The Politeness Effect in an Intelligent Foreign Language Tutoring System

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Abstract. A previous study showed that pedagogical agents that offer feedback with appropriate politeness strategies can help students learn better [21]. This work studied the Politeness Effect in a foreign language intelligent tutoring system, and provided further evidence that tutorial feedback with socially intelligent strategies can influence motivation and learning outcomes.

Keywords: Politeness Effect, Pedagogical Agents, Intelligent Tutoring System, Affective Computing, Second Language Acquisition, Motivation.

1 Introduction

Reeves and Nass have proposed the Media Equation hypothesis [20], which states that people respond to media, including computer-based media, as they do to other people. They argued that designers of computer systems should take this similarity into account. Researchers in intelligent learning environments have then begun to investigate how the Media Equation might apply to educational software. Lester et al. [15] conducted a study in which an animated pedagogical agent named Herman the Bug facilitated learning in an intelligent learning environment named Design-a-Plant. They posited the Persona Effect, that an animated pedagogical agent with a life-like persona and expressed affect could facilitate learning.

A number of pedagogical agent investigations have been conducted, seeking to understand the Persona Effect in more detail, and replicate it in a range of learning domains [9][18]. The results of these studies have been mixed. André et al. [1] demonstrated that an animated agent could help reduce the perceived difficulty of instructional material, and Bickmore [3] reported that subjects liked an animated agent that responded socially to them. But in neither study the agent yield differences in learning gains. Further studies [2][8][16] suggested that it was the voice of the animated agent that influenced learning, not the animated persona at all.

The animated persona itself may not be the primary cause of the learning effects of animated agents. Rather, if as Reeves and Nass suggest learners respond to

pedagogical agents as if they were social actors, the agents' effectiveness should depend upon whether or not they behave like social actors.

Human tutors make extensive use of social intelligence when they try to satisfy learner's cognitive needs while motivating and supporting learners [14]. Porayska-Pomsta (2004) observed that expert human tutors use a wide range of strategies to phrase criticism so that it can indirectly "get the message through" without "hurting learner's motivation". She linked the "indirectness" in the feedback to the notion of politeness and tried to use the politeness theory [4] to explain the various strategies used by the tutor to phrase the tutorial feedback.

Politeness theory holds that people in all cultures have face wants: a desire for positive face (the desire to be approved of by others) and for negative face (the desire to be unimpeded by others). Many interactions between people, such as requests or instructions, potentially threaten face, and so people employ a range of politeness strategies to mitigate face threat and lessen an utterance's impact on positive or negative face. A series of studies of how human tutors interact with learners [10][11] found that human tutors use a range of tactics to address students' face.

Although politeness theory describes tutorial interaction at the tactical level, there is much more to tutorial interaction than face threat mitigation. Human tutors phrase their feedback comments to avoid negative impact on learner face and actively seek to influence learners' underlying motivational and affective states.

Researchers in motivation in learning e.g., [13], have identified several factors that promote learner motivation, including the so-called 4 Cs: confidence, curiosity, challenge, and control. Lepper & Woolverton [14] studied highly effective tutors in remedial mathematics education, and found that they employed motivational tactics to promote and optimize the 4 Cs. There is a close correspondence between the face wants identified by Brown and Levinson and some of these motivational factors. Negative face is related to control, so tactics that address learner negative face may also influence learner sense of control. Positive face is related to self-confidence; if learners have a sense that others approve of their performance, they are more likely to be more confident of their own performance. Thus, the politeness tactics that we observed in our studies of human tutors can be viewed as part of the tactical repertoire that tutors can employ to promote learner motivation.

Wang et al [21] applied the media equation hypothesis to the socially intelligent behavior of the pedagogical agent, in particular the use of politeness strategies. The study showed learners who received polite tutorial feedback achieved better learning results than those who received direct feedback. This effect is termed the Politeness Effect. Later, McLaren [17] applied the politeness strategies to intelligent tutoring systems in real classroom environment and failed to replicate the Politeness Effect.

In this paper, we present our investigation of the use of politeness in the context of a foreign language intelligent learning environment - Tactical Iraqi[1] [12]. The main question we want to address is: "How does politeness influence learning?" Our hypothesis is that pedagogical agents with proper politeness strategies can improve student's learning result by promoting student's motivation.

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[1] Tactical Iraqi™ is a registered trademark of Alelo Inc. in the United States and other countries.

2 Tactical Iraqi

Tactical Iraqi is one of several game-based courses developed by Alelo TLT LLC., based on earlier prototypes developed at the Information Science Institute of University of Southern California. It is a training system that supports individualized language learning and helps military service members who may have no knowledge of foreign language and culture quickly acquire functional communication skills.

Tactical Iraqi includes three modules: the Skill Builder, the Mission Game and the Arcade Game. The Skill Builder consists of interactive lessons and exercises, and interactive game experiences. Learners use headset microphones to interact with the software, along with a keyboard and mouse. Lessons, exercises, and game experiences all involve speaking in the target language; speech recognition software is used to interpret the learner's speech.

Learners are introduced to concepts of language and culture in the Skill Builder lessons, and practice and apply them in the Arcade Game and Mission Game. The current study focuses on Skill Builder only. More information on the Arcade Game and Mission Game could be found in [12].

2.1 Feedback in the Skill Builder

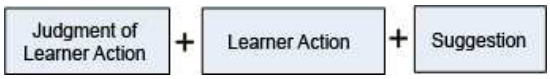
To study tutor feedback in Tactical Iraqi, we videotaped sessions of human tutoring in the context of Tactical Iraqi. Analysis of the videos revealed six different types of tutoring feedback:

- Acknowledgement/Criticize: acknowledge that the learner action is correct or incorrect.
- Elaborate: explains a language fact relates to learner's action.
- Suggest Action: offers hints to the student for the next step.
- Recast: when learner makes a mistake, instead of explicitly criticizing the action, tutor simply demonstrates the correct action.
- Encourage Effort: feedback aims to elicit more effort from learner.
- Consolation: consoles the student by saying his errors are expected.

We decided to implement acknowledgement/criticize, elaborate and suggest action in two types of Skill Builder pages: vocabulary pages and exercise pages. We designed recast as part of Suggestion – suggesting learner to listen to tutor speech again. Tutor strategies purely for motivational purpose (Encourage Effort and Consolation) are not included in the study.

2.1.2 Feedback on Vocabulary pages

User interaction on a pronunciation page consists of listening to the tutor's phrase, recording learner's own speech, playing back the learner's speech and receiving feedback about the recorded phrase. We designed the feedback on vocabulary pages with the following structure:



The learner's speech is first processed by a speech recognizer. The feedback model receives the recognized phrase and compares it to tutor's phrase. If it matches then the Judgment of Learner Action is "correct", otherwise it's "incorrect". The second component of the feedback – Learner Action – displays the phrase recognized by the speech recognizer, e.g. "It sounds like you said 'as-salaamu 9aleykum (Hello)'." The third component of the feedback offers the learner a suggestion on what to do next: practicing the utterance more, listening to the tutor speech or moving on for now. An example of the complete feedback could be "Your pronunciation is incorrect. It sounds like you said 'as-salaamu 9aleykum (Hello)'. Try again."

2.1.3 Feedback on Exercise pages

There are three types of exercise pages: utterance formation pages, multiple-choice pages and match-item page. User interaction on an utterance formation page consists of recording a response in the foreign language to a question and receiving feedback regarding the answer. Multiple-choice page consists of a multiple-choice question. Match-item page presents learner with match-item questions. Learner matches a list of phrases in Iraqi Arabic to their translations in English. The structure of feedback on utterance formation pages is shown below.

The first and third components are similar to the ones for pronunciation feedback. The second component – elaboration – presents analysis of learner's answer. The lesson XML, which defines the pages in the Skill Builder, also includes possible correct and likely incorrect answers to questions on an exercise Page. The feedback model retrieves the analysis from the lesson XML based on the answer recognized. An example of the complete feedback would be "Incorrect. 'li sh-sharaf' is used to formally accept an invitation, and not to respond to a new acquaintance. Try again."

Feedbacks like the example above can create threats to learner's face. Judging learner action, especially in the case of criticism, can threaten the learner's positive face. Suggesting action, e.g. "Try again" on the other hand, can threaten learner's negative face. To mitigate the face threat, we designed a series of politeness strategies for the feedbacks based on Brown & Levinson's politeness theory, as shown in Table 1. Examples of these politeness strategies are listed in Table 2.

Table 1. Politeness strategies in Skill Builder feedback.

Feedback Component	**Politeness Strategies**
Judgment of Learner Action	Exaggerate, Common Ground, Conventionally Indirect, Be Vague, Understate, Impersonalize
Learner Action or Elaboration	Impersonalize
Suggestion	Common Ground, Tautology, Question, Impersonalize

Table 2. Examples of politeness strategies.

Politeness Strategy	**Example**
Exaggerate	Great job!
Common Ground	Let's practice this a little bit more before we move on.
Be Vague	Looks like someone got the right answer!
Understate	This utterance needs a little bit more work.
Question	How about we listen to the tutor's speech again?
Tautology	Practice makes perfect.
Impersonalize	It might be helpful to listen to the tutor's speech again.
Conventionally Indirect	This utterance requires more practice.

Fig. 1. Feedback with appropriate politeness strategies delivered by an avatar.

To apply the politeness strategies, a database containing phrase templates for each feedback components using different politeness strategies is created. The feedback model queries the database with feedback component type and politeness value. The database finds the all matches within a politeness value range, selects one at random and returns it to the feedback module. The feedback model combines the query results and delivers the feedback to the learner by an avatar (Figure 1). The avatar is not animated and no speech synthesized speech is used. The feedback is delivered in text.

3 Method

Sixty-one volunteers (59% women, 41% men) from the greater Los Angeles area participated in the study. They were recruited by responding to recruitment posters on Craigslist.com and were compensated $40 for three hours of their participation. On average, the participants were 38.4 years old (min=21, max=63, std=11.5), with 1.6% of them with high school diploma, 21.3% with some college education, 50.8% with college degree, 8.2% with some graduate education and 18% with graduate degree.

3.1 Design

To investigate the effect of politeness strategies in tutorial feedback, we created two types of feedbacks: a polite feedback which is phrased using various politeness strategies and a direct feedback which is phrased without any politeness strategies. An example of direct feedback is "No, that means 'This is a sergeant.' Try again." An example of polite feedback is "It's usually hard to get answers to this question right, but that means 'This is a sergeant.' How about we try it again?" The study was designed as a between-subjects experiment with two conditions: Polite (n=31) and Direct (n=30), to which participants were randomly assigned.

3.2 Procedure

Participants first watched a video about the Tactical Iraqi. Then participants filled out the pre-questionnaire packet. The experimenter then gave a brief introduction on how to use the Skill Builder of Tactical Iraqi. The experimenter informed the subjects to take the lessons in the Skill Builder in order and not to take any quizzes. Next, participants started training in the Skill Builder in Tactical Iraqi. Participants in Polite condition received polite feedback while participants in Direct condition received direct feedback. Experimenter turned on the camcorder and left the room. One hour later, experimenter returned to the laboratory and ended session 1.

The next day, participants came back and completed another hour of training. They were then asked to write down the name of the lessons they took in Skill Builder. Later participants filled out the post-questionnaire packets. Finally, they took the quizzes from the lessons they took in Skill Builder.

3.3 Apparatus

Two Dell laptop computers installed with Tactical Iraqi were setup in two separate rooms. A headset was connected to each laptop computers. A camcorder was setup in front of each laptop computers to record participants' behavior.

3.4 Measures

3.4.1 Learning Gains

Learning Gains were measured using quizzes at the end of each lesson in the Skill Builder. The quizzes contain three types of questions. First type of question is *Utterance-Formation* question, where participants answer the question by recording their own speech. The second type of question is *Multiple-Choice* question. The third type of question is the *Match-Item* question, where participants match phrases in Iraqi Arabic to translations in English. Each correct answer scored 1 point. Participants took quizzes from all the lessons that they took during the 2 hour training.

3.4.2 Motivation

Two indices of motivation were measured: self-efficacy and perceived autonomy. Self-efficacy measured both in the pre-training questionnaire (α=.829) and the post-training questionnaire (α=.713). The difference between pre-training and post-training results will allow interpretation of how self-efficacy increased or decreased due to the training. Items from self-efficacy measure include items such as "Compare to others, I think I'm pretty good at learning Iraqi Arabic." Sense of autonomy (α=.885) was measured only in the post-training questionnaire. Example items from autonomy measure include "I feel the system was deciding what I should do next for me."

3.4.3 Individual Difference

Individual characteristics were measured in an attempt to test their possible interaction with the Politeness Effect. These individual characteristics include extraversion [5], openness [7], conscientiousness [5], preference for indirect help (α=.286) and attitudes toward language learning [6].

4 Results

Data from seven sessions were excluded. Two sessions were excluded because computer crashes and speech recognizer malfunctions. One session was excluded because participant's hearing and speech impairment. Four other sessions were excluded because participants "cheated" on the post-test. In Tactical Iraqi Skill Builder, lessons and quizzes are always accessible to the user. At the beginning of each experiment session, participants were instructed to not to take any quizzes. Immediately before the post-test (quizzes), participants were instructed not to review the lessons before or during the quizzes. Log data from Tactical Iraqi showed that participants from the four excluded sessions either took the quizzes before the post-test, or reviewed the lessons during the quizzes. As a result, data from 50 participants was included in the analysis, 25 from the polite condition and 25 from the direct condition. Student T-test was used to compare results from polite and direct group.

4.1 Learning Results

Overall, we did not find significant difference between polite and direct group on overall quiz scores (p=.626, M_{polite}=7.08, SD_{polite}=4.00, M_{direct}=6.56, SD_{direct}=3.48). We then broke down the comparison of learning performance to different types of quiz questions. On utterance-formation questions, there is significant difference between polite and direct group (p=.037, M_{polite}=5.08, SD_{polite}=2.66, M_{direct}=3.64, SD_{direct}=2.06). On other two types of questions, we did not find significant differences: multiple choice questions (p=.180, M_{polite}=1.92, SD_{polite}=1.78, M_{direct}=2.68, SD_{direct}=2.15), Match-item questions (p=.183, M_{polite}=.08, SD_{polite}=.28, M_{direct}=.24, SD_{direct}=.52). Match-item question scores are extremely low because there were only a couple of them in the quizzes. And they only appear in quizzes of later lessons. Few participants encountered them in the post-training learning test.

4.2 Motivation Results

We compared change of self-efficacy to learn Iraqi Arabic from before two learning session. We found significant results on self-efficacy change (p=.045, M_{polite}=.848, SD_{polite}=.856, M_{direct}=.366, SD_{direct}=.803). On autonomy, we did not find significant differences between two groups. (p=.838, M_{polite}=3.04, SD_{polite}=1.04, M_{direct}=3.11, SD_{direct}=1.45).

4.3 Individual Differences

Two-way between groups analysis of variance were conducted to explore the impact of individual differences and polite treatment on learning and motivation. Medium splits were conducted on the individual differences variables to divide each variable into two categories.

4.3.1 Motivation to learn foreign language

We found a marginally significant main effect of motivation to learn foreign language on change of self-efficacy to learn foreign language (F(1, 46)=3.93, p=.053, M_{group1}=.49, SD_{group1}=.80, M_{group2}=.84, SD_{group2}=.90, η^2 =.108). This means that self-efficacy of participants with higher motivation to learn foreign language increased more than those with lower motivation to learn foreign language. The interaction effect (F(2, 46)=3.58, p=.065) did not reach statistical significance. The main and interaction effects for motivation to learn foreign language on other autonomy and learning were not statistically significant.

4.3.2 Preference for indirect help

The main effect of preference for indirect help on learning outcomes and motivation were not statistically significant. The interaction effect of preference for indirect help and polite treatment on learning outcomes and motivation were not statistically significant.

4.3.3 Extroversion

The main effect of extroversion on learning outcomes and motivation were not statistically significant. The interaction effect of extroversion and polite treatment on learning outcomes and motivation were not statistically significant.

4.3.4 Intellect

There was a statistically significant main effect for intellect on the overall quiz score ($F(1, 46)=11.28$, $p=.002$, $\eta^2=.197$), Utterance-formation question quiz score ($F(1, 46)=6.11$, $p=.017$, $\eta^2=.117$) and Multiple-Choice quiz score ($F(1, 46)=9.15$, $p=.004$, $\eta^2=.166$). This means that participants with higher self-reported intellect performed better on the learning test than participants with lower self-reported intellect. The main effects of intellect and self-efficacy and sense of autonomy were not significant. The interaction effects of intellect and polite treatment on any of the quiz score measures were not significant. The interaction effects of intellect and polite treatment on self-efficacy and sense of autonomy were not significant.

4.3.5 Education

The analysis of variance show that the effect of education on overall quiz scores was significant ($F(1, 46)=5.53$, $p=.023$, $M_{group1}=6.17$, $SD_{group1}=3.22$, $M_{group2}=8.50$, $SD_{group2}=4.45$) and the effect size was moderate ($\eta^2=.107$). The interaction between education and politeness on overall quiz score was also statistically significant ($F(2, 46)=4.41$, $p=.041$), but the effect size was small ($\eta^2=.087$). For the participants with lower education, those who received polite treatment did not differ those who received direct treatment on their overall quiz score ($M_{Polite}=5.89$, $SD_{Polite}=2.87$, $M_{Direct}=6.47$, $SD_{Direct}=3.66$). For participants with higher education, the difference between those who received polite treatment and those who received direct treatment did not reach statistical significance either ($M_{Polite}=10.83$, $SD_{Polite}=5.00$, $M_{Direct}=6.75$, $SD_{Direct}=3.29$). We did not find any significant effect of education on self-efficacy and sense of autonomy. The interactions between education and politeness on self-efficacy and sense of autonomy were not statistically significant.

5 Discussion

This paper has presented an investigation of the Politeness Effect in a foreign language tutoring system. Our results showed that on utterance-formation questions in the quizzes, those who received polite treatment did significant better than those who received direct tutorial feedback.

In Tactical Iraqi Skill Builder, not all exercises are alike. The exercises in Tactical Iraqi are designed to progressively prepare learners to apply their skills in conversation. The focus of Tactical Iraqi curricula is to develop spoken communication skills. It provides learners with a progression of exercises that start with basic recognition and recall, and progress toward spoken conversation. The utterance-formation quiz questions are the ones that require learner to answer the question by recording their own speech. They are much more difficult and complex than multiple-choice and match-item questions, and are closer to real-life language

use. The results shown here are similar to the study on Persona Effect [15] in that the polite agent helped learner perform better on only complex problems.

Our results also show that participants who received polite tutorial feedback increased their self-efficacy more than those who received direct tutorial feedback. This is consistent with our hypothesis. However, we did not observe significant difference between polite and direct group on self-report of sense of autonomy. This is likely to be because the study was carried out in only in the Skill Builder of Tactical Iraqi. The Politeness Effect, if it exists, is not likely to apply identically to all learners in all learning environments. In the Skill Builder, there is relatively little scope for learners to exercise their autonomy. They either speak the language correctly or they do not. And they can either move on or continue practicing. Politeness tactics that focus on learner autonomy may therefore have limited effect.

Several individual differences showed influence on the learning result, although very few showed interactions with the polite and direct experiment manipulation. It was not surprising that participants with higher motivation to learn foreign language showed higher increase of self-efficacy to learn Iraqi Arabic than those who with lower motivation. The influences of intellect and education are quite interesting, indicating that participants who consider themselves highly intellectual or received higher education learned better. However, there were small to none interaction with the experiment manipulation. Contrary to the findings in [21], we did not find preference for indirect help to have much influence on either learning or motivation. This may be because the instrument to measure preference for indirect help has low inter-item reliability (α=.286).

There are several limitations to current study. The learning gains were measured right after the training. Even though the utterance-formation quizzes are close to real-life conversations, measures in a role-playing interview maybe a more comprehensive measure of communication skills. The version of Tactical Iraqi used in the study was in its early development stage. Speech recognizer error could potentially reduce the credibility of the feedback.

In conclusion, designers of educational software should consider carefully how politeness strategies apply to their particular application. In interactive applications that provide feedback, there are typically many opportunities to employ politeness tactics. Conversely, system developers and content authors who neglect politeness issues may unintentionally introduce messages that threaten learner face. Attention to politeness issues may result in improved learner performance, as well as improved learner attitudes and motivation.

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