Factors Contributing to Ideal Instructional Interactivity

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Abstract: What are the factors that contribute to "ideal" instructional interactivity? In this study, subjects observed different interactive situations between a student and teacher, displayed in video format on a computer and were asked to subjectively rate the quality of interactivity for each situation. Analysis of pilot test data using multiple regression analysis showed a small but significant effect for factors of information redundancy and paralanguage.

Introduction

The purpose of this project was to determine factors that contribute to an "ideal" interaction. In particular, we examined the effects of three independent variables: redundancy of information, instructor paralanguage, and overt affective cues on one dependent variable: quality of the interactivity. These variables were selected from several possible variables of interest as they related to a structural model of interactivity (Yacci, 2000).

The structural model of interactivity posits that instructional interactivity is a loop between two entities, originating at the student and concluding again with the student. (see Figure 1.)

![Figure 1. A completed message loop between two entities](image)

The structural model suggests that there are factors within the loop that will make the interactivity between student and teacher more effective. Some of these factors are: the redundancy of information, the paralanguage used, overt affective cues, lag time of response, and the cohesiveness of the exchange. This study was interested in isolating and testing the effect of redundancy, paralanguage and overt affective cues as they impact an observer’s perception of the interaction.
Theory

The quality of this interactive loop is determined by a variety of influencing variables. For instance, consider a question in which a simple response of "yes" adequately completes an interactive loop. If this "yes" response occurs 30 seconds after a question, it will probably be perceived as more immediate and useful feedback than a "yes" response occurring 30 minutes, 30 hours, or 30 days later. Lag time of response, (as used in this example) is one of the many structural variables that have an impact on the quality of the interaction. Some examples of other variables include message duration (the length of the message and its response), overt affective cues (statements included in the message that signify "liking" or "disliking"), paralanguage (smiles, head nods) and redundancy (the predictability of the response). Message duration refers simply to the time span of a particular message from its beginning to its ending. Overt affective cues describe statements that are included within a message that signify friendship or other "approach/avoid" indicators. Paralanguage is a term used in communication theory to describe a message's nonverbal constituents such as voice tone, rate, and velocity and other non-verbal communication behaviors (Yacci, 2000). Information redundancy is sometimes referred to as entropy. Entropy, a term used in many other disciplines, was used by Shannon (1948) to describe the amount of uncertainty in messages. An example of low entropy occurs when an individual can predict an incoming message with a high degree of accuracy. In this case, the information is also considered to have high redundancy. Pierce (1961) eloquently articulates entropy by asserting, "The more we know about what message the source will produce, the less uncertainty, the less the entropy, and the less the information."

It is believed that these factors will impact the quality of interactivity. That is, these factors can be optimized to produce interactivity that is more "ideal." Although we do not know the exact values of these variables, the structural model suggests these to be important factors for further study.

The Experiment

The following three variables were investigated in this study.
1. Paralanguage, operationally defined by whether or not the teacher smiled and used an upbeat tone of voice.
2. Overt affective cues, operationally defined by whether or not the teacher used a polite phase ("Thanks for that insight, Jerry.") when talking to the student.
3. Redundancy in the information, operationally defined by whether or not the student responded by saying, "Thanks, but I already knew that." That is, the information was not new to the student.

A repeated measures experimental design was used in which each of these variables was combined with all others, creating a total of eight treatments showing all possible combinations of these three variables. In turn, each subject was exposed to every treatment condition.

The treatments were in the form of a several short, 20-second dialogues between student and teacher. In each of the treatment conditions, the dialogue itself was kept constant, while different video clips of teacher and student were inserted, producing the eight different treatment conditions.

The program was created using Macromedia's Director, and presented the eight video treatments in a random order. The Director program also collected all of the research data. After subjects observed one of the eight treatments, they were asked to rate the level of interactivity on a scale of 1 to 10, with 1 being the "least ideal" interaction and 10 being the "most ideal" interaction. This pattern was repeated for each of the eight treatments until each subject had seen all treatments. Also, as an option, subjects were asked to type comments in a message box to describe their ratings for each situation. All of the information entered by each subject was exported and stored categorically as text files.
Subjects

The study used 32 subjects as a pilot test of the study. This convenience sample was primarily friends and family of the experimenters with ages ranging from late 20's to 60's.

The Treatments

The following notations represented the eight treatments that subjects viewed. A brief description of each treatment follows.

<table>
<thead>
<tr>
<th>Notation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SV_P_R</td>
<td>Teacher smiles, using a pleasant tone of voice and a polite phase. Student responds indicating redundancy of information</td>
</tr>
<tr>
<td>SV_P_NR</td>
<td>Teacher smiles, using a pleasant tone of voice and a polite phase. Student responds indicating non-redundancy of information</td>
</tr>
<tr>
<td>SV_NP_R</td>
<td>Teacher smiles, using a pleasant tone of voice. Student responds indicating redundancy of information</td>
</tr>
<tr>
<td>SV_NP_NR</td>
<td>Teacher smiles, using a pleasant tone of voice. Student responds indicating non-redundancy of information</td>
</tr>
<tr>
<td>NSV_NP_R</td>
<td>Teacher does not smile and uses a monotone voice. Student responds indicating redundancy of information</td>
</tr>
<tr>
<td>NSV_NP_NR</td>
<td>Teacher does not smile and uses a monotone voice. Student responds indicating non-redundancy of information</td>
</tr>
<tr>
<td>NSV_P_R</td>
<td>Teacher does not smile, uses a monotone voice and a polite phase. Student responds indicating redundancy of information</td>
</tr>
<tr>
<td>NSV_P_NR</td>
<td>Teacher does not smile, uses a monotone voice and a polite phase. Student responds indicating non-redundancy of information</td>
</tr>
</tbody>
</table>

Results

The purpose of the project was to pilot test the treatments. These results are preliminary and based on a small convenience sample (N= 32) and should not be generalized at this time. A replication of the study, with a larger N and under more controlled conditions is being conducted at this time.

Average Ratings of "Ideal"

Averages of the ratings from our subjects for the eight different treatments are shown in table 1, below. The highest rated treatments had the same mean score –and differed only in their presentation of the overt affective cue (in this study, the inclusion of a polite phrase by the teacher). Also interested, the lower rated treatments also differed only in their inclusion of the overt affective cue variable.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>SV_P_NR</td>
<td>6.59375</td>
</tr>
<tr>
<td>SV_NP_NR</td>
<td>6.59375</td>
</tr>
<tr>
<td>NSV_NP_NR</td>
<td>6.125</td>
</tr>
<tr>
<td>SV_NP_R</td>
<td>5.65625</td>
</tr>
<tr>
<td>SV_P_R</td>
<td>5.65625</td>
</tr>
<tr>
<td>NSV_P_NR</td>
<td>5.21875</td>
</tr>
<tr>
<td>NSV_NP_R</td>
<td>4.9375</td>
</tr>
<tr>
<td>NSV_P_R</td>
<td>4.375</td>
</tr>
</tbody>
</table>

Key: N= Not (Variable is off)  P= Polite Phase  SV= Smiling with pleasant tone of voice  R= Redundancy

Table 1. Average Ratings of Ideal for each of eight treatments.
The highest rated two treatments both showed a teacher smiling with a pleasant tone of voice and a student stating that he is receiving new, non-redundant information. However, in one treatment, an overt affective cue is used; i.e., the teacher says a polite phase while in the other treatment she does not. According to this data, it appears that the inclusion or non-inclusion of overt affective cues has no effect on either of these treatments. Furthermore, two treatments tied for fourth place with all variables being equal except for whether or not the overt affective cue was included. Here again, the inclusion of the overt affective cue by the teacher does not appear to affect our subjects' ratings. The overt affective cues, apparently have little affect on the rating of "ideal."

Non-redundancy associated with the student receiving new information and paralanguage such as the teacher smiling and using an upbeat tone of voice were the only significant variables according to our multiple regression analysis.

A stepwise multiple regression analysis was used to create a model of the variables. Stepwise regression automatically includes variables that are significant, and includes them in the model in the order of the most variance accounted for. In this situation, both non-redundancy and paralanguage variables were similar individually in the amount of variance accounted for. Non-redundancy (individually) has an \( r = .2249 \), while Paralanguage has \( r = .2213 \).

### Variable | Individual correlation
--- | ---
Non-redundancy | \( r = .2249 \)
Paralanguage | \( r = .2213 \)

However, there is not an additive effect in a multiple regression model, because there is overlap in the variance accounted for between the two variables. Therefore, the Multiple \( r = .31553 \) for the two-variable model is not a simple additive result of the two individual correlations. Multiple regression models are sensitive to the order in which the variables are entered into the equation. Stepwise regression automatically selected non-redundancy as the first variable in the equation based upon the amount of variance accounted for. Both variables, however, were significant at \( p < .0003 \). This means that there is a real effect of these variables, although the effect is relatively small. Because these numbers are small, we are led to believe that there could be other factors, which we have not measured that are contributing to "ideal" interactions.

### Variable | Multiple r | significance
--- | --- | ---
Non-redundancy | \( r = .2249 \) | \( p < .00001 \)
Paralanguage | \( r = .31553 \) | \( p < .0003 \)

Overt affective cues were not a significant variable, and that variable was automatically eliminated from the regression equation. This confirms what our simple comparison of the means suggests—overt affective cues are not significantly important to creating an ideal interaction.

**Conclusion**

This study suggests that non-redundancy of information and paralanguage are important factors in designing and improving instructional interactions. At the same time, overt affective cues do not seem to create an impact on perception of "ideal" interactivity. What does this suggest for online interactivity, for example? Based on this data, we might suggest that broader bandwidth communication, such as video, which can transmit paralanguage would be more ideal than smaller bandwidth communications. It would also appear that students might see information that is not redundant, but rather new and novel as more ideal than information and content that restates what they already know. Apparently, the inclusion of overt affective cues was not detectable by students, and consequently had little impact when used in a situation in which paralanguage could dominate.
References

