A comparative analysis of e-mail and face-to-face communication in an educational environment

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Accepted 21 June 2006

Abstract

Electronic mail (e-mail) is an extremely important medium for Internet-based education. Due to its unique characteristics, there is reason to be concerned that students do not put appropriate care into writing messages that are sent via e-mail. This has significant implications for the effectiveness of online learning environments. This paper describes an empirical research project to investigate the amount of thought students put into e-mail communication versus traditional face-to-face communication. A survey was administered to 596 undergraduates. The results of this survey indicate that students put significantly more thought into e-mail communication with the instructor and groups of peers than they do for equivalent face-to-face communication. At the same time, students tend to put about the same amount of thought into e-mail compared to verbal communication with individual peers. Finally, the research uncovered some interesting patterns concerning student gender and technology comfort as predictors of thought put into e-mail communication.

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Keywords: Distance education; Online learning environments; Computer-mediated learning; Social presence theory; E-mail communication

1. Introduction

Virtual universities and e-learning will be key components for progressive education in the twenty-first century. There is evidence that this trend is already well underway. In 1999, it was estimated that one million of the fourteen million total students in the United States had taken some sort of online course for credit and fully one-third of the universities in the country had at least one accredited degree program online (Huffstuter & Fields, 2000). By 2003, the growth rate for online enrollment was 19.8% and predicted to be 24.8% by 2004—faster than the growth of student enrollment (Oblinger & Hawking, 2005). This is not a passing fad. Over 65% of all public and private for-profit institutions surveyed agreed that online education is critical to their long-term strategy for success (Allen & Seaman, 2004). Increased consumer demand, improved technology and infrastructure, and the economic benefits of e-learning all but guarantee the continued growth of web-based education.

Web-based learning depends upon electronic communication. The very nature of the Internet as a medium for education requires the flow of electronic messages and images from the instructor to the students. Likewise, the students must communicate with the instructor and interact with peers in the class. The instructor and these student
Electronic mail (e-mail) is the most widespread and commonly used tool for electronic communication (Bafoutsou & Mentzas, 2001). It has been estimated that 53% of all Americans use e-mail for an average of 29 minutes every day (Festa, 2001). In business, e-mail is replacing traditional communication media such as letters, faxes, and telephone calls (Tassabehji & Vakola, 2005). Consequently, it is reasonable to assume that e-mail will be the communication tool of choice in Internet-based learning environments for the foreseeable future.

E-mail is also a somewhat problematic medium. It is a hybrid form of communication that has been shown to exhibit characteristics of both oral and written discourse (Crystal, 2001; Davis & Brewer, 1997; Gruber, 2000; Matthews, 2000; Rice, 1995). This combination gives messages sent via e-mail the informal, free-flowing structure of conversation with the permanence of a written document (Deegan, 2000). The writing style used in e-mail communication has also been shown to have unique characteristics. Specifically, creative non-standard spelling, excessive punctuation (Mallon & Oppenheim, 2002), playful use of creative greetings and improvisational language (Danet, 2001), and extensive use of multiple fonts (Trupe, 2002) are common. The messages sent by e-mail tend to be more ambiguous and subject to misinterpretation than is commonly realized (Adam, 2002; Kruger, Epley, Parker & Ng, 2005). The combination of unique written and oral elements in e-mail results in messages that are more spontaneous, less inhibited, and more carefree than traditional written communication (Crystal, 2001; Jonsson, 1998; Naughton, 1999; Rice, 1995). This raises some interesting questions about e-mail as a communication tool in general and its use as the primary means of communication in Internet-based learning environments in particular.

The current study addresses the problem of carelessly constructed e-mail messages created by students in an educational environment. The method employed to measure this uses student perceptions concerning the amount of thought put into crafting e-mail messages as compared to equivalent face-to-face verbal messages. In this usage, “thought” encompasses the writing style, structure, and content of the e-mail message. It is hypothesized that students are aware of the unique characteristics of the e-mail medium. They demonstrate this awareness by putting more thought into the e-mail message and by writing more carefully when the situation deems it appropriate. If this conjecture is correct, it indicates a mature understanding by students of the limitations (and strengths) of the e-mail medium and an ability to use it appropriately in a variety of educational situations. The results of this research should be of particular interest to instructors charged with designing and administering Internet-based courses because failure to recognize potential communication problems inherent in the general design of these courses could jeopardize the success of the entire web-based education program. Said another way, “Successful communication depends in part on an ability to anticipate miscommunication.” (Keysar & Henly, 2002, p. 207).

2. Theoretical framework

The main issues addressed by this research are closely aligned with a branch of communication theory called social presence theory. Social presence theory was initially proposed by Short, Williams, and Christie (1976) as a means to explain and predict the media selected by communicators when media of varying social presence were available. In this context, social presence is defined as the perceived subjective quality of the medium to transmit the awareness of another person in an interaction (Rice, 1993; Short et al., 1976; Walther & Burgoon, 1992). Social presence can be described as “the degree to which a person is perceived as ‘real’ in mediated communication” (Richardson & Swan, 2003, p. 70). Numerous factors influence the perception of social presence including (but not limited to) posture, facial expression, and eye contact in face-to-face interaction, and the word selection, pitch, volume, and pacing of the words that make up the communication (Short et al., 1976). As used in the theory, social presence is a subjective attribute of the medium as perceived by individuals; consequently, different communicators could judge the social presence of a medium to be different in identical situations (Baskin & Barker, 2004; Gunawardena, 1995; Perse, Burton, Kovner, Lears, & Sen, 1992; Young 1999).

In their seminal research, Short et al. hypnotized that communicators are aware, on some level, of the social presence of media for specific contexts and situations. Further, they believed that communicators avoid specific media in situations where the social presence of the medium is inadequate for the task (Short et al., 1976). The rationale for this reaction on the part of the communicator is that media with a high social presence, such as face-to-face interaction, contain numerous overt and hidden communication channels. As the variety and number of communication channels and social cues are reduced, as happens with the e-mail medium, the social presence of the media is perceived to
decline. This phenomenon is normally referred to as the “cues filtered out” model (Culnan & Markus, 1987; Sussman & Sproull, 1999; Walther & Parks, 2002). Short et al. (1976) believed that communicators are aware of this reduction and, rationally, do not attempt a communication task that requires a high degree of social presence using a medium that is perceived to have a low degree of social presence. When media with low social presence cannot be avoided, communicators modify the way they use the media in order to compensate for its lack of social presence (Danchak, Walther, & Swan, 2001; Gunawardena, 1995; Hiltz, 1995).

In their initial experiments, Short et al. (1976) found that face-to-face communication has the most social presence, followed by audio–video, audio-only, and finally, written text. Subsequent researchers confirmed these findings and extended the general precepts of social presence theory to include new media and to apply it to other contexts (Reid, 1977; Rice, 1984, 1993; Rice & Love, 1987; Richardson & Swan, 2003; Straub & Karahanna, 1998; Tu & McIsaac, 2002).

2.1. Characteristics of e-mail in an educational setting

E-mail is an electronic communication tool that predates the Internet. It was used initially for intra-corporate communication via mainframes and later by private dial-up networks. Following this, the U.S. Department of Defense set up the first operational packet switching network, known as the Advanced Research Projects Agency Network (ARPANET), specifically for the purpose of providing a robust communication medium. Once ARPANET was developed, the tool was widely used by scientists and academics (Hauben, 2000). As the Internet grew and the notion of a world-wide-web became reality, e-mail was joined by a host of other, richer, media for communication. These included (but are not limited to) online text chat, audio chat, listservs, bulletin boards, streaming video, live web-casting, and video conferencing. Today, despite competition from these newer high-bandwidth media, e-mail is still one of the most widely used communication tools in education (Le & Le, 2002). Some research has gone so far as to conclude that e-mail is more popular than face-to-face interaction between students and instructors (Berge, 1997; Gustafson, 2004; Sherry, 2000).

As an educational communication medium, e-mail has a number of advantages and disadvantages which are discussed below. These characteristics paint the picture of a very powerful education tool with some noteworthy drawbacks. Understanding these unique characteristics and limitations will illustrate the need for this project and will provide the basis for the research questions posed by this study.

2.2. E-mail advantages

E-mail breaks down the barriers of distance and time by allowing students to communicate with the instructor and their peers when and where it is convenient. With this tool, it is no longer necessary for students to make appointments or queue up between classes at the instructor’s office. A simple e-mail question can be sent instead. From the teacher’s perspective, e-mail is also valuable because it helps leverage the instructor’s efforts. It is impractical to expect an instructor who teaches several hundred students to have a face-to-face conference with each student (Le & Le, 2002). Quite often, students seeking these conferences all have the same basic questions and information needs. It is much more efficient for the instructor to write a general purpose global message that answers these common concerns and send it to all students. This leaves more time to deal with the problems that actually require individual attention. These advantages, and others, are well documented in the literature (Martin, 1996; Sharp, 2000; Zhang, Zhao, Zhou, & Nunamaker, 2004).

2.3. E-mail disadvantages

E-mail shares many characteristics with the spoken word; however, it should not be forgotten that it is still a text-based form of communication (Rice, 1995). Not only is it text-based, but it is electronic text that can be easily forwarded, attached to other messages, and kept forever on a disk or tape. There is no way to control it once sent and no way to predict who will ultimately see (or edit) it (Crystal, 2001). Consequently, it should be treated specially and created with more care than either spoken communication or standard paper-based communication (Thompson & Lloyd, 2002).

Unfortunately, the nature of e-mail as a medium of communication encourages writers to create messages that are more spontaneous and less inhibited than standard written text (Adam, 2002; Jonsson, 1998; Naughton, 1999; Rice, 1995). According to Festa (2001), “people have discovered that their fingers often outrace their brains.” Naughton (1999, p. 143) reinforces this observation when he says that the text created for e-mail often resembles “stream-of-
consciousness narratives, the product of people typing as fast as they can think.” This tendency is due to the fact that e-mail reduces contextual clues for the writer and forces them to concentrate on the only audience available—themselves (Kruger et al., 2005; Rice, 1995). Recent empirical findings by Sassenberg, Boos, and Rabung (2005) support this assertion for computer-mediated communication as compared to face-to-face interaction. By concentrating so narrowly, e-mail writers tend to produce messages with far less structure or semantic integrity than would be acceptable in either spoken or traditional written communication. Consequently, it is easy to create e-mail that lacks sufficient clarity and is subject to misinterpretation. This is a predictable consequence of communicating over a medium, such as e-mail, with minimal social cues (Kruger et al., 2005). When one considers that face-to-face conversations are approximately 90% body language and 8% tone of voice, it is no wonder that the remaining 2% of the message that e-mail is capable of relaying is often misinterpreted and misunderstood by the recipient (Thompson & Lloyd, 2002).

E-mail is not a private communication despite the common misconception that it is analogous to a private letter. A better analogy is that e-mail correspondence is more like a postcard than a sealed letter (Thompson & Lloyd, 2002). E-mail communication is also potentially litigious, especially in a business environment. The same general concern holds true in an educational environment where a misstatement or careless phrase could have disastrous repercussions.

Taken together, the permanent nature of e-mail, its tendency to induce writers to behave spontaneously and carelessly, and the potentially legally binding nature of the medium combine to create a communication tool that should be used with great care. One hopes that e-mail users realize this and take far more care writing e-mail messages than they do in traditional face-to-face verbal communication. Translating these concerns to the environment of modern Internet-based teaching highlights the need for this research.

2.4. E-mail and Internet-based education

If one accepts that e-mail communication is a fixture in Internet-based education for the foreseeable future, then instructors involved in this type of education need to be concerned that students understand the special nature of e-mail and treat it differently than face-to-face verbal communication. Specifically, do students realize the potential problems inherent in e-mail communication? Further, do students demonstrate an awareness of these problems by putting more thought into e-mail communication than equivalent face-to-face verbal communication? The answers to these questions will bring insight to the hypothesis that students not only understand the potential problems of e-mail communication, but behave rationally and act as predicted by social presence theory by putting more thought into creating e-mail messages (which have a lower social presence) than they do with face-to-face communication (which has a very high social presence). This level of savvy by students would support social presence theory and demonstrate a sophisticated understanding of the e-mail communication medium in the context of an Internet-based education program.

3. The research study

The previous sections outlined the theoretical framework for this study along with the reasons why it is important to consider student perceptions concerning the amount of thought put into writing e-mail messages in an educational environment. This section describes an empirical research project that was designed to determine these perceptions from a group of students. The research questions for this study are:

Q1: Do students put more thought into e-mail communication with the instructor than they would put into verbal face-to-face communication with the instructor?
Q2: Do students put more thought into e-mail communication with an individual student than they would put into verbal face-to-face communication with the student?
Q3: Do students put more thought into e-mail communication with large groups of students than they would put into verbal face-to-face communication with the same group?

A pilot survey instrument was developed and administered to several sections to fine-tune the questions and the methodology. Following this, a modified instrument was created to ask students these questions along with four other questions intended to capture non-identifying student classification data. The answers to the three key questions were designed around a 5-point ordinal scale ranging from “much less thought” on one extreme to “much more thought” on the other. A copy of the survey instrument can be found in the Appendix A of this paper.
The student sample was drawn from classes in a college of business administration. The college has approximately 1200 students and provides undergraduate only education in a state supported university of about 12,000 students. Students in the college can generally be described as “traditional,” meaning that they typically fall into the 18 to 24 year old age group, are away from home for the first time, and are pursuing their first degree. Entrance prerequisites into the college assure that all students in the population have at least a basic understanding of the Windows™ operating system, the Internet, and e-mail.

Data were collected via a paper-based survey questionnaire that was administered during class to 28 sections of courses over two semesters. The classes surveyed represented the full range of student majors within the college. Within these classes, student classifications ranged from freshman to senior. Given that the student population in the college is weighted toward the junior and senior year classifications, the sample also shares this characteristic.

Participation in the survey project was anonymous and completely voluntary. A total of 596 completed questionnaires were collected out of a population of approximately 840 students. Data from these surveys were coded into SPSS™ and initially analyzed using basic frequency analysis and the chi-square goodness-of-fit statistic. The numeric results of this analysis are shown in Table 1. The results are also graphically represented in Figs. 1–3 to aid the discussion and analysis.

4. Results

The results presented in Table 1 indicate that the majority of students perceive that they put at least the same amount of thought (or more) into e-mail communication as compared to verbal communication with instructors, $\chi^2 (4, N = 591) = 255.62, p < .001$, other individual students, $\chi^2 (4, N = 589) = 328.97, p < .001$, and groups of students, $\chi^2 (4, N = 587) = 555.17, p < .001$. This implies that there are non-random patterns associated with the amount of thought that students perceive they put into e-mail communication when compared to equivalent face-to-face communication. These non-random patterns are skewed toward the “more thought” side of the continuum.

It is interesting to note that the thought put into e-mail communication with both the instructor and groups of peers is markedly more than that put into communication with individual students. Only 34.6% of the participants felt they put

<table>
<thead>
<tr>
<th>Survey question</th>
<th>$N$</th>
<th>Much less thought</th>
<th>Same thought</th>
<th>Much more thought</th>
<th>$\chi^2$ goodness-of-fit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1 (%)</td>
<td>2 (%)</td>
<td>3 (%)</td>
<td>4 (%)</td>
</tr>
<tr>
<td>Q1: Thought put into e-mail with the instructor</td>
<td>591</td>
<td>4.0</td>
<td>3.9</td>
<td>30.3</td>
<td>28.8</td>
</tr>
<tr>
<td>Q2: Thought put into e-mail to other students</td>
<td>589</td>
<td>6.8</td>
<td>10.4</td>
<td>48.2</td>
<td>21.7</td>
</tr>
<tr>
<td>Q3: Thought put into e-mail to a group of students</td>
<td>587</td>
<td>1.5</td>
<td>1.2</td>
<td>22.3</td>
<td>20.4</td>
</tr>
</tbody>
</table>

Fig. 1. Thought for e-mail compared to verbal with the instructor.
“more” or “much more” thought into e-mail to individual students while 61.8% and 75.0% put “more” or “much more” thought into e-mail to the instructor and groups of peers, respectively. This is consistent with the general conjecture that students realize the unique characteristics of e-mail and rationally put more thought and effort into messages going to the instructor and groups of students. At the same time, the fact that 65.4% of the students put the same amount of thought or less into communication with an individual student supports the contention that students are aware of the special nature of e-mail and rationally put less thought into e-mail to individuals than to the instructor (who assigns grades) or a group of peers (who judge socially).

Another interesting pattern emerges when the data distributions from the “e-mail to the instructor” and the “e-mail to a group of students” questions are compared. Both distributions show that the data are skewed toward the “more thought” side of the spectrum; however, the data in the “group of students” question are more highly skewed in this direction. Apparently, students are even more concerned with what the other students in the class think of them than they are with what the instructor thinks. When examined from the other side of the spectrum, the same pattern emerges as 7.9% report putting “less thought” or “much less thought” into e-mail to the instructor while only 2.7% report the same behavior when applied to groups of students. None of the classes in the survey used peer input to influence the final course grade, so this effect is purely due to social pressure and a desire to avoid looking foolish to the other students. This was a surprising finding given the power to assign grades that the instructor wields.

Finally, the data from Table 1 imply that students do not have major concerns about putting “less thought” or “much less thought” into e-mail to individual students, as 17.2% reported following this practice. However, this is unexpectedly high given that only 2.7% put “less thought” or “much less thought” into e-mail communication with groups of students. There is no clear explanation for this; however, it is possible that students only write e-mail to individuals they know well enough so that careless style and poorly structured content do not matter. Another possible explanation is that writing to a group of peers jolts the student into the awareness that others may be critical of their e-mail content and writing mechanics. This awareness may cause them to increase their writing diligence to
levels very similar to that used when creating e-mail for the instructor. In either case, this action is indicative of rational, thoughtful behavior on the part of the student concerning the audience that will be reading and judging them based upon the e-mail.

In an effort to glean additional information from the data, a multinomial logistic regression analysis was performed on each of the three survey questions. This type of analysis can be used to estimate the influence that a set of predictor variables have on a categorical dependent variable. In this case, the predictor variables were the student’s major, gender, classification, and comfort with technology. The dependent variables were three questions concerning thought put into e-mail versus face-to-face communication. The results of this analysis indicate that the student’s gender and the comfort with technology are significant influences in predicting the thought put into e-mail to the instructor, $\chi^2 (72, N=587)=116.86, p=.001$, and the thought put into e-mail to an individual student, $\chi^2 (72, N=585)=116.71, p=.001$. The overall fit of the model was satisfactory for Q1 (Nagelkerke $R^2=.189$) and Q2 (Nagelkerke $R^2=.191$). This is a reasonable degree of predictability given that only four factors were involved in the calculations. The results for Q3 (i.e., “thought put into e-mail to a group of students”) were not significant.

The technology comfort factor was a significant predictor for Q1 ($\chi^2=13.60, df=6, p=.034$) and for Q2 ($\chi^2=12.93, df=6, p=.044$). Detailed examination of the results from the multinomial regression analysis indicates that the more comfortable a student is with technology, the more likely they are to put more thought into their e-mail communication. Conversely, the less comfortable they are with technology, the less likely they are to put extra care into e-mail communication. This finding seemed counter-intuitive on the surface; however, two possible explanations do come to mind. First, the students who are less adept in technology may be the ones who prefer face-to-face communication and seldom send e-mail. In this respect, it is logical to assume that they put more thought into their face-to-face verbal communications. A second plausible explanation is that students who are more comfortable with the technology can concentrate more easily on the structure and content of their message than can those students who must worry about how to use the tools that deliver the message (i.e., the computer, e-mail, and the Internet).

The gender predictor factor was even more pronounced than the technology comfort factor. Specifically, student gender was a significant predictor for Q1 ($\chi^2=28.49, df=6, p<.001$) and for Q2 ($\chi^2=20.60, df=6, p=.002$). This level of impact was of particular interest because recent research into gender differences in communication indicates that males and females approach and interact with virtual communities in different ways for significantly different reasons (Gefen & Ridings, 2005; Tassabehji & Vakola, 2005). Detailed analysis of the regression results show that males are far more likely than females to put less thought into e-mail communication with the instructor as compared to face-to-face interaction. At the same time, females tend to put more thought into e-mail communications with the instructor than males. The same pattern holds true, albeit to a much less pronounced degree, for communication with individual students. This indicates that females tend to be more aware and concerned with the special nature and characteristics of e-mail communication than males. It could also be interpreted as evidence that males generally feel more confident when communicating with others via e-mail and consequently put less effort into the mechanics and structure of their messages. These results are very interesting because they highlight some of the inherent gender differences that exist in communication within virtual communities.

5. Discussion and research implications

The results of this research have several implications for instructors who design and administer Internet-based education courses. On the positive side, the data indicate that the majority of students are aware that e-mail communication is different from verbal communication and should be approached with more care than traditional face-to-face interaction. Further, these same students put this knowledge into practice by rationally applying extra thought to e-mail messages intended for instructors and groups of peers—the very recipients where the problems associated with careless e-mail would likely arise. This supports the research hypothesis posed by this study and is consistent with social presence theory.

On the other side, the results show that many students still put the same or less thought into e-mail messages than they would into verbal communication. This problem can be mitigated by explicitly educating students about the key differences between the two communication media. A simple class assignment that highlights how easy it is to misinterpret e-mail and the potential consequences of careless wording in e-mail messages would
make this point. The instructor can also put extra effort into providing communication channels for those students who, for whatever reasons, prefer verbal communication over e-mail. The availability of these channels will give these students a safer mechanism for their communication needs until (or if) they decide to utilize the e-mail medium.

Finally, the findings concerning the differences in thought put into e-mail messages based upon technology comfort and gender should be of interest to instructors’ fine tuning course designs. For example, if a specific Internet-based section has a large percentage of students with low technology comfort, it may benefit overall course effectiveness to spend some class-time working on exercises designed to improve technology comfort. Likewise, if a class has a high percentage of male students, it may be advantageous to reinforce the notion that e-mail is a permanent medium that could potentially damage careers if used inappropriately. Rules for e-mail etiquette could be drafted and enforced for all class communication. This dimension of the project has many intriguing facets that are worthy of further investigation.

5.1. Research limitations and future investigations

The primary limitation of this project revolves around the fact that the data collected by the survey instrument are based on students’ perception of the amount of thought put into creating e-mail messages; not an empirical measure of the actual amount. A related criticism is that the notion of thought put into a task is a relative construct. Consequently, the measurement of a relative concept using a semantic differential scale (where respondents may apply different meanings to the keywords) could produce inconsistent results. Both of these concerns have been a common criticism of research into social presence theory since its inception (Tu, 2002).

A second limitation of this research is a lack of context in the questions. It is likely that a student gives less thought to writing a message asking the instructor the date of an examination than that same student gives in writing a letter to the instructor to petition a grade change. The context aspect is missing from the questions used in the survey instrument.

Finally, this project would benefit if information was available concerning student preferences for other, non-face-to-face, media such as live telephone, online text chat, and instant messaging. According to social presence theory, these media should show progressively less social presence due to the number of communication cues that are filtered out. It would be interesting to see if the theory is supported in the full range of media from face-to-face to asynchronous e-mail.

A research project planned by the author will address and mitigate these limitations. Specifically, this project will address the first issue by collecting both the students’ perceptions via a survey instrument and actual samples of e-mail text written by the student. These samples will be analyzed using lexical and content analysis techniques. The intent is to compare the students’ perceptions to the actual writing to determine if the respondents’ actions match their intentions. The other two limitations will be addressed by adding additional contexts and situations to the questions in the survey instrument along with a wider variety of media from which to choose. If a large enough sample can be collected, this project should provide some very interesting results.

6. Conclusion

E-mail is an integral component of Internet-based education. It is needed to maintain timely communication in an environment where students and instructors cannot easily arrange face-to-face meetings. E-mail as a communication medium has many advantages, but it also has some distinct drawbacks. Specifically, e-mail has the free-form spontaneity of the spoken word with the permanence and potential impact of a written document. Messages sent via e-mail are not private, can be easily transferred to others, and may be legally binding. Taken together, this should be cause for serious concern to educators’ intent on using e-mail as a primary communication medium in their Internet-based classes.

The nature and seriousness of these concerns lead the author to put forward a series of three questions about the amount of thought students put into e-mail communication as compared to the amount put into traditional face-to-face verbal communication. A survey was developed around these questions and was administered to a sample of 596 undergraduate students. Analysis of the results of this survey indicates that students do indeed put more thought into e-mail communication to the instructor (61.8%) and to large groups of students (75.0%) than they put into equivalent face-to-face communication to the same audience. As far as communication to an individual student is concerned, nearly two-thirds (65.4%) of those surveyed put the same amount of thought or less into these e-mail messages while slightly over one-third (34.6%) put more thought.
Further analysis of the data led to the conclusion that students who are more comfortable with technology tend to put more thought into e-mail communication as compared to face-to-face verbal interaction while those who are less comfortable with technology put less thought. This was true for interaction with both the instructor and to individual students. This same analysis indicated that male students are much more likely to put less thought into their e-mail communications than female students when the message is directed to the instructor or to individual students. The converse of this also holds because the analysis showed that female students generally tend to put more thought than males into e-mail messages directed to the instructor or individual students.

These results support the basic precepts of social presence theory and the conjecture that students truly do understand the nuisances and special characteristics of the e-mail medium. This understanding is demonstrated when students act rationally and put more thought into e-mail messages that could damage them academically (i.e., those to the instructor) or impact them socially (i.e., those to large groups of peers). This is good news for instructors teaching classes to a hybrid audience that includes both local and remote learners. The results of this research can be used to design and fine tune courses to ensure more effective overall communication.

Appendix A

The questions below refer to your feelings about class-related e-mail communication in general, not within this specific class or with this particular instructor. In this survey, “thought” encompasses the writing style, structure, and content of the e-mail message.

In general, when I communicate with an instructor by e-mail, I put ______ thought into my questions than I would if I were speaking to him or her in person.

<table>
<thead>
<tr>
<th>Much less thought</th>
<th>Less thought</th>
<th>Same thought</th>
<th>More thought</th>
<th>Much more thought</th>
</tr>
</thead>
</table>

In general, when I communicate with individual students by e-mail, I put ______ thought into my questions than I would if I were speaking to him or her in person.

<table>
<thead>
<tr>
<th>Much less thought</th>
<th>Less thought</th>
<th>Same thought</th>
<th>More thought</th>
<th>Much more thought</th>
</tr>
</thead>
</table>

If I know that a large group of students in the class can read an e-mail or electronic comment that I write, I put ______ thought into my message than I would if it were speaking to the group in person.

<table>
<thead>
<tr>
<th>Much less thought</th>
<th>Less thought</th>
<th>Same thought</th>
<th>More thought</th>
<th>Much more thought</th>
</tr>
</thead>
</table>

Please answer the questions below. They are not intended to identify you personally.

I am currently a: Freshman Sophomore Junior Senior Other

My major is: Acct. CIS Finance General bus Marketing Management Other

My gender is: Male Female

My “comfort level” with the Internet and technology is _____.

<table>
<thead>
<tr>
<th>Not comfortable</th>
<th>Extremely comfortable</th>
</tr>
</thead>
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