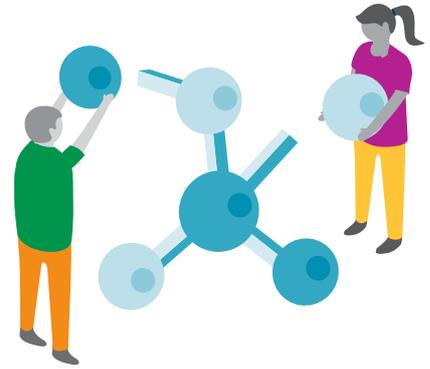


Ideas Worth Sharing

What's happening next in AIED



Using smart technology to give feedback with empathy

Beate Grawemeyer

The importance of how we feel to learning

It is well understood that a person's emotional and motivational state--how they feel, or their "affect"--interacts with, and influences, how well they learn. Positive states such as surprise, satisfaction or curiosity generally contribute towards learning gains. Meanwhile, negative states such as frustration, confusion, or disillusionment may lead to challenges in learning. In fact, when we're learning, we move fluidly between positive and negative feelings. A student may be very interested in exploring a particular topic, but there might be difficulties, which leave her feeling frustrated or disappointed. These negative feelings may lead her to abandon the topic, but she might respond differently, deciding to 'go for it' and overcome the difficulties leading to positive feelings of engagement and eventually achievement.

To help address the educational "bumps in the road" caused by these constant shifts in how students feel, my colleagues and I have been working on an adaptive system that can identify a student's emotional state and tailor the feedback they receive accordingly. The aim is to help students who are progressing well to continue to do so, while supporting those

who are experiencing difficulties to persist, by moving them out of a negative affective state into a positive one through adaptive feedback. We're calling this support 'Affect-aware Feedback'.

To achieve this, we needed to build a system able to predict the effects of feedback on student's affective state. We first developed what is called a 'Bayesian network, a technology that assesses the probability of something happening based on what it already knows. The network was trained with data gathered in 'Wizard-of-Oz' studies (pictured below), experiments in which a student interacts with a computer system that, unknown to the student, is actually being fully or partially operated by another person. (Wizard of Oz studies allow us to quickly and inexpensively test a theory, and gather data, before building the technology itself.) Through these studies we investigated which types of feedback are able to enhance a student's future affective state based on i). how they are currently feeling and ii). their interaction with the learning environment - for example, whether they were confused, or did not follow the advice given to them previously through feedback.



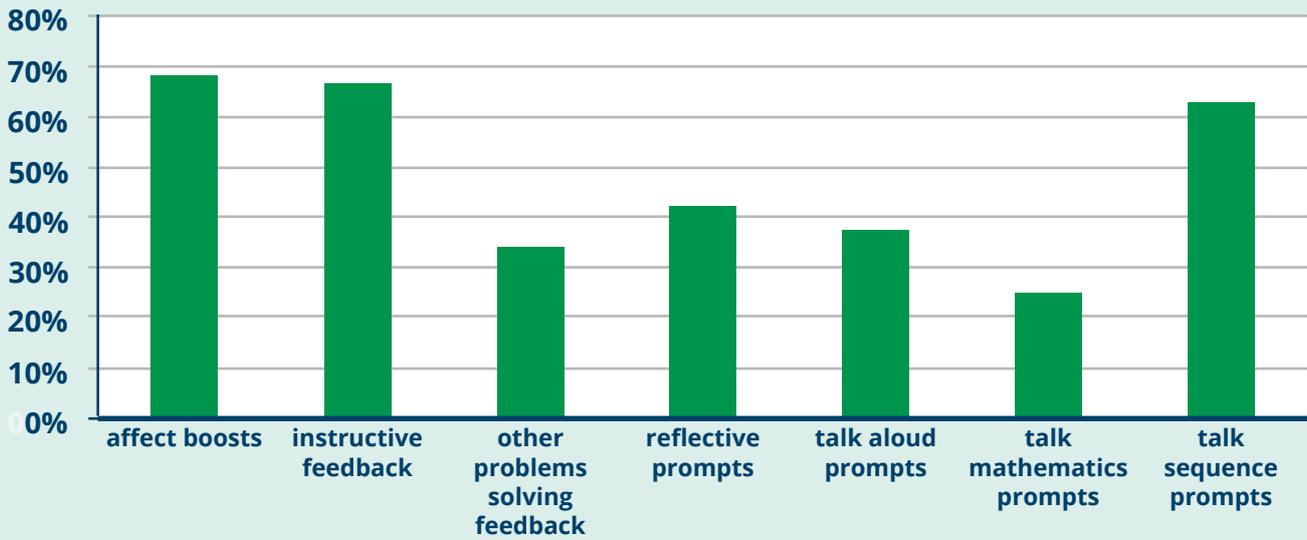
'Wizard-of-Oz' study at the London Knowledge Lab

Not all feedback is equal

We found out that when students are confused, certain types of feedback, such as instructive feedback (“Use the comparison box to compare your fractions”) or affect “boosts” (“Well done. You’re working really hard!”) are more effective than other more open ended problem solving feedback (“To add two fractions together, they first need to have the same denominators.”).

When we’re learning, we move fluidly between positive and negative feelings. A student may be very interested in exploring a particular topic, but there might be difficulties, which leave her feeling frustrated or disappointed.

From confusion to flow



We have also learned that the way in which feedback is presented to students is important. When students are confused or frustrated, for example, high-interruptive feedback (which appears in a pop-up window that interrupts the student) is more effective: the cost of not viewing the feedback is likely to be a negative affective state. In contrast, when students are progressing well, or in “flow,” low-interruptive feedback (which can be accessed by the student by clicking an adjacent button) might be preferred. Using this

tailor the presentation of the feedback to be high- or low-interruptive based on how the student is feeling.

So far, we have evaluated our system with 77 students in the UK, and additional evaluations are being run with over 100 students in Germany. We have compared our affect-aware feedback to non-affect-aware feedback that provided support according to the student’s performance, but ignored how the student was feeling. Results show that students who received the affect-aware feedback showed much less off-task behaviour (for example, chatting to other students about something unrelated), and were also less bored, than students who received the non-affect aware support.

The next stage of our learning

The results of our evaluation indicate the high potential of affect-aware support in learning environments. The next steps include further investigation of how affect-aware feedback might help students move from a negative affective state (for example, boredom) into a positive one (such as flow).



Beate Grawemeyer is a research assistant at the UCL London Knowledge Lab.

Ideas Worth Sharing is Pearson’s new Open Ideas mini-series, where top experts from outside and inside the company share their leading edge work in education technology, research, and innovation.

@Pearson
#SmarterEdtech