Boredom in the classroom: Sentiment analysis on teaching practices and related outcomes.

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Students' emotional experiences have been a widely discussed theme among researchers, proving a central role on students' outcomes. Yet, up to now, far too little attention has been paid to teaching practices that negatively relate with students' negative emotions in the higher education. The present work aims to examine the relationship between teachers' teaching practices (i.e., students' evaluations of teaching and autonomy support), the students' feelings of boredom and agentic engagement and motivation in the higher education context. To do so, the present study incorporates one of the most popular tools in natural processing language to address students' evaluations of teaching: sentiment analysis. Whereas most research has focused on the creation of SA models and assessing students' satisfaction regarding teachers and courses to the author's best knowledge, no research before has included results from SA into an explanatory model.

A total of 225 university students (Mean age = 26.16, *SD* = 7.4, 78.7 % women) participated in the study. Students were enrolled in degree and masters' studies at the faculty of Education of a public university of Spain. Data was collected using an online questionnaire students could access through a QR code they completed during a teaching period where the assessed teacher was not present. To assess students' sentiments towards their teachers' teaching, we asked them the following open-ended question: "If you had to explain a peer who doesn't know your teacher how he or she communicates in class, what would you tell them?". Sentiment analysis was performed with Microsoft's pre-trained model. For this study, we relied on the probability of the students answer belonging to the negative category. To assess the reliability of the measure, inter-rater agreement between this NLP tool and one of the researchers, who independently coded all answers, was examined. The average pairwise percent agreement and the Cohen's kappa were calculated with ReCal2. The agreement reached was of 90.8% and Cohen's kappa .68, both considered satisfactory. To test the hypothesis relations a structural equation model (SEM) was estimated.

Results showed that the model fit indices displayed a good fit to the data; $\chi^2(134) = 351.129$, $p < .001$, RMSEA = .07, SRMR = .09, TLI = .91, CFI = .92. Specifically, results show that boredom was negatively predicted by autonomy support practices (β = -.47[-.61, -.33]), whereas for the negative sentiment extracted from SET, this relation was positive (β = .23[.16, .30]). In other words, when students' opinion towards their instructors' teaching practices was negative, it was more likely for them to feel bored. Regarding the relations among boredom and student outcomes, results showed a negative predictive value of boredom on students' motivation to study (β = -.46[-.63, -.29]) and agentic engagement (β = -.24[-.33, -.15]). Altogether, results show a promising future for sentiment analysis techniques in the field of education as they proved the usefulness of this tool when evaluating relations among teaching practices and student outcomes.