Overcoming Foreign Language Anxiety in an Emotionally Intelligent Tutoring System

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ABSTRACT

The interactions between learning and emotions are bidirectional. Positive emotions such as motivation, engagement, and happiness induce learning gain. Negative emotions such as anxiety, confusion, and frustration weaken learning achievements. Understanding the learner's mental and emotional state would promote their positive emotion and diminish their negative emotion, which in return, increases learning acquisition. One of the most negative emotions that affect foreign language learning is anxiety. Through our study, we would like to investigate how to detect foreign language anxiety (FLA) then how to reduce and eventually overcome FLA. In the context of FLA, we propose a sensor-free anxiety detector. To overcome FLA, we propose a pedagogical animated agent that provides emotional support. Our preliminary findings showed that a pre-test of a Foreign Language Classroom Anxiety Scale (FLCAS) is effective to predict FLA in the context of an e-learning system.

Keywords

Foreign language anxiety, Emotion, Affect, Intelligent Tutoring System, Sensor-free, Animated Agent

1. INTRODUCTION

Learning and emotions are interrelated. The brain architecture allows complex interactions between emotion and cognition. The brain region work in the integration of the emotional and cognitive process that impact behaviors [18]. A positive, supportive learning environment can escalate positive emotions, which in return, can increase learning gains. On the other hand, a negative learning environment could increase negative emotions, which would weaken learning achievement [9]. Learning a foreign language is challenging because of the cognitive, emotional, and native language proficiency [14]. Anxiety plays critical role in reducing foreign language acquisition [19]. There are several reasons that induce Foreign Language Anxiety (FLA) such as fear of neg-

ative evaluation, communication apprehension, test anxiety [8], task complexity [12], and lack of emotional intelligence [20]. FLA impacts the learner's production and retention [19]. Moreover, FLA produces unwillingness to communicate in the foreign language [15, 17] and reduces the motivation to learn [16]. Furthermore, it divides attention between emotion and cognition which makes performance less efficient [11].

To measure FLA, researchers have used physical measurements [9], self-report [8], and facial recognition [7].

To overcome FLA, researchers have used ITSs [13], robots [3], or games [21]. Each study employs different strategies such as animated agents that provide communicating strategies and affective backchannels [5], soothing music [13], or adjusting the difficulty to suit the learner's level [1, 4, 6, 13].

In our research, we are focusing on foreign language anxiety (FLA). We would like to build a sensor-free emotionally intelligent tutoring system that reduces and eventually overcomes FLA. To achieve or goal we need to understand the causes of FLA, to detect FLA, and to provide interventions that overcome FLA.

The first research question is how to detect the student's anxiety level in an e-learning system. Based on [8], three main reasons produce FLA; fear of negative evaluation, communication apprehension, and test anxiety. In previous studies, we used sensor-lite approach which uses minimal sensors like self-report. We analyzed language difficulty self-report, system difficulty self-report, score of exercise, and pre-test of FLCAS to predict anxiety level [9]. However, for future studies, we would like to investigate sensor-free approach to avoid asking the learner. Consequently, we hypothesized that a pre-test of FLCAS which consists of these three parts would be effective for predicting FLA in the context of an e-learning system.

The second research question is what is the best intervention to reduce FLA in an e-learning system. According to [2], the experimental condition which included animated agents showed positive effects on reducing language barriers while the control group showed shyness and worry when learning Russian as a foreign language. Providing emotional support reduces anxiety[10]. Consequently, we hypothesized that animated agents that provide emotional support are effective for reducing FLA.

2. PROPOSED CONTRIBUTIONS

Our project is significant because we will use a sensor-free emotionally intelligent tutoring system that overcomes anxiety when learning English as a second language. Using a sensor-free approach will allow the learner to use the product in any environment without the interruptions of a physical sensor. Also, it will be capable of recognizing FLA without asking the learner about their feeling. The ITS will be able to identify learner's anxiety levels and provides adequate support.

The proposed project is unique because it uses animated agents that provide emotional support to reduce FLA. The benefits of this work are decreasing and eventually overcoming FLA. It will help foreign language learners defeat their negative emotions. Moreover, it will generate a relaxing, encouraging, and motivating learning environment which ultimately improves the learning gain.

3. RESULTS SO FAR

3.1 Previous Studies

We did an experiment to identify FLA. 30 participants who are non-native English speakers join the study. They completed FLCAS and demographic information. Then, they answered 27 exercises in grammar, vocabulary, speaking, and listening. We did a correlation analysis to understand the relationship between physical measurements and level of anxiety self-report. We found a significant positive correlation between level of anxiety self-report, blood pressure, heart rate, and eye fixation. Also, we identified FLA by analyzing interaction of learners with e-learning system. We found that time on task, and number of mouse clicks were not significant. While language difficulty self-report, system difficulty self-report, and score of exercise were effective to predict FLA in context of e-learning system [9].

We did other analyses to predict FLA in the context of e-learning system. We predicted FLA based on subject and regardless of type of exercise using pre-test FLCAS components. Depending on exercise type, we used sensor-free prediction using various components of FLCAS. For example, average communication apprehension score was 40% effective to predict FLA in context of listening exercise. Grammar and vocabulary predictions were not significant. For overall FLA, we predicted that average fear of negative evaluation, average communication apprehension, language difficulty self-report, system difficulty self-report, and exercise score account for about 43% of variation in anxiety. We used sensor-lite in this prediction by using language and system difficulty self-report to increase accuracy of prediction.

3.2 Current Study

There will be 180 participants randomly assigned to six groups. They should be non-native English speakers and non-fluent. Their age should be above 18 years old.

The participants start the study by answering some demographic information (native language, age, educational level, and English level). Then they complete FLCAS. After that, they are assigned to one of the six groups (control, textbase supportive feedback, voice supportive feedback, voice feedback, agent supportive feedback, or agent feedback). All the six groups have the same material which teaches and provide practice in English listening, vocabulary, grammar, writing, and reading. The difference between the groups is in the way feedback is provided. The participants are expected to learn the material then do 20 exercises. After each exercise, there is a self-report that includes language difficulty, system difficulty, and anxiety level. When the participant finishes all the exercises and self-report we send them a $20 Amazon e-gift card.

For the first research question, we will do a statistical analysis to understand the relationship between FLCAS and learner's current level of anxiety when using an e-learning system. We would like to predict the learner's current level of anxiety using three main components of FLCAS: communication apprehension, fear of negative evaluation, and test anxiety [8]. We will use regression and 10-fold cross-validation to verify the results. For the second research question, we will use Mann Whitney U test to understand which intervention is effective to reduce anxiety.

Then we will use the data from both research questions to build an ITS that reduces FLA.

4. ADVICE SOUGHT

There are two main aspects of research on which advice is sought. First, the set of features used to predict FLA using a sensor-free approach. Our preliminary study showed that using sensor-lite is effective to predict FLA. Sensor-lite uses language difficulty, system difficulty, score, and pre-test of FLCAS as predictors. We would like to use sensor-free without having the language and system difficulty self-report but the model fit drops from 40% to 20%.

Second, algorithms, tools, and applications to build an English foreign language intelligent tutoring system which reduces FLA. So far, we built an e-learning system but we want to upgrade it to be intelligent tutoring system. We tried using CTAT as platform but it was not compatible with the animated agent application we are using. We would like to find the best practices to build the ITS.

5. CONCLUSIONS AND FUTURE WORK

Foreign language anxiety is a major obstacle to learning a foreign language. Identifying FLA then reducing it and eventually overcoming it is a novel approach to improving foreign language acquisition. Using sensor-free anxiety detector and altering the system to reduce anxiety is a promising approach. Through our study, we hope we can predict anxiety using sensor-free approach and reduce anxiety using emotional supportive agent.

6. ACKNOWLEDGMENTS

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