

## Adapting Feedback to Personality to Increase Motivation

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Feedback is an important part of learning and motivation [2]. As internet use increases worldwide, web based distance learning is becoming more popular, and there has been considerable interest in developing sophisticated Intelligent Tutoring Systems (ITS) such as AutoTutor [1] which intelligently adapt content delivery to certain characteristics of learners. Common characteristics include affective state [Nkambou, 2006], motivational state [8] and performance [11].

In this PhD project we are investigating how an intelligent text based Conversational Agent (CA) could adapt its language when giving students feedback on their progress, in order to increase motivation. We hypothesise that these adaptations will be more effective when tailored to the learner's personality, as modern motivational research has shown that motivational levels depend on the individual, and 'one size fits all' approaches do not work in practice [6].

To measure the personality of the learner, we are using the trait model from Psychology, which is a popular way of modelling and measuring the personality of an individual. The Five Factor Model (also known as Big 5) is one of the most popular [10] and due to the existence of validated self-report questionnaires, is a convenient way to model and measure personality for computer systems. The factors are Extraversion, Agreeableness, Conscientiousness, Neuroticism and Openness to Experience. We are also interested in Generalized Self Efficacy which describes 'the extent to which a person believes they are capable of completing a task' [8].

We are interested in whether employing a *slant* or bias in the written feedback on particular test scores can motivate a learner more effectively, as opposed to telling the absolute truth. For example, if a conscientious learner has failed a test by a narrow margin, simply telling them that they had failed the test may decrease their motivation, as conscientious learners will usually have invested considerable time preparing for the test. Instead, the CA could say something less blunt, such as "you are slightly behind in the topic".

In addition to this, we are interested in augmenting this approach with empathic emotional support statements. Previous research has shown that the personality of an individual can be used as a predictor of the propensity of the individual to experience certain emotions while learning [11]. Using this, we aim to pre-empt the emotional state of the user based on what the CA knows about their personality and their progress, and provide empathic responses based on this in order to mitigate negative emotional states. This would build on work by Robison et al [11] examining different empathic approaches and establishing which of these that human tutors use.

In order to develop and evaluate an algorithm which would allow the CA to employ these tactics, we are employing the User as Wizard approach [7], where we measure how humans taking the role of a teacher adapt their feedback to learner personality. We can then investigate the effect of this adaptation on the motivational level of the student. Thus the research project has the following aims:

## **Feedback on Progress**

1. Which of the currently defined personality traits can be exploited to give feedback that enhances motivation?
2. What algorithms can generate feedback, in producing results from Q1?

## **Emotional Support on progress**

1. Are there simple algorithms for inferring emotions (from personality and progress) which can be exploited to give emotional support that enhances motivation?
2. What algorithms can generate emotional support messages to accompany feedback on progress, taking the results from Q1 into account?

Currently we are in the process of running a series of studies which examine a personality trait to investigate how it affects the slant of feedback generated by teachers. We have completed studies investigating how teachers adapt to Generalized Self Efficacy, where we found that teachers put a positive slant on the lowest grades [3], and Conscientiousness where we found that teachers put a positive slant on grades which are close to passing [5].

We are currently designing an exploratory study which attempts to evaluate the results of the adaptation to conscientiousness on learner motivation. We use a 2x3 between subject design where participants are given a story about a fictional student, which has been validated [4] to express conscientiousness at either a high or low level. They are also given a set of grades which the student achieved, and feedback in the form of a sentence which utilizes positive, neutral or negative slant (established in [3]). We then ask participants: whether they think the student will be willing to spend time on work in the future; whether the student will give up before the course ends; and whether they will study the topics further, as a measure of the student's motivational state following the feedback. Participants will also be asked to indicate which emotions they think that the student may be experiencing using the PANAS scale [12], for future analysis.

It is hoped that this experimental design will evaluate the effects of the adaptation on learner motivation and affective state reliably. As well as allowing us to establish the most appropriate slant, we can build on this by adding an empathic response to the feedback statement in future designs to counteract any negative affective states which the student may experience as a result of their personality and their scores.

We will then design further experiments which will examine interaction effects between personality traits, and establish a hierarchy of the traits considered during the feedback process. This will allow us to construct and implement an overall algorithm for providing motivational feedback on performance tailored to personality.

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