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ABSTRACT

A study examined the strategic behaviors of email users when they are reading online email messages. Three voluntary subjects (an undergraduate student and 2 graduate students) read a group of 24 email messages collected through a listserv discussion group. The messages were collected over a period of 1 month concentrating on one theme. Subjects were videotaped and computer-tracked for their reading of the messages. Subjects also engaged in a think-aloud protocol and an unstructured interview. Results indicated that (1) users treated email messages as on-going conversation rather than as reading texts; (2) in the on-going conversation, users were aware of social information available of their "interlocutors" in the email message headings; (3) some salient features of email messages were checked out by some users; (4) skipping and skimming through messages were both verbally indicated by the users and recorded in the computer-tracking data; (5) lack of coherence of the message group did not seem to bother the users; and (6) although users had more than 3 years of email experience, differences in their use of strategies reading online email messages were visible. Findings suggest that subjects used a wide range of strategies and some of them were only meaningful in an email context. Further research could use more authentic situations, explore the teacher's role in facilitating on-going conversations, and control other possible factors such as reader difference, interest and prior knowledge, and task priorities. (Contains 54 references. A keyboard strokes chart is attached.) (RS)

Online Strategies Used in Reading Email Messages

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Email communication has been widely adopted in the recent ten years across all fields. In education, email communication has become one of the most favored channels of communication, and its communication advantages have been exploited in many aspects in instructional practices. Teacher-to-students communication through email has been widely accepted into curriculum (e.g., Fey, 1994; Spitzer, 1989). Collaboration among and sharing experience with students in different regions have also been reported in the literature (e.g., Schwartz, 1990; Wild & Winniford, 1993). Even remote teaching of classes through email communication has been a possibility.

The popularity of email has already prompted considerable research across many fields. Researchers have probed various aspects of email communication, ranging from unique email language features to human interaction through email communication (see Herring, 1996).

Despite the popularity of email communication and some research concerning several aspects of email usage in education, we lack in-depth knowledge about how email communication affects users' cognitive strategies while reading and responding to email messages. Considering the textual nature of email communication, this understanding of cognitive strategies of users becomes essential in two aspects:

1) Theoretically, this fits in with cognitive scientists' examination of the fundamental processes of human thinking, which encompasses such cognitive behaviors as reading and writing in various media (such as on paper and on computer screen).

2) Practically, gaining an understanding of email users' strategies also sheds light on better implementation of email communication for instructional and educational purposes.

The present study intends to investigate the strategic behaviors of email users when they are reading online email messages.

Literature review

Relevant literature of two areas are reviewed to provide a theoretical framework for the present study: email research and reading strategy research.

Reading as an action is usually affected by several main types of factors: reader, text, and task. Reader factors are usually composed of different ages and language proficiency levels. Text factors are made of oral and written modes of language. The written language can also be further divided into different genres such as expository, narrative, poetry, etc. Task factors are mainly reflected in task requirements such as reading for comprehension or reading for remembering.

The availability of computer for creating another surface upon which text is presented has added another possible source of factors to influence reading as an action. The text presented through computer becomes less stable and can elicit more active participation on the reader's part (Bolter, 1991). The network

capacities of computers have further complicated the interactions (such as user experience with computer networking) due to its unique characteristics.

Reading strategies are the strategies readers demonstrate and develop in taking cues from all the above-mentioned factors to successfully accomplish reading on hand. In the case of computer network reading, reading strategies will have to be more broadly termed as cognitive strategies due to its interactive nature of reading (such as writing at the same time as reading online messages).

An explanation is due here concerning the definition of strategy here. According to Wade, Trathen, & Schraw (1990), strategy is different from tactic in that strategy is considered a deliberate action while a tactic is one of the steps taken to achieve the purpose of the action. Thus according to this definition, rereading would be a reading tactic and flexibility in reading speed would be a strategy. However, this distinction between strategy and tactics is not adopted here for two reasons: 1) Most of the research I have reviewed in the following section takes no heed of such distinctions and have been using strategy in place of tactics; 2) The distinctions can sometimes become very vague when in different contexts. For example, rereading can become a strategy if it comprises of skimming, slow reading, reading for different information each time. Therefore in this study, strategy refers to all the identifiable deliberate actions in the given contexts to accomplish reading email messages.

The focus of the present study is on cognitive strategies email users use in reading messages online. Therefore, my review of literature will specifically concentrate on the following areas: email characteristics, language features of email messages, and reading strategies as pertaining to expert readers and task requirements.

The growth of email communication in education is phenomenal. Yet, in general, email research in education is still fledgling (Tao, 1995) and depends heavily on both the empirical and theoretical studies of other fields to shed light on this phenomenon in education.

Email research in education has been influenced mostly by research done in communication, management science, and organization. Their research can be roughly divided into two categories: email as a media with certain stable characteristics (e.g., Daft, Lengel, & Trevino, 1987; Sproull & Kiesler, 1986), and email as a media whose usage is being affected by personal and environmental factors as well (e.g., Fulk, Schmitz, & Steinfield, 1990; Spears & Lea 1992). The first category assumes that email has certain unique characteristics (Rice, 1987; Sproull & Kiesler, 1986). Therefore, our selection and use of email depends upon our understanding of these characteristics and their variations (e.g., Daft & Lengel, 1986). The second category looks at email as a communication media whose selection and use are also being affected by subjective users and various

environments (e.g., Fulk, Schmitz, & Schwartz, 1992).

Online behaviors of users have been studied under the assumptions taken from the first category (e.g., McCormick & McCormick, 1992). Characteristics of email communication have been identified as follows: synchronous/asynchronous, rapid in transmission and reply, textual in nature to the exclusion of normal extra-linguistic cues , allowing one-to-one and multiple correspondence, and easy to store and manipulate. According to media richness theory (e.g., Daft, Lengel, & Trevino, 1987) and social presence theory (e.g., Kiesler, Siegel, & McGuire, 1984), these email characteristics have resulted in some unique behaviors of users such as shaping the new structures of relationship of email users and changing the information distribution (e.g., Sproull & Kiesler, 1986), widening connection network (e.g., Schaefermeyer & Sewell, 1988; Steinfield, 1986), more participation of traditionally marginalized groups (e.g., Eveland & Bikson, 1988), and flaming (e.g., Lea, O'Shea, Fung, & Spears, 1992). In literacy education, some work has been done in the same line (Fey, 1994; Selfe, 1990) to explore the effects of email characteristics on users' perceptions of learning community and learning behaviors. However, these studies have focused on the effects of group dynamics and organizational shifts as well as user perceptions. Online strategies of users have not been examined.

Lately email's textual nature has received some attention. Some researchers have observed the unique textual nature of the email message (Hawisher & Moran, 1993; Romiszowski & de Haas, 1989). Email messages are found to be less cohesive, more fragmentary, and less coherent as a whole. Aside from these few observations, some systematic studies on email messages as texts have also been carried out (Collot & Belmore, 1996; Werry, 1996; Yates, 1996). Email messages are situated in various contexts (such as computer conferencing, BBS, and personal messages) and found to bear different linguistic features from either written language or spoken language in most situations.

However, these studies concerning the language features of email messages were usually conducted aside from online behavior studies. While they would certainly aid our understanding of users' online strategies in reading email messages with identifiable linguistic features, they did not provide direct evidence as to the online strategy use of email users.

Reading strategy research has summarized various strategies readers use in reading texts (see Meyers, Lytle, Palladino, Devenpeck, & Green, 1990; Olshavsky, 1976-1977; Pressley & Afflerbach, 1995; Wade, Trathen, & Schraw, 1990). Readers are typically assessed of the strategies they use during their reading through simultaneous thinking aloud and introspective report/interview. The strategies they use are also indirectly assessed through their performance of certain tasks such as text recall and assigning importance to different text parts (Brown & Smiley, 1977). While indirect assessments of strategy use in

performing a reading task (such as comprehension or main idea identification), the verbal protocols summarized by Pressley and Afflerbach (1995) provide a more direct and richer resource for understanding reading strategies readers use during reading.

Three factors affect reading strategies: Reader, text, and task. In reading strategy research, these factors are usually examined in relationship to each other.

Readers of different reading proficiency levels are found to be using various reading strategies when interacting with different text formats, across different domains (e.g., Anderson, 1980; Guthrie & Kirsch, 1987; Wade, Schraw, Buxton, & Hayes, 1993). Poor and novice readers are found to be strategically different from good and expert readers in reading texts (Brown & Smiley, 1977; Kletzien, 1991). Good readers use strategies more flexibly. In order to understand reading processes, researchers usually used expert readers to elicit strategies they use (e.g., Afflerbach, 1990). In addition to age differences and reading proficiency levels, reader interest and prior knowledge are also the factors which shape strategy use of readers (Olshavsky, 1976-1977). In reviewing literature on metacognition, researchers (Baker & Brown, 1984; Paris, Lipson, & Wixson, 1983) have concluded that good and old readers are more capable of monitoring their reading and knowing when there is a comprehension failure, while poor young readers are seldom aware of such failures. Their self-monitoring tends to cover a wide range from words to text styles (see Pressley & Afflerbach, 1996).

Among the factors affecting readers' use of strategies, text formats were constantly explored by researchers focusing on reading strategies (e.g., Johnston & Afflerbach, 1985; van Dijk & Kintsch, 1983). For example, in studying strategy use of both good and poor readers, Kletzien (1991) has used readability (difficulty levels) as the controlling technique for making comparable versions of texts for good and poor readers. Expository texts are usually the texts used in studying reading strategies. Narratives are also used for strategy study (see Olshavsky, 1976-1977). The abstract levels of texts (concept loads) were also found to affect readers' reading strategy use (Guthrie, Britten, & Barker, 1991; Olshavsky).

Task requirements (such as comprehension vs memorization, information searching vs information encoding) have also been found to elicit different reading strategies (see Baker & Brown, 1984; Guthrie & Mosenthal, 1987; Wagoner, 1983). Reading to locate information and reading for memorization (study) require different distribution of attention and mental capacity. Guthrie & Mosenthal (1987) suggested strategies readers use specific to locating information. The task oriented strategies were confirmed by Guthrie, Britten, & Barker's study (1991).

When the above factors are examined together, as they usually are, reading strategy research has yielded some insightful understanding of cognitive processes underlying

reading. According to the Cognitive Workbench Model (Britton, Glynn, & Smith, 1985) which hinges on the memory capacity and memory processes, different text in terms of its difficulty levels and concept load, different tasks such as reading for comprehension and reading for memorization demand use of different distribution of mental resources which are limited by our short term memory. Readers are, therefore, required by different texts and tasks to effectively use the limited mental resources. Expert readers and novice readers perform differently due to the different availability of mental resources when faced with texts and tasks. The metacognitive strategies expert readers demonstrate make them different from novice readers in recognizing the problem and fixing it.

Pressley and Afflerbach (1995) has summarized strategies based on previous research reading strategy research using verbal protocols. The list of strategies they have come up with is long and involved. They used a schema of classification which follows the sequential occurrences of cognitive strategies in reading: before reading, during reading, and after reading. Each is further sequentially subcategorized. For example, in during reading category, they further classify strategies into logic sequential subcategories: initial reading of text, assigning relative importance to information in text, making inferences, integrating different parts of text, and interpreting.

The reading strategy research up to now has enriched our understanding of the nature of reading (van Dijk & Kintsch, 1983; Pressley & Afflerbach, 1995) and will consequently benefit reading and literacy instruction. Yet, when reading is exercised through computer, a fourth factor has to be considered in terms of its possible influence on reader's strategy use.

Media and their possible cognitive effects on readers and listeners have long been fascinating to researchers (Saloman, 1979). For example, researchers have done in-depth research of the relationship between television watching and reading achievements (see Reinking & Wu, 1990). Television and printing have had different effects on learners' perception (Salomon, 1984). Computers have also been comparatively examined with printed books for their relationship. Bolter (1992) has argued that computer reading creates another reading space for the reader to participate in the writing. Reinking (1992) has also concluded that electronic texts are conceptually different from printed texts. In reviewing literature on computer reading and writing, researchers have suggested that computers can provide more reader control and therefore increase interactions of readers with the text writing (Reinking & Bridwell-Bowles, 1991).

The email communication through computers has made already fluid electronic texts more flexible in terms of its formalities and sustained value. There are at least two causes for this. First, characteristics of email communication identified by researchers such as synchronous/asynchronous, rapid in transmission and response, easy to store and manipulate, and

comparatively anonymous have made possible a conversational like communication environment (McCormick & McCormick, 1992). Secondly, the purposes of email communication are usually different from that of formal writing. Email communications occur more like a daily exchange of information through text forms which carry fewer writing formalities (see McCormick & McCormick).

The email communication, therefore, creates an environment which is very different from formal literacy situations in conventional schools (Hiltz, 1986). Taking into consideration the situated learning theory (see Alexander & Judy, 1988), we would naturally expect that this peculiar environment of email communication would require users to exercise strategies which would fit in with the situation. For example, we would not expect an email reader to scrutinize email messages for remembering (due to the storage function and purpose of email communication). Likewise, email users may also develop some email use wisdom through constant use that they would be discriminating enough to know which message to skip and which to delete (due to the easy duplication feature and comparatively anonymous feature). There are indications that this is the case. For example, in Mackay's (1989) study, an email user chose to budget half an hour each day for her email messages reading and responding, which was apparently not enough for any careful scrutiny of messages.

However, aside from these assumptions deducted from email communication characteristics and fragmentary anecdotes about certain strategies, there are no study, up to date, investigating the strategies of users' email message reading. Given the unique language features and socially dynamic nature of email messages, it would be worthwhile to probe the strategies users exercise when reading email messages, particularly when reading messages online.

Therefore, the present study chooses a semi-authentic situation in which users are reading real email messages. This will provide information about what users really do when they read email online and can aid our understanding of the effect of email media in shaping users' strategies.

Based upon the literature review, the study intends to look at the following questions:

1) What cognitive strategies users employ when engaged in on-line reading the email messages.

2) What strategies are peculiar to email situations.

Subjects and Procedures

The present study uses a semi-naturalistic setting in which 3 individuals are studied for their strategy use when reading a group of 24 email messages collected through a listserv discussion group. These messages were collected over a period of month concentrating on one theme. Several other themed discussions were collected along with it to make meaningful comparisons in terms of the length and time duration of the themed messages. The messages of this particular themed

discussion were found not different from the other themed groups of discussion both in its length and duration of the time. The messages were subjected to a coherence analysis and the results were reported in another study (Tao & Moon, 1996). They were found lacking theme coherence as a whole group. They were deemed comparable to usual email messages these three individuals received in their email box from listserv discussion groups they subscribed to. To make it less artificial, I created a special folder using PINE for that particular group of messages, so that they looked exactly like the email box in which their email messages were stored and read in terms of the screen layout.

These 3 individuals are voluntary subjects: one undergraduate students, two graduate students. None of them were getting credit for their participation in the study. Due to the exploratory nature of the present study, conventional sampling procedures was not followed. Instead, the author used a convenient sampling procedure by using volunteers who are within the access of the author. In a naturalistic study, this has the advantage of establishing the necessary rapport between the researcher and the subjects.

The present study has employed different data gathering methods to validate evidence from a single data collection source.

With the tracking and recording capacity of a portable usability lab (see Hale, Orey, and Reeves, 1995), users were video-taped and computer-tracked for their reading of the selected email messages. The equipment was set up in such a way that I could leave during the time the subjects were being monitored and taped for their reading.

The subjects were being instructed to think aloud while they were reading. They were told they should read the messages as they were reading their own daily email messages, and thinking aloud while they were reading. Think aloud was demonstrated for the undergraduate by the researcher. The two graduate students were familiar with think aloud strategies and were not provided with think aloud demonstration.

The computer-tracking data (including number of key strokes, forward and backward keyboarding, and length of each key strokes) were analyzed corresponding to each message along with the think aloud data.

An immediate unstructured interview afterwards provided another source of data concerning what each individual did when they were reading the email messages. The interviews varied in length and were also video-taped.

In sum, the main data sources were the think aloud data, computer-tracking data, and the ensuing short interviews.

Verbal statements of readers have been constantly used as a data source for reading strategy research (see Pressley & Afflerbach, 1995; Ericsson & Simon, 1993). Despite contentions against the validity of such data source, some convincing arguments have been made about the validness of using verbal

protocols such as think aloud and retrospective statements for reading strategies readers are using. Think aloud approach has been believed to be particularly strong in teasing out strategies without significantly changing the reading processes readers are engaged in (see Ericsson & Simon, 1993).

Results

The think aloud data were transcribed and analyzed several times for emerging categories. Then another colleague was given the initially established categories with explanations and afterwards independently examined about 20 percent of the randomly selected transcribed data for identified categories. The inter-rater agreement was above 80%. Differences were resolved through conferences. The categories were further refined as a result.

The computer-tracking data were translated into the number of key strokes, the length of time between two keyboard strokes, and forward and backward movement for each message. The length of each message was also operationalized as the number of screens it took to display through equal number of key strokes (see Key Stroke Chart).

The analysis of the data yielded the following major findings in terms of the focus for the present study.

Collective strategies of the users reading email fell into two general categories: Strategies dealing with the format, and strategies associated with the content.

Format-connected strategies. The data revealed that users were paying to attention to some of the peculiarities of messages of email communication. The most visible strategies they used were checking the sender(s) of email messages such as who the person was and where that person came from.

They also noticed the length of messages on the screen, though information available at the upper right hand corner of the message about the length of the present message was never checked by any user. Interestingly enough, all users indicated that they checked the message list to see how many messages in the box, though none of them seemed to have kept this in mind while reading messages one after another. None of the users ever checked the date information at the header of a message.

Skipping and skimming messages were either indicated or demonstrated by the users in reading the messages.

Email messages were treated as an on-going conversation rather than a group of written texts, though going back for clarification checking was a strategy sometimes employed.

Content-connected strategies. This part was not particularly interesting to us at the present study, though these strategies constituted a large part of the strategies users used at the present study. The most salient ones were confirming or negating through personal associations regarding certain thesis in the messages, instant judgments or value-laden comments, and term clarifications. For example, all individuals demonstrated an awareness of the innate incongruity when two personal messages

were sent to the discussion under the themed title.

Individual strategies used by each user provided a more complicated picture than the pooled strategy analysis. There are at least two reasons for this complexity. First, these individuals might represent a wider range of difference in using strategies than their corresponding academic rank would indicate. Second, due to an equipment error, part of the data (both think aloud and computer-tracking data) of the undergraduate were irreversibly missing and therefore would make this individual less comparable to the other two.

First individual. This individual displayed a tendency to skip through messages and concentrate on content-related information provided by the email messages. She never explicitly mentioned her skipping or skimming through messages. However, based on the limited computer-tracking data we have of her, she was basically skimming through messages at the beginning. Interestingly enough, the individual never checked to try to find out anything about the sender of a message. The total number of times when she executed format-related strategies was 6.

Second individual. In comparison to the first individual, this subject had used/mentioned 12 times the format-related strategies. This individual said that he began to skim through messages towards the end of the reading (Message #16). However, the individual never skipped a message. The computer-tracking data showed his quick movement through Message 16, but moved comparably through other messages as others do. The comments he made were mostly concentrating on content, though he also noticed the sender information from time to time.

Third individual. He was the one who showed greatest awareness of information concerning the sender and the place where the sender was from. He was constantly checking for getting a big picture of what's going on. He also explicitly mentioned that he skipped messages and sampled messages in his reading. In general, he was the individual who contributed most to the strategies classified under format-related category (37 times all told).

Computer tracking data provided evidence for the individual strategy use (see Key Stroke Chart).

Discussions

The above findings should be understood in the context of the present study which used a quasi-authentic situation in which users were reading a group of previously collected messages from a discussion group.

Format connected strategies were the focus of our interest here in this study, because they would reflect how the characteristics of email communication affected users' strategy use in reading email messages. In other words, the users would not have demonstrated these strategies if it were not for email communication. The data revealed that email communication as a way of communication did have an impact upon users in the way they dealt with the messages.

First of all, users treated email messages as on-going conversation rather than reading texts. The same user perception concerning email messages was evidenced in McCormick & McCormick's (1992) study of college students' email messages. The subjects in the present study seldom checked back for clarification except 3 times. Text comprehension was apparently not the main purpose. In such a case, even typos could be overlooked. And there were a lot personal associations and examples. Notice, these personal associations and examples were provided not for the sake of elaborating on the text for stronger retention, but they were there to confirm or negate the points raised in a conversation. Their attention was usually directed towards details in the conversation rather than seeing the whole picture. As a result, users would add a lot of value comments to indicate their interest or no interest in the conversation.

Second, in the on-going conversation, users were aware of social information available of their "interlocutors" in the email message headings. They checked out the sender and the place the sender was from. This attention towards the origins of messages might be a combination of text-oriented and conversation-directed tendency. In conversation we tend to notice whom we are talking to together with a lot of other socialinguistic cues (such as facial expressions and gestures). While in text reading, such attention might not always be necessary or available. Not that we are uninterested in knowing who wrote what we are reading, but we are in a less interactive situation in text reading than in a conversation which usually requires feedbacks and responses from us as interlocutors. Besides, reduced social and linguistic cues in email situation make conversation's usual personal presence less available. Therefore, efforts to know who is speaking might be warranted as a vestige of our conversational realization in an email situation. Interestingly no one seemed to pay any attention to the time information available in the email headings. It might be that this piece of information was not important or even irrelevant to a conversation one engaged in.

Third, some salient features of email messages were checked out by some users. The email message list and titles were noticed by the all the users. This should have given them a pretty good estimate as to the length of the reading as far as message numbers were concerned. However, we found that once users were engaged in reading the messages, they were usually not monitoring the number of messages. The key stroke data and the think aloud data both revealed this tendency. This is very interesting, given the fact that all of them noted at the beginning of reading how many messages were in the box and information about order number of their present email message was always present at the right upper hand corner of the screen. There could be two possible explanations for this. One is based on the cognitive workbench model proposed by Britton at el (1985). According to that model, attention to the outside markers such as message numbers might

take away the limited mental resources on reading. So engaged reading should not so be distracted. The second possible reason for this phenomenon is that users' checking of message numbers at the beginning is not a typical behavior during a conversation. So once they were in a conversation, they were simply following the general rules of a conversation. In other words, even if you expect the conversation to be brought to an end as quickly as possible, your control of the conversation process is limited at most. In email situation such as the one we created for our subjects to read messages, this limited control would even be more visible.

Fourth, skipping and skimming through messages were both verbally indicated by the users and recorded in the computer-tracking data. This might also have something to do with the purpose of the reading. Since they were familiar with email communication, since they were not expected to recall any of the information they had encountered in reading the messages, and also since they did not select the messages to read in the first place for themselves, the users could afford to skip over anything they were not interested and anything they thought were redundant. Besides, this might be another way they could combat their lacking control of the flow of messages in this message group.

Fifth, lack of coherence of the present message group did not seem to bother the users as a whole in reading the messages. However, individually there was some evidence to show that this feature had an effect in reader's monitoring their own reading. For example, one user observed that all the messages were basically the same (failing to see the different themes going on there). Interestingly, the subject also attributed her not understanding a concept in the discussion to her own missing the message rather than blaming for the incoherence of the messages, which was actually the case (the concept was not even discussed in the present themed discussion). Yet, two personal messages mistakenly sent to the group were mentioned by all three users. This is hard to explain logically. However, it might be practically that's what we have been doing all the time while engaged in a conversation: We seldom deeply process our conversation to make it logically sensible; yet we still notice when something gets way out of track.

Last but not least, though there were no substantial differences in users' experience in using email communication (all reported having above 3 years of email experience), the differences found concerning their individual use of strategies reading online email messages are visible and not easily explained due to the complexity we mentioned above. While the think aloud data of the third individual provided most of the evidence of using format-related strategies, the other two individuals were concentrating more (in proportion) on the content-related strategies. However, given the fact that we did not control these individuals' learning styles and their reading

strategies, we could only suggest that email using experience of individuals might be overshadowed by some other factors in email situations.

In sum, users did use a wide range of strategies and some of them were only meaningful in an email context.

Significance and limitations

Email is pervasive in society and becomes more and more available in schools. How can literacy educators and researchers take advantage of this communication channel to better serve our students? This is a question literacy educators are facing. Logically speaking, the premises for taking advantage of email communication is to understand it. Though some efforts have been made in understanding email and its functions in facilitating classroom literacy activities, systematic studies have yet to come to investigate into users' strategies in reading email messages. This study took an initial step in this direction by looking at users' strategies in reading email messages in a discussion group. This will help literacy researchers understand better the unique nature of email communication and facilitate our instructional usage of this media.

Due to the exploratory and semi-naturalistic nature of the study, it has some limitations.

1) Problems certainly reside in the sampling procedures of the present study. A more standardized sampling procedure may produce more convincing data concerning email's effect on readers. Therefore, any generalizations from the study should be made with caution.

2) Due to nature of the email messages in a discussion group, it should be treated with caution for the following two specific reasons. First, the messages in a discussion group has a public or semi-public (as in a limited listserv such as NRC list) nature. How they are different from private email messages that would be more relevant and interesting to the reader is not known. Second, even these listserv messages were not the ones they received in their own email box. How is this imposed reading different from the more authentic reading they would do in reading messages in their own email boxes? As we learned from literature that reader's interest would certainly make a difference in their comprehension, will this interest effect also their strategies in reading email messages?

3) Equipment maintenance should be sustained. Any possible failure of a mechanical nature would cost unnecessary loss of data and result in incomplete picture of the phenomenon under investigation.

Some suggestions for future research are tentatively put forth.

1) Future investigations in the same line can use more authentic situations in which users are reading their own email messages. To avoid the dilemma of prying into the private messages and still retaining the information research is looking for, future studies can concentrate on the strategies users use

while ignoring the content of email messages.

2) In classroom situations, the same line of investigations can look into the intervention a teacher can have in facilitating on-going conversations through email (such as changing the purpose of email communication or intervening by using imposing certain classroom etiquette in email communication).

3) Textual nature of email messages on user's strategic behavior should be investigated by controlling the other possible factors such as reader difference, interest and prior knowledge difference, and task priorities.

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Key Strokes Chart

M	K	P1							P2							P3						
1	4	22							2	45	57	30				56	49	21				
2	5	10							3	6	2	1	18			12	1	3	7			
3	2	8							16	3						36	15					
4	2	15							3	21	11					36	12					
5	2	2							25	21	5					28	16					
6	2	3							25	15b	22	13				44	16					
7	2	20							37	50						33	35					
8	6								15	28	22	23	9			22	30	23	24	2		
9	6								42	22						18	28	2				
10	2								17	8						11	2					
11	1								21	2						19	1					
12	3								14	54	4					15	31	13				
13	3								6	25	7					35	3					
14	2								45	12	2					33	30					
15	5	20	16	23	4				8	3	24	40	35	2		12	20	40	30			
16	7	35	38	47	21	48	35	3	23	21	12	3	46	41		45	50	40	35	60	33	2
17	2	5	4						8	7						10	4					
18	4	42							24	2	1	4				18						
19	2	39	7	9					33	8						37						
20	1	12							31	5						17						
21	1	2							25							7						
22	3	34	50	2					29	37						38	35					
23	3	3							7	2	10					7	2	2b	2b	2f	2f	
24	2	7	2	1	1				23	5	2					25	4	2				

Note: M=message number
K=key strokes required
P1=participant one
P2=participant two
P3=participant three
*All the numbers in columns underneath P1 to P3 are the seconds spent on one stroke.

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