

Impact of K-12 Interaction by Applying Soller's Collaborative Learning Conversation Skill Taxonomy to Student Discussions

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With the growth of online education, decision makers inside and outside of academia raise questions about the methodologies involved with this approach to learning. This study explores the effect of communication and delivery modes in problem-solving discussions on high school students who attend a K-12 school. Participants were given scenarios to discuss in a peer-group environment in a face-to-face setting, synchronous audio conferencing, and asynchronous discussion forums. From transcription analysis using Soller's Collaborative Learning Conversation Skill Taxonomy, a deeper understanding of how the different modes influence interaction among students was explored. With a greater awareness of the characteristics of the different communication approaches, educators, parents, and others interested in online education will better comprehend how students interact in this environment.

Online learning in the K-12 educational world is a rapidly growing phenomenon in the United States. According to Evergreen Education Group, the number of students attending K-12 online schools in 2010 was approximately 1 million, or roughly 2% of the students enrolled in schools. Twenty-four states and the District of Columbia provide the opportunity for students to attend K-12 schools that are entirely online, while many school districts in these and other states offer blended curricula giving students the choice to take a portion of their courses in an online setting (Watson, Gemin, Ryan & Weeks, 2010). Some educators predict that within the next ten years, more than half of American high school courses will be taught online (Christensen, Horn, and Johnson, 2008).

The purpose of conducting this study was to understand the level of interaction among high school students who were familiar with online and face-to-face education when engaged in problem-solving discussions in a cyber-environment. Because there are different approaches to communication (both online and face-to-face), it was insightful to explore students' level of interaction conducted through synchronous and

asynchronous approaches. Similarly, it was useful to see how students related to each other during face-to-face meetings versus the online setting.

Discussions by voluntary students who attend the same high school were recorded, investigated, and examined noting level of interaction of students as they engaged in discussions. The interactions occurred during three similar, yet unique problem-solving scenarios. One session was held in a face-to-face setting, while two others took place in an online environment. The cyber interactions were divided into a live, synchronous debate along with an asynchronous discussion. Between the three dynamics, the question was explored-using Soller's Collaborative Learning Conversation Skill Taxonomy to categorize statements made by participants, what patterns of discourse emerge that demonstrate how the different modes of communication affect group interaction during problem-solving discussions?

Literature Review

Synchronous versus Asynchronous

When exchanging information in an online environment, two modes of communication exist - synchronous and asynchronous. Under each category, there are a number of ways in which educators and students can interact.

Synchronous communication involves real-time or live interaction between two or more individuals. This mode of online exchange can include communication methods such as instant messaging, text chatting, audio and/or video conferencing, or other approaches that allow for live exchange of information (Davidson-Shivers et al., 2001).

Asynchronous communication does not occur instantaneously, but instead over a period of time. Rather than taking place in real-time, asynchronous interaction occurs when people correspond with others at their own pace and convenience. Asynchronous communication can involve e-mails, discussion boards, blogs, wikis, and other methods that allow participants to interact in a manner that is not live (Hrastinski, 2008).

In an online course that uses synchronous communication, the interaction between instructor and students or among students more

closely resembles the exchanges in a traditional, face-to-face setting (Whittaker, 2003). Synchronous approaches provide nearly instantaneous interactivity between the participants allowing for a collective or shared interpretation of the topic or concept being discussed in real-time (Whittaker, 2003).

Asynchronous communication involves a different exchange dynamic between the parties involved. Since this mode of interaction is not live, an instant response is not as important in the interaction as in a real-time discussion. This permits the participants a chance to digest the content, research the topic, and ample time to contribute to the discussion (Davidson-Shivers, Muilenburg, & Tanner, 2001).

In a study evaluating synchronous and asynchronous communications in various online courses, Im and Lee (2003-2004) found that synchronous discussions provided more social interaction. At the beginning of a course, this approach might be beneficial to establishing a social environment and to build an online community. Asynchronous interactions were more useful for information sharing, reflection and evaluation. This mode may be more useful when introducing concepts that are more task-oriented.

Cook et. al (2011) stated from their research that that asynchronous communication permits the participants more of an opportunity to read the posts, digest the meaning, possibly research the concept, and then respond to the thought.

The decision to use synchronous or asynchronous communication modes can be challenging to an educator when preparing online activities. In a 2008 study, Hrastinski notes how both approaches have advantages and limitations. Asynchronous interaction produced more comments that were directly related to the subject matter being discussed. Also, because response time is typically delayed, the participants have more time to comprehend postings, review concepts, process the information, and respond with more complex ideas (Hrastinski, 2008). One drawback to the asynchronous mode involves the feeling that some students may become isolated and disconnected from the other students (Hrastinski, 2008). Also, the number of participants can influence the effectiveness of asynchronous interaction. Palloff and Pratt note how when using discussion boards, it is difficult to have a rich, involved debate with a small group (1999).

According to Hrastinski, synchronous interaction increases psychological arousal in addition to motivation among the participants

(2008). This may be due to the immediate responses that occur in this type of dialog. Instant feedback takes place with this communication mode making it to be more like face-to-face conversation than asynchronous interaction (Hrastinski, 2008). O'Brien, Barker, and Ellsworth noted that during live discussions that participants can simultaneously respond simultaneously yielding a great level of participation. A possible shortcoming to using a synchronous approach is that the ideas stated in the conversation are not as deep and meaningful as those in an asynchronous debate. Because people want to state their views or responses as quickly as possible in the live exchange, the quality of the statement is often compromised (Hrastinski, 2008). Students will often post or state "something" during a synchronous debate rather than be excluded from the group or the discussion (Hrastinski, 2008).

Fernandez states that the responses of asynchronous discussion boards are more thoughtful and contain full, complete sentences and ideas (2007). In contrast, synchronous interactions are much shorter and contain sentence fragments that are not as thorough or deep. However, the number of responses in a synchronous interaction is considerably higher in comparison to the asynchronous exchange (Fernandez, 2007). In comparing the two approaches, asynchronous interaction is considered not as strong as synchronous in building a social presence or a feeling of community (Newberry, 2001).

Roberts, Lowry, and Sweeney in their 2006 study discovered that the face-to-face mode is not advantageous in comparison to online discussions, but due to the immediacy of the participants, in-person interactions have higher social presence. Similarly, Zhan and Mei (2013) remarked that from their research that because participants interact more openly during in-person discussions, the level of social presence is higher during the face-to-face environment.

Soller's Taxonomy

Soller, in a 2001 study, investigated how particular interactions in online courses contributed to enhance learning outcomes related to successful problem-solving (2001). Soller developed three general categories to describe statements made by the participants during online dialog. Her Collaborative Learning Conversation Skill Taxonomy (CLCST) continues with various levels of interaction (2001). Table 1 displays the categories, their secondary classes, and their descriptions.

At the top level, three categories are given by Soller at the most general level including *Active Learning*, *Conversation*, and *Creative Conflict*. *Active Learning* includes concepts that ask for input from group members along with statements that aim to enlighten or support other participants to engage in the interaction. Discussion members make use of *Conversation* to maintain the dialog by recognizing other's perspective along while promoting a collective unity among the group. During a discussion, *Creative Conflict* will occur when the participants engage in deliberation or attempt to reconcile a misunderstanding (2001).

At the next level, *Active Learning* is broken down into more defined ideas including *Request*, *Inform*, and *Motivate*. *Request* occurs when a person asks for help in hopes of understanding another's comment. *Inform* includes statements that advance the conversation by providing insight or information. *Motivate* comments are ones that provide positive feedback or reinforcement (Song & McNary, 2011).

The *Conversation* level has sub categories of *Task*, *Maintenance*, and *Acknowledge*. *Task* exchanges note when a shift from a current idea to a new topic or problem takes place in the dialog. *Maintenance* statements support group cohesion and the involvement of team members. *Acknowledge* ideas involve the informing of team members that their comments have been read, heard, and understood (Song, & McNary, 2011).

Two classes exist under the *Creative Conflict* level: *Argue* and *Mediate*. *Argue* statements involve positive or negative comments that provide a debate between team members. *Mediate* statements include invites or suggestions from others in the dialog to intervene to clarify the engagement (Song & McNary, 2011).

Soller states that in various problem-solving situations, the amount of *Active Learning* versus *Creative Conflict* statements can vastly alter the level of success in achieving the objective (2001). From her research, however, no clear trends and patterns emerged that would predict how the number of different sub-categories statements would influence problem-solving (2001).

Table 1: Soller's Collaborative Learning Conversation Skill Taxonomy

Active Learning	Request	Ask for help/advice in understanding a comment
	Inform	Advance the conversation by providing information or insight
	Motivate	Provide positive feedback or reinforcement

Conversations	Task	Shift the current focus to a different task
	Maintenance	Support group cohesion and team member involvement
	Acknowledge	Inform team member that comments have been read
Creative Conflict	Argue	Debate (positive or negative) comments made by a team member
	Mediate	Suggest intervention from others

Using the established instrument of Soller’s Taxonomy to categorize interactions among participants in online discussions in both synchronous and asynchronous modes can be a valuable asset to understanding the dynamics of student problem solving. From transcribed interactions, the relative frequency of each discussion category can be recorded to establish which mode may tend to exhibit certain trends. This approach can be applied to face-to-face and online discussions to better understand the number of each type of level and category that occurs.

Soller’s Collaborative Learning Conversation Skill Taxonomy is one of several instrument useful in categorizing dialogs. Several factors contribute to this model being a more effective tool to classify interactions in comparison to other models. First, the mechanism shown in Table 1 was developed to classify interactions of students in online environments and face to face settings where collaborative learning discussions were reviewed. Since this dissertation study involves online and face-to-face discussions that encompass group problem solving, the various levels of the taxonomy apply logically to the variety of types of statements that will be occur in the discussions.

Second, this instrument was developed with the purpose of categorizing student-centered discussions, where other instruments incorporate the instructor as the facilitator of the debate. Since the study examines how only students interact in discussions void of a moderator, Soller’s Taxonomy was established to manage this approach.

Third, Soller’s Taxonomy will be used in the transcription of the discussions by categorizing the exchange between the participants during each session. Each statement will be classified as one of the labels of the taxonomy.

Finally, because the study will involve discussions that are centered on problem-solving scenarios, Soller's Taxonomy possesses categories that lend themselves specifically for dialog where conflict may occur. The Creative Conflict layer contains the classification of Argue and Mediate which hold a high probability of occurring during problem-solving interactions. Other instruments that were reviewed lack these specific labeling categories.

One critical aspect of the study was the utilization of Soller's Collaborative Learning Conversation Skill Taxonomy. Because this system has been established in investigating students in an online environment with previous research, applying this classification system to students in problem-solving discussions allowed for a better understanding of how the communication mode impacts the interaction of K-12 students. The various categories of Soller's Taxonomy provide a framework where transcribed discussion statements can be labeled to note emergent patterns that may occur in connection with the different communication and delivery modes.

Methodology

Twenty-seven 11th and 12th grade high school aged students who attend the same high school were randomly assigned to three evenly divided groups. Each group participated in three different projects that involved discussing a given topic in a group setting and reaching a consensus decision for each scenario (Appendices B, C & D). The problems were hypothetical scenarios with multiple acceptable answers that permitted each student to provide input on the topic so that everyone's view was known and understood. Through discussion with group members, decisions on the possible solutions were obtained.

One of the interactions was an online synchronous discussion that involved the use of audio-conferencing to discuss the ideas. The second interaction was an asynchronous discussion that had the students post their thoughts in an online discussion board in attempt to reach an understanding on the problem. The third interaction was a face-to-face meeting where the participants discussed the project in a traditional manner.

The groups were randomly assigned a designation and the different scenarios were administered with the various modes in a rotation manner that prevented the order and/or the mode from becoming a compromising element. Table 2 demonstrates how the three groups interacted with the scenarios and which modes were used for each problem.

Table 2: Group, Mode, and Scenario

Group	Mode	Scenario
A	Face to Face	1
B	Online Synchronous	1
C	Online Asynchronous	1
A	Online Synchronous	2
B	Online Asynchronous	2
C	Face to Face	2
A	Online Asynchronous	3
B	Face to Face	3
C	Online Synchronous	3

The research question explored the patterns of discourse that occurred during the problem solving sessions. Statements from the discussions were categorized using Soller's Collaborative Learning Conversation Skill Taxonomy.

Problem-Solving Scenarios

The three scenarios used in this study were adapted from puzzles presented in the book, *Learning Discussion Skills Through Games*, by Gene Stanford and Barbara Dodds Stanford (1969). The authors of the book created the activities to be used by students who were between the 7th and 12th grade. Since the students involved in the research were high school aged, the content was appropriate for their skill set and maturity level.

The topics in the three scenarios were similar in the fact that they provided open-ended problems with multiple solutions. This allowed the participants the opportunity to debate and discuss the rationale for potential resolutions while communicating in the various interaction modes. Problem-solving scenarios such as the ones that employed in this study are used in various educational situations to stimulate group dialog.

Data Collection

The face-to-face sessions were held in rooms in the school that provided adequate space and were conducive to a group discussion. These in-person forums were audio recorded, saved, and stored for data analysis purposes.

The online synchronous sessions was conducted in the school's course management system using the synchronous audio conferencing tool.

As the researcher, I introduced the scenario and gave basic instructions, but then merely observed the interaction. The online synchronous discussions were recorded using the course management system.

The asynchronous discussion involved postings on a discussion board that was saved in the course management system and accessible during and after the scenario for analysis. The platform in which the synchronous and asynchronous discussions took place allowed for the conversations to be logged and recorded in the school's course management system. The online synchronous interaction involved audio-conferencing that was recorded and later used for data analysis purposes, while the asynchronous debate was logged and also accessible for later examination.

The synchronous discussion and face-to-face session were given 60 minutes to complete. It was possible for the group to achieve a consensus before the end of the given time, and some groups did complete the task early. No group exceeded the 60 minute time limit, and all groups did reach a consensus solution.

The asynchronous discussion continued for no longer than one week. The length of one week was given for this mode in comparison to the 60 minutes in the synchronous discussions because the asynchronous interaction was not spontaneous and additional time is permitted to allow the participants to exchange their thoughts. Some groups reached a consensus earlier than the given time, but an ending time was stated to the groups and the deadline was enforced.

For each face-to-face and synchronous discussion, the audio portions were transcribed and saved into Microsoft Word. The asynchronous forums had textual data that was retrieved from the course management system and saved into a format compatible with Microsoft Word. From the transcriptions, the different sessions were analyzed independently with the expectation that certain themes would emerge while specific aspects of the data were anticipated and explored more deeply.

From the transcriptions of the face-to-face, asynchronous online and synchronous online discussions for each session, the Collaborative Learning Conversation Taxonomy developed by Soller was used to categorize the conversations. Using the classifications, student responses were identified according to the appropriate category of Soller's Taxonomy. From this process, it became insightful to notice what patterns of discourse

emerged that demonstrated how the different modes of communication affected the interaction. Also, it was interesting to compare the types of comments made by the individuals during the discussions and which categories had the most numerous responses.

To ensure the transcriptions are categorized in a consistent manner, three independent researchers classify a portion of each discussion using Soller's Taxonomy. These were compared to the researcher's classifications to certify that the student comments were reliably categorized into the correct level of Soller's Taxonomy.

The transcriptions were analyzed by the researcher along with three other individuals to ensure accurate application of Soller's Taxonomy. An instructional technology graduate student and two professors who teach online courses and are familiar with the use of different communication modes categorized the statements from the sessions. Their analysis was compared to the researcher to reach a consensus on how each part of the dialog was categorized according to Soller's Taxonomy. The people whose results are compared to the researcher's analysis did not categorize all of the discussions. Instead, each person conducted the classification process on three different groups and modes. This approach allowed for the application of Soller's Taxonomy to a cross-section of the data rather than restricting each person to a particular mode and/or group increasing the validity.

Results

Using Soller's Collaborative Learning Conversation Skill Taxonomy (Table 1) to categorize statements made by participants, patterns of discourse were examined that demonstrates how the different modes of communication affected group interaction during problem-solving discussions.

Table 3: Face-to-face Soller's Taxonomy Category Results

	F2F-Group A		F2F-Group C		F2F-Group B	
Request	15	23%	23	25%	28	23%
Inform	8	12%	10	11%	13	11%
Motivate	1	2%	1	1%	2	2%
Task	17	26%	22	24%	14	11%
Maintenance	1	2%	1	1%	2	2%
Acknowledge	5	8%	11	12%	17	14%

Argue	17	26%	24	26%	46	37%
Mediate	1	2%	1	1%	1	1%
	65		93		123	
	Total F2F Statements		281			

The tabulated data from Soller’s Taxonomy was organized by the different modes, and a total of 281 statements were made in all face-to-face sessions. Table 3 shows from the face-to-face sessions the quantity of each statement for each category along with their percentage in relation to the total number of statements for each group. The percentages of statements were relatively consistent for each of the groups during the face-to-face interactions. The Argue category was most prevalent in all three groups, while Task statements were the second percentagewise in two of the three groups. This would lead one to believe that the face-to-face discussions included a great deal of positive and negative debate and had a fair amount of shifting between topics. Although not ranked the same in each group, Request items were common among all groups in the face-to-face discussions. Because Request statements involve the participants asking for help or advice about the topic being discussed, it could be inferred that those in the face-to-face interactions were inquisitive and sought clarification to better understand the problem.

Of the 281 statements made by all three subject groups in the face-to-face sessions, participants in Group B made considerably more comments than the other two groups. With nearly twice as many statements made by Group B versus Group A, participants with the most statements were comfortable discussing in the face-to-face setting. The students in the group with low participation (Group A) could have been more reserved or shy and not as comfortable conversing during the session.

Why would there be such a disparity between levels of participation engaged in by different groups in face-to-face sessions? Since Group B participated in the face-to-face session after first completing the online synchronous and online asynchronous, there was a possibility that the students were more comfortable with the discussion objectives or with each other which translated into a very active discussion and the large number of statements. On the other hand, Group A was involved in the face-to-face session first and the unfamiliarity of the discussion operation could have resulted in lower activity.

The topics of the sessions could also have contributed to the level of interaction. The students in the group might have felt more comfortable about the subject matter of the problem scenario than students in another group.

Table 4: Online Synchronous Soller’s Taxonomy Category Results

Online-Synch	OS-Group-B		OS-Group-A		OS-Group-C	
Request	29	22%	44	24%	22	14%
Inform	5	4%	25	14%	12	8%
Motivate	1	1%	4	2%	3	2%
Task	25	19%	30	16%	43	28%
Maintenance	12	9%	3	2%	4	3%
Acknowledge	32	24%	38	21%	18	12%
Argue	28	21%	36	20%	52	33%
Mediate	2	1%	3	2%	2	1%
	134		183		156	
	Total OS Statements		473			

Table 4 shows the results of the online synchronous statements. For the audio conferencing discussions, a total of 473 statements were noted. The category distribution was quite inconsistent among the groups. In comparison to the face-to-face discussions, more Acknowledge statements were found during this mode of interaction. Because of the online platform, the students felt the need to inform the others that comments had been heard and accepted. A fair amount of Request statements were also present in this mode’s discussions. Similar to the rationale for the large number of Acknowledge because of being online, the students felt the need to ask for clarifications or justifications to ensure the understanding of other’s remarks. Also, this idea of the quantity of Acknowledge statements would support the idea that the students felt inclusion.

Group A had the highest number of comments in the audio conferencing discussions with 183 statements, while Group C was next with 156, and Group B had the least with 134.

With 473 statements made in the online synchronous discussions, this is considerably higher than the 281 comments from the face-to-face sessions. With the turn-based requirement of the audio conferencing

platform, one might believe that this would restrict the level of communication rather than result in larger number of statements.

Table 5: Online Asynchronous Soller’s Taxonomy Category Results

Online-Asynch	OA-Group-C		OA-Group-B		OA-Group-A	
Request	10	19%	2	6%	5	10%
Inform	2	4%	2	6%	3	6%
Motivate	1	2%	1	3%	2	4%
Task	14	27%	9	26%	12	24%
Maintenance	3	6%	3	9%	4	8%
Acknowledge	7	13%	4	12%	8	16%
Argue	14	27%	11	32%	14	28%
Mediate	1	2%	2	6%	2	4%
	52		34		50	
	Total OA Statements		136			

Table 5 shows the results of the online asynchronous statements. The outcomes of the transcription analysis for the online asynchronous interactions were more similar in the percentage of statements by category to the face-to-face sessions than the online synchronous counterpart. Each asynchronous discussion had more Argue remarks than the other categories. One might conclude that with the larger percentage of Argue statements that the asynchronous sessions involved a fair amount of conflict or debate, similar to face-to-face and online synchronous.

Next, the Task classification statements were second in number for all three groups. Since this category involves shifting focus and coordinating group progression, one may conclude that the participants felt that the discussion was relatively fluid and involved a fair amount of change throughout the session.

Finally, the Acknowledge statements were third in regards to the amount of frequency among all groups. These remarks were used to inform team member that comments have been read. Across the three groups for the asynchronous mode, a level of consistency was present where the classifications percentages and rankings were relatively the same.

For the asynchronous discussions, a total of 136 statements were given resulting in the lowest number of comments among the

communication modes. Group C had the most statements with 52 in the discussion board mode but had the second most in both synchronous modes. Group A who had nearly the same amount of comments as Group C in the asynchronous discussion with 50 comments had the most statements in the online synchronous session and the least in the face-to-face discussion. Group B, who had the highest level of participation in the face-to-face sessions, had the lowest number of statements in the asynchronous mode. This group also had the fewest comments during the online synchronous discussions which would suggest that overall; they prefer the face-to-face mode versus online. The overall low number of comments by groups in comparison to the other modes would imply that the online asynchronous mode was the least preferred mode for discussing problem-solving scenarios.

It is surprising and should be noted that the three groups had such differing levels of participation in the different modes. Each mode prompted a different group to participate the most, and more consistency might have been expected.

Using Soller's Taxonomy to categorize and interpret the statements from each session, the different modes produced unique results. With 473 total statements (Table 3) in the online synchronous mode versus 281 in the face-to-face sessions (Table 4), it might seem that student preferred the online synchronous mode over the face-to-face. The online asynchronous group had a total of 136 statements (Table 5), lower than the face-to-face or online asynchronous modes. This low would imply that students possibly preferred face-to-face communication to asynchronous communication for discussion problem-solving scenarios.

Conclusions

The tabulated results of the categories of statements using Soller's Taxonomy contradict previous literature. In regards to asynchronous discussions, statements are more thoughtful and contain full, complete sentences and ideas (Fernandez, 2007). From the transcript analysis, the asynchronous comments were comprised of short, incomplete statements similar to those of the face-to-face and audio conferencing online synchronous. Hrastinski noted that typically asynchronous discussions produce more comments directly related to the matter being discussed (2008).

The transcripts from the asynchronous discussion boards reveal particular characteristics that are not present in the online synchronous or face-to-face sessions. One occurrence that was fairly common in the discussion boards involved the participants making multiple statements in their posts rather than single thoughts. For example, students might reply to one person's question, state a new idea, and ask a follow-up inquiry where in the synchronous discussions, the remarks were mostly single thoughts. Similarly, the comments or answers were longer and more involved in the asynchronous discussions with numerous sentences or even paragraphs. Because the students had longer time to read other's posts, interpret the opinion, and more eloquently state their perspective, more attention was paid and detail given. This coincides with findings noted by Hrastinski who noted how synchronous statements are often less detailed and shorter than those found in asynchronous discussions (2008).

The flow of the discussion during the asynchronous sessions was smoother and more cohesive than those conducted synchronously. While the face-to-face and online audio conferencing consisted of statements that would jump from topic to topic, the statements in the discussion board had a more logical progression. Many of the statements given were for clarification or verification of other people's viewpoints. Also, there were fewer arguments between the participants in the asynchronous mode. Combining this fact with the orderly approach the students demonstrated, overall, the use of discussion board possessed the appearance of being a more group oriented mode.

The comments from the online synchronous discussion displays some attributes that separate it from the online asynchronous or face-to-face modes. The statements given by the students during the online audio conferencing sessions were mostly short and in some cases incomplete sentences. Because this approach is more like face-to-face than online asynchronous in regards to the quick exchanges among the participants, the condensed statements mimic how people often debate topics in real-time.

Also similar to face-to-face, the movement of the online synchronous discussion was not always in chronological order. In fact, this was more noticeable when using audio conferencing online than in the face-to-face modes. Because of the dynamic of the online synchronous discussion, people would sometimes have a question, response, or new belief, but need to wait their turn. This would cause some students to be a

few statements behind in the debate and require them to alter their thought or be lagging.

Resembling the online asynchronous discussions, a great deal of confirmation questions or statements categorized as Acknowledge in Soller's Taxonomy were given during the audio conferencing sessions. Percentagewise, more comments of this type occurred in the online synchronous in comparison to the discussion board. At times, participants would ask for more details, clarification of an opinion, or if the group members were all in agreement on a topic. Although not as prevalent as in discussion board, the students were team centric during the online synchronous mode. In the online asynchronous, possibly because of the time delay of responses, the participants were more individualized than concerned about the group. Group members were regularly asking for affirmation during the audio conferencing to ensure that everyone was in agreement and understanding the statements made and the overall goal.

During the face-to-face sessions, the transcriptions brought to light some qualities that make it distinct in comparison to the online modes. Most of the statements during the in-person discussions consisted of single, brief thoughts. The statements from the asynchronous sessions were longer and contained greater detail. The shorter remarks were from the in-person discussions were similar in nature to those found in the online synchronous mode in regards to the length and depth of content.

The flow of the interaction during the face-to-face mode was not as methodical as the discussion board sessions, but it was more logical than the online synchronous. Because this manner of communication was most natural for the participants and there was no need to wait for the technology, the face-to-face discussion allowed for a fluid interaction.

One major difference between the face-to-face discussion and the online communication modes is the number of confirmation statements. In the discussion board and online audio conferencing modes, numerous comments were given to ask clarification or to verify if the group was in agreement. This was not as prevalent in the in-person discussions because the students had the opportunity to visually affirm ideas among participants. This was not as intuitive in the online modes due to technological constraints. Students consciously or unintentionally substantiated other group member's remarks to overcome the technical barrier. As new technologies have been developed and gotten more complex, interactions have become richer, but

the participants are required to learn and be comfortable with the discussion tools (Wagner, 1994).

In conclusion, synchronous interaction generated more statements during problem-solving discussions than asynchronous. Although the quantity might be greater, the comment lengths are generally longer and more involved when using discussion boards versus debates conducted in-person or using audio conferencing.

The flow of interactions can be more systematic in the asynchronous mode than in the synchronous discussions. The participants can read, interpret, and formulate their replies without the pressure of spontaneously responding to the question or comments. Face-to-face and online synchronous interactions can be disjointed due to the ease in movement from topic to topic during the discussion. This could be caused by the physical presence of the participants in a face-to-face debate or possibly the technological barriers present in audio conferencing.

Appendix

Soller’s Collaborative Learning Conversation Skill Taxonomy		
Active Learning	Request	Ask for help/advice in understanding a comment. <i>Include ideas such as: Information, Elaboration, Clarification, Justification, Opinion, and Illustration.</i>
	Inform	Advance the conversation by providing information or insight <i>Include ideas such as: Rephrase, Lead, Suggest, Elaborate, Explain/Clarify, Justify, and Assert.</i>
	Motivate	Provide positive feedback or reinforcement <i>Include ideas such as: Encourage and Reinforce.</i>
Conversation	Task	Shift the current focus to a different task <i>Include ideas such as: Coordinate Group Process, Request Focus Change, Summarize Information, and End Participation.</i>
	Maintenance	Support group cohesion and team member involvement. <i>Include ideas such as: Request Attention, Suggest Action, Request Confirmation, Listening, and Apologize.</i>
	Acknowledge	Inform team member that comments have been read. <i>Include ideas such as: Appreciation, Accept/Confirm, and Reject.</i>
Creative Conflict	Argue	Debate (positive or negative) comments made by a team member. <i>Include ideas such as: Conciliate, Agree, Disagree, Offer Alternative, Infer, Suppose, Propose Exception, and Doubt.</i>
	Mediate	Suggest intervention from others. <i>Include the idea: Participant Mediation.</i>

NUCLEAR HOLOCAUST: WHO SHOULD SURVIVE?

Scenario:

World War 3 has just occurred and 12 people managed to make it to a bunker that had been built in anticipation of such an event. There may only be a limited amount of supplies that will ensure survival for an extended period of time. If supplies run low, some tough decisions may need to be made as to who may be removed from the bunker.

In the bunker, the following facilities exist:

- sewage system
- water
- seeds
- some clothes
- a few books

- some medical facilities but no operating material
- a greenhouse

In the group of 12, each person has a characteristic that might make them worthwhile (or unworthy) of staying in the bunker. Your group has the final decision in determining the rating of the individuals.

In the bunker, the following 12 people are found:

- a. scientist
- b. priest
- c. married couple who are drug addicts
- d. a single pregnant woman with a 5 year old girl
- e. an army officer who has mental instability of some sort but is useful nonetheless
- f. an elderly woman
- g. a disabled person
- h. lawyer
- i. homeless person
- j. doctor

The task is for you to rank the 12 survivors in the bunker. The higher the given number, the more important they are and probably will survive longer in the bunker. The lower the number, the more likely they will be asked to leave if supplies diminish or other factors occur.

RANKED ORDER OF THE 12 SURVIVORS

12 is most important where 1 is least important

CHARACTER	Ranked 1-12
SCIENTIST	
DOCTOR	
PRIEST	
MARRIED COUPLE ADDICTED TO DRUGS (Wife)	
(Husband)	
SINGLE WOMAN, PREGNANT, WITH A CHILD (Mother)	

(Child)	
ARMY OFFICER WITH PSYCHIATRIC PROBLEMS	
ELDERLY WOMAN	
DISABLED PERSON	
LAWYER	
HOMELESS PERSON	

LOST AT SEA

Scenario

A group has chartered a yacht with their friends for the holiday trip of a lifetime across the Atlantic Ocean. Because none of the group has any previous sailing experience, they have hired an experienced skipper and a two-person crew.

Unfortunately in the mid-Atlantic, a fierce fire breaks out in the ships galley and the skipper and crew have been lost while trying to fight the blaze. Much of the yacht is destroyed and is slowly sinking.

The boat’s location is unclear because vital navigational and radio equipment have been damaged in the fire. The best estimate is that they are many hundreds of miles from the nearest landfall.

The group has managed to save 15 items, undamaged and intact after the fire. In addition, the group has salvaged a four-person rubber life craft and a box of matches.

The group only has room, however, to keep some of the 15 items. Your task is to rank the items in terms of their importance, as the group waits to be rescued. Place the number 15 by the most important item, the number 14 by the second most important; and so on through to number 1 for the least of the least important items you will keep.

Rated Items:

15 is most important where 1 is least important

	Ranked 1-15
A sextant	
A shaving mirror	
A quantity of mosquito netting	
A 25 liter container of water	
A case of army rations	
Maps of the Pacific Ocean	
A floating seat cushion	
A 10 liter can of oil/petrol mixture	
A small transistor radio	
20 square feet of opaque plastic sheeting	
A can of shark repellent	
One bottle of 160 per cent proof rum	
15ft nylon rope	
2 boxes of chocolate bars	
A fishing kit	

Moon Landing Survival

Scenario

A group of astronauts are scheduled to rendezvous with a mother ship on the lighted surface of the moon. However, due to mechanical difficulties, the ship was forced to land at a spot 200 miles from the rendezvous point. During re-entry and landing, much of the equipment aboard was damaged and, since survival

depends on reaching the mother ship, the most critical items available must be chosen for the 200-mile trip. Remember, the group is on the moon.

Fifteen items are listed as being intact and undamaged after landing. Your task is to rate them in terms of their importance for the astronaut crew, to allow them to reach the rendezvous point. Place the number 15 by the most important item, the number 14 by the second most important, and so on through to number 1 for the least important.

- Box of matches
- Food concentrate
- 50 feet of nylon rope
- Parachute silk
- Two .45 caliber pistols
- One case of dehydrated milk
- Two 100-pound tanks of oxygen
- Stellar map
- Self-inflating life raft
- Magnetic compass
- Five gallons of water
- Signal flares
- First aid kit containing injection needles
- Solar powered FM receiver
- Portable heating unit

Rated Items:

15 is most important where 1 is least important

	Ranked 1-15
Box of matches	
Food concentrate	
50 feet of nylon rope	
Parachute silk	
Two .45 caliber pistols	
One case of dehydrated milk	
Two 100-pound tanks of oxygen	
Stellar map	
Self-inflating life raft	
Magnetic compass	
Five gallons of water	
Signal flares	
First aid kit containing injection needles	
Solar powered FM receiver	
Portable heating unit	

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