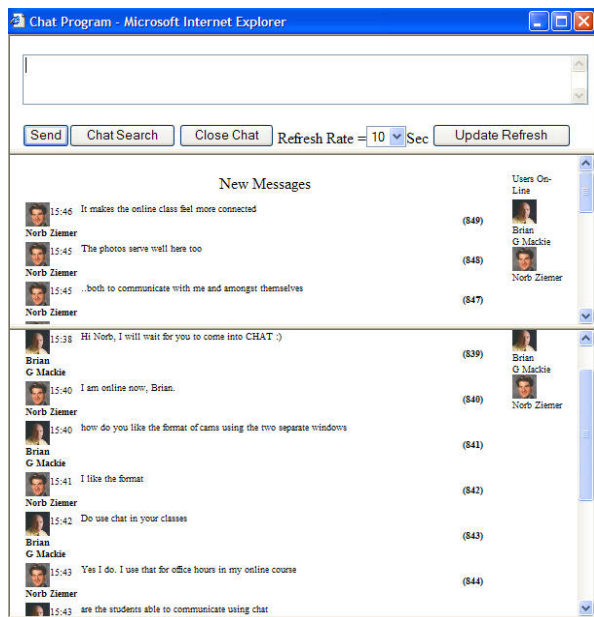


Figure 4: CHAT

## METHODOLOGY AND RESULTS

Both faculty and students, from a large Midwestern university who were either facilitating or taking a class using CAMS were asked to voluntarily participate in the survey. Five classes were asked to participate, with 210 possible respondents. The questionnaire was distributed online through CAMS to eliminate the possibility of responses by individuals not participating in a CAMS community. Out of a total of approximately 210 possible participants, 83 responded to the survey within the given time period, providing a response rate of approximately 40%. Even partially completed questionnaires were used, as respondents whom had not used all functions or features of CAMS could answer questions regarding the specific question, and thus, the sample size changes for each question.

Respondents were both undergraduate (70%) and graduate students (30%). Undergraduate students were mostly Management Information Systems (MIS) or Operations Management (OM) majors. However, a small number of respondents from other business majors were represented in the sample. In regard to the graduate students, 95% were MIS majors. It should be noted that the questions on the survey

instrument could not be validated as they are specific to the CAMS system.

Respondents were categorized into 4 types as described in Table 2. Type 1 are non-majors in a mass section, Type 2 are MIS/OM majors (smaller class size), Type 3 represents graduate students (more familiar with fellow students) and finally Type 4 identifies faculty/instructors. It should be noted that there were a very limited number of Type 4 respondents.

We hypothesize:

**H1:** There is a positive relationship between the use of pictures and the “sense of community” within the collaborative environment.

**H2:** There is a difference in the responses of the three student types (Types 1-3).

Type	Description	Class Size
1	Undergraduate non-major	> 50
2	Undergraduate MIS/OM major	< 50
3	Graduate student	< 35
4	Faculty/Instructor	N/A

Table 2: Respondents Type and Description

The Kruskal-Wallis test results for H2, are given in Table 3.

#	H - statistic	p-value
1	3.80	0.150
2	3.32	0.190
3	3.66	0.161
4	2.26	0.324
5	3.12	0.210
6	2.82	0.245
7	0.99	0.609
8	2.80	0.246

Table 3: Kruskal-Wallis Test Results

The above results incorporate adjustments for ties. In each of the above cases, there is not sufficient evidence to conclude that there is a difference in the responses between the types of students.

Respondent experience level with CAMS ranged from “this being the first exposure” to “using the system in 4 or more classes prior to this semester”. Table 4 provides the mean and standard deviation for the 8 questions concerned with the use of pictures. Respondents were asked to indicate their level of agreement to the statements on a 7-point Likert scale (1 being strongly agree, 7 strongly disagree).

#	Question	n	Mean	Std Dev
1	It is useful to provide access to my picture for other class participants	70	2.414	1.4395
2	It is useful to be able to view other class participants pictures	72	2.361	1.4946
3	When using (CAMS) IM to communicate, I find it beneficial to see the individual's name and image	73	2.315	1.4988
4	When using (CAMS) Chat, I find it beneficial to view the images of the active participants	65	2.369	1.2570
5	When using (CAMS) Chat, I find it beneficial to have the name and picture of the individual sending the message supplied with each message	65	2.354	1.3855
6	Being able to view other students pictures helps me familiarize myself with the community participants	83	2.157	1.3388
7	The use of pictures in CAMS, provides an increased sense of belonging; being part of the community.	60	3.833	1.6991
8	I would feel left out if most other students had a picture available online for the class and my picture was not available	64	3.125	1.7861

**Table 4:** Survey Question Analysis

### Student Insights

As shown in Table 4, the use of pictures in the CAMS environment is seen as a positive function, adding to the sense of community. Very few students perceived the use of pictures negatively, and then only because they didn't like their own pictures. Many participants stated that the pictures were very useful. However, some participants felt that after being in the community for a while, the pictures lost some of their benefit. Additionally, even with the inclusion of participant pictures, the lack of body language was seen as a disadvantage. Table 5 provides a sample of the open-ended questions divided up by the type of students whom answered the question.

<b>Type 1 Open-ended responses</b>
It helped me find my group members visually instead of having to search for their name. It also gave me a better sense of who was in the class since it was so big. You could ask for help from one of your classmates without knowing their name. It was great!
I believe it is a good idea. If you need to contact someone and you don't remember their name, you can go to CAMS and look for their picture. Once you find their email you can contact them.
I think it helps familiarize you with the students in a larger class like this one. Since there isn't much time to talk to the students in the class and get to know them, this makes it a lot easier to put the face with the name.
It was nice to be able to look up classmates names by their picture. So, If you forgot their name you did not feel rude asking them their name multiple times.
<b>Type 2 Open-ended responses</b>
Gives online learning a more personal touch.
The most important reason for having a picture on CAMS is at least your classmates know who you are and this makes it easy to communicate.
I don't think it is a bad idea, matter of fact, I think it helps student feel more comfortable with each other. It facilitates familiarity.
I feel that having our pictures available in CAMS is good because it allows us to attach a name with a face. It does improve the class environment in the sense that we are not in a room with "complete" strangers. It also makes it a lot easier for us to approach one another, in case we need help with an assignment or topic in class. I actually had another student in our class ask me a question about Oracle in the computer lab after he saw my picture in CAMS. It feels more comfortable when you talk to someone if you know the person's name.
<b>Type 3 Open-ended responses</b>
It doesn't make a difference to me. If I can see them in class, in person, then I don't see any point of posting their pictures. I have taken an online course and the pictures were helpful because I didn't meet any of the students or the Instructor.
I like the idea of having a picture available on CAMS because it helps you learn new classmates' names easier and faster.
I would rather see my classmates using desktop video conferencing for groups, with the picture I can't tell what they are thinking.
I think it is somewhat beneficial to have a student's picture available. The environment seems more open and friendlier.
I believe that having pictures in CAMS is a good thing because it gives a face to the name, so it helps in knowing who people are and I believe that is very beneficial now because the same students are going to be in most of the same classes, so CAMS is a jump-off point to get to know people a little better.
<b>Type 4 Open-ended responses</b>
It's a good way to link students with students. Placing faces with names is a positive communication builder for both the student and the teacher. As an instructor, I can also see who is sending messages, it helps to put the name with the face.
The use of pictures is a distinguishing feature of CAMS.

**Table 5:** Representative Responses to Open-Ended Questions

## CONCLUSIONS

In this paper we investigate the use of participant pictures in a collaborative environment. Although a system using static pictures conveys less visual information than a system that uses streaming media or video conferencing, user responses on the usefulness of static pictures show that they provide an enhanced sense of community and personalization. Therefore, a system that incorporates static pictures provides much more than just process support. Furthermore, most systems allow access to the picture of a participant in only one function or area, thus making it more difficult to view pictures of other participants. According to the respondents, the availability of participant pictures in multiple areas is useful.

Most participants benefited from some aspect of the collaborative learning environment and had positive comments, both in terms of the use of pictures and the "building of a community." The analysis of the responses, as well as overall participant feedback, indicate the importance of providing a sense of community within a collaborative environment. Visual images of participants not only provide familiarity within the community, but also remove some of the fear that comes with working in an online collaborative environment, possibly an environment where the participants have never met face-to-face. The use of context in a coordinated manner was shown to facilitate participant understanding and encourage interaction. However, the interaction using any collaborative technology is up to the users as collaborative systems include people and tools to make them successful. The process of collaboration can be taught and learned and eventually it can be diffused throughout society. Thus, collaborative tools of this nature, used in the educational environment, should translate into valuable skills in the workplace.

## LIMITATIONS AND FUTURE RESEARCH

The CAMS system was selected for use in this study because the authors had easy access to the system as well as to its designer/administrator. Additionally, a convenience sample of students was used. Therefore, the results of this research may not be applicable in other settings. As mentioned previously, the questions on the survey instrument could not be validated because they were specific to the CAMS system. Future research should be done in a business setting to determine if these results are applicable to such organizational collaboration.

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