

Way to Go! Effects of Motivational Support and Agents on Reducing Foreign Language Anxiety

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Abstract. Using a tutoring system for English as a foreign language, we studied the impact on students’ anxiety levels of an animated agent that provides motivational, supportive feedback. We compared two types of feedback — explanatory and motivational supportive feedback — presented in three ways: by text, by voice, or by a character agent. Results showed that using an agent that gives motivational, supportive feedback decreases the learners’ anxiety levels overall. We also found that performance and gender interact with the effectiveness of the treatment for reducing foreign language anxiety (FLA). Our findings have implications for promoting equity and determining how best to improve positive emotions and reduce anxiety for all students.

Keywords: Feedback · Motivation · Agent · Foreign Language · Anxiety · Support.

1 Introduction

Foreign language anxiety (FLA) is a feeling of tension, stress, or worry when learning a new language [12–14, 18]. Decreasing FLA can significantly improve learning achievement [21]. Researchers have investigated ways of reducing FLA in general, like providing supportive, empathetic feedback, either by teachers, peers, or animated agents [2, 4, 5, 16, 17, 25]. Others have studied the use of animated agents to improve learning [1, 7, 8, 26] and support emotions [19]. Researchers used multiple forms of animated agents such as voice assistants or characters with bodies and voices [1, 7]. Conversational agents that provide empathetic support increased the willingness to communicate in the foreign language, which presumably alleviated anxiety and enhanced self-confidence [4, 5].

Different types of feedback have also been studied, for example, sandwich feedback [23], explanatory feedback [8], and corrective feedback [8, 20, 24]. Sandwich feedback is providing an explanation or correction between two positive comments [22, 23]. Explanatory feedback is explaining the right answer instead of focusing on evaluating the learner. Corrective feedback informs the learner if their answers were correct or incorrect without any explanation [8].

Factors such as learner’s achievement [9] and gender differences [3] affect how the learner benefits from motivational, supportive feedback and animated

agents. Equity in education implies that all students should be empowered to succeed in learning based on their own needs. An adaptive learning environment can aim to ensure success no matter the learner’s gender or performance level [9, 12]. Research on FLA has shown that struggling learners feel more anxious than successful students [11]. The research has shown mixed results about FLA differences according to gender [10, 11, 17, 27].

2 Methods and Experimental Design

We built an e-learning system for teaching English as a foreign language and for researching FLA. We performed an experiment using a 2x3 factorial design where the factors were *feedback type* (Explanatory vs Motivational Supportive) and *feedback modality* (Text vs Voice vs Agent). The 56 non-native English speaking participants were randomly assigned to one of the six conditions. In all conditions, textual feedback was shown on the screen. In the voice modality condition, the text was accompanied by narration. The agent modality used an animated agent¹. After the learner answered a question, the system evaluated their answer and provided its feedback depending on the condition. In every case, an *explanation* like this one for a vocabulary exercise was given:

Decreased is the right answer because we need a word that means fewer.

In the explanatory feedback condition, if the learner’s answer was correct, the feedback was, “Yes”, followed by the explanation. If it was incorrect or partially correct, then only the explanation was given. The motivational supportive feedback conditions used a sandwich feedback model, which put the comment between two positive statements [23]. Figure 1 shows how the explanation was embedded in the motivational, supportive feedback, depending on the evaluation of the learner’s answer. After each exercise, the learner answered a question about their level of anxiety during that exercise [14, 15].

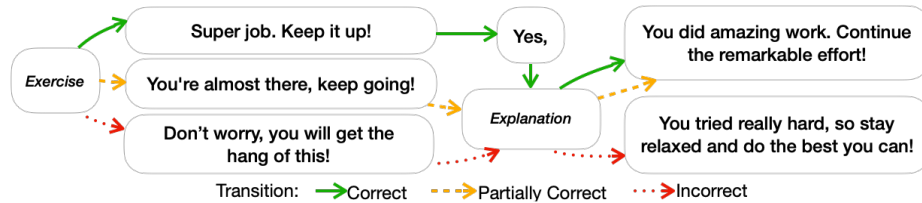


Fig. 1. Example of motivational supportive feedback. Correct: green straight line, Partially Correct: yellow dashed line, Incorrect: red dotted line

¹ Media Semantics (<https://www.mediasemantics.com>) provided us with a free license for educational use.

3 Results

We did an ANOVA with feedback type and feedback modality as factors and the self-reported FLA as the dependent variable. The results revealed no main effect. There was, however, a crossover interaction between feedback type and modality, $F(2, 1114) = 7.163, p < .001$ (see Table 1).

Table 1. Mean Anxiety (with SD) for feedback modality and type

	Explanatory	Supportive
Text	24.13 (23.44)	33.52 (28.62)
Voice	30.35 (34.08)	29.57 (22.99)
Agent	29.01 (28.27)	22.62 (21.31)

To test the effects of performance, we grouped answers as correct, partially correct, or incorrect. For each group we did a t-test with feedback type as the independent variable and level of anxiety as the dependent variable. We found no significant differences for feedback type within the incorrect group $t(304) = 1.744, p = .082$ and partially correct group $t(187) = 0.684, p = 0.495$, but there was a significant difference for the correct group, $t(623) = -3.308, p < .001$. When receiving explanatory feedback, anxiety was lower ($M=17.36, SD=25.52$), than it was with motivational supportive feedback ($M=23.67, SD=21.85$).

For gender, we did an ANOVA with FLA as dependent variable and gender, feedback type and feedback modality as the factors. The results revealed a main effect of gender, $F(1, 1088) = 7.519, p = .006$. This was qualified by interactions between gender and feedback modality, $F(2, 1088) = 3.305, p = .037$. There were no interactions between gender and feedback type $F(1, 1088) = 2.543, p = .111$. The interaction among gender, feedback type, and feedback modality was significant $F(2, 1088) = 13.098, p < .001$ (see Table 2).

Table 2. Mean Anxiety (with SD) for feedback type and modality between gender

	Male		Female	
	Explanatory	Supportive	Explanatory	Supportive
Text	16.48 (22.52)	44.17 (23.09)	31.77 (21.95)	29.97 (29.45)
Voice	33.66 (36.51)	34.82 (22.99)	24.53 (28.66)	23.14 (22.32)
Agent	34.24 (29.39)	20.38 (20.41)	22.05 (25.29)	23.46 (21.65)

To further investigate the interaction between gender and feedback type and modality, we did separate ANOVAs for males and females. For females, there was a main effect of feedback modality $F(2, 634) = 5.353, p = 0.005$. Feedback

from the animated agent produced the lowest level of FLA ($M = 23.08$, $SD = 22.65$), followed by voice ($M = 23.76$, $SD = 25.27$), then text ($M = 30.42$, $SD = 27.73$). There was no significant interaction between feedback type and modality $F(2, 634) = 0.208, p = 0.812$. For males, we found a statistically significant interaction between the effects of feedback type and modality on FLA $F(2, 454) = 17.202, p < 0.001$. There were no other significant effects.

4 Discussion and Conclusion

Focusing first on feedback type alone, we did not find a main effect on FLA. Both explanatory and motivational supportive feedback types included explanations which focused on the right answers. Because the explanations did not dwell on incorrect answers, learners with incorrect answers should not have been overly threatened by the feedback. We also found that the modality for providing the feedback did not have an overall effect on FLA. As discussed below, there may be other factors that affect the overall impact of feedback modality. Learners who received supportive feedback from animated agents reported the lowest anxiety levels. This result echoes [5] which found that a conversational agent that gave empathetic support effectively reduced FLA.

The highest level of anxiety was reported by learners who gave incorrect answers and received explanatory feedback, but the difference between that and the supportive feedback did not reach the level of significance. This differs from the findings of [9], but it should be noted that they were based on a median pre-test split, and we analyzed the data on an exercise-by-exercise basis. We found that the lowest anxiety level was reported by learners who answered correctly and received explanatory feedback, and this was significantly lower than the level of anxiety for correct answers which received supportive feedback. The highest anxiety level was reported by learners answering incorrectly and receiving explanatory feedback. This suggests that motivational support should be applied judiciously. It can reduce anxiety when the learner gives an incorrect answer. It may, however, increase anxiety when the learner has answered correctly, perhaps by implying that they're not doing as well as they thought. This is in line with [9] which indicated the importance of being supportive *only* when needed.

To advance gender equity in foreign language, researchers recommend understanding how gender influences which aspects of a learning environment are most effective for both learning and for anxiety [3, 6]. We did not find gender-based differences for different feedback types. We did, however, find gender differences based on the feedback modality and the combination of feedback type and modality. For women, feedback from the agent produced significantly lower anxiety than from the other modalities, with the lowest levels coming from agent-based explanatory feedback. Males' anxiety levels were lowest when they received text-based explanatory feedback but they were highest when they received text-based supportive feedback. Future studies will focus on understanding the effectiveness of the interaction between feedback type, gender and performance within an adaptive system.

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