# Teachers' physiological signals to improve teacher-student relationships

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**Abstract**. In this study we explore how the physical movements teachers use can lead to improved interactions between students in a university language course. The study used video to capture and analyse an intervention focusing on the effects of teacher nodding. Results showed that positive measurable differences were found in students' physical postural responses in relation to the frequency with which their teacher nodded. The next stage of this preliminary research project will make use of the data gathered on micro-level interactions to develop technological support mechanisms to be used in the classroom to support teacher-student interactions.

**Keywords**: physiological signals, teacher-student relationship, body posture, student interaction, micro-level interactions.

## 1. Introduction

Positive teacher-student relationships are known to support student learning (Allen et al., 2021), and there are many standard strategies that teachers employ to build positive relationships within their classrooms. It is important, however, to further foster classroom relationships for the benefit of both teachers and students and to harness technology to do so. Micro-level interactions affect how classroom relationships are perceived (Wubbels, 2018) and can be captured, analysed, and then used to improve interactions via technological intervention. In this study

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we explore how the physical movements used in teaching can lead to improved interactions between students. We hope to build a base of knowledge to allow for technological classroom support mechanisms to be effectively developed. The study utilises embodied cognition, the ways that "body movements both express and influence how people feel and think" (Chandler & Schwarz, 2009, p. 123), and specifically focuses on the effects of teacher nodding.

A wide variety of experiments exploring embodiment show that our "thoughts, feelings and behaviours are grounded in bodily interaction with the environment" (Meier, Schnall, Schwarz, & Bargh, 2012, p. 705). Some of these experiments show, for example, that facial expressions (Buck, 1980), arm movements (Förster & Strack, 1997), or how often we nod (Briñol & Petty, 2003; Wells & Petty, 1980) can affect our mental processes including the ways that we perceive ourselves and/or others (Mussweiler, 2006). Nodding is almost universally understood to be a positive signal (Helweg-Larsen, Cunningham, Carrico, & Pergram, 2004) that previous studies suggest correlates with likeability (Godfrey, Jones, & Lord, 1986). Some studies suggest that the *chameleon effect*, seen when a person unconsciously copies the physical behaviours of the people that they are with, eases interactions between people and increases how positive they feel towards one another (Chartrand & Bargh, 1999). In addition, as face coverings are presently omnipresent to contain the spread of COVID-19 and may remain so indefinitely, it has become important to explore these physical responses. The work of, for example, de Gelder (2009), which finds that physical responses such as torso and head angle show more consistent and reliable information than facial responses, is particularly reassuring in this context. This preliminary research article investigates whether increased nodding by the teacher has an impact on student-to-student interaction and posits that the enthusiasm displayed by students as teacher nodding increases may be due to more positive perceptions of the teacher and, by extension, student relationships with them.

## 2. Method

Classroom observations were undertaken in a compulsory first-year English as a foreign language class in a Japanese university with an experienced female instructor in Week 13 of a 15-week course. The two female and 14 male participants are between 18 and 20 years old. All participants were informed that their class would be observed and digitally recorded one week prior and gave informed consent according to institutional policies. In line with institutional COVID-19 practice, all participants wore face coverings.

Three video cameras were placed in the classroom; one wide-lens camera trained on the teacher, and the others placed on either side of the rear. These also recorded the ambient classroom sound on internal microphones. During the first 45 minutes of the 90-minute observation, the teacher was asked to teach as usual. During the second 45 minutes, the teacher was prompted intermittently with a visual cue from the rear of the classroom to increase nodding during her next interaction. Data was coded using ELAN (2022), with attention paid to teacher nodding during teacher-student interactions and to the angle and direction of student torsos and gaze during student-student interactions. The students first read a short passage individually then completed several short discussion activities in pairs. Between discussions, the teacher called for attention and gave general feedback before setting the next task.

## 3. Results and discussion

Two three-minute segments of the 90-minute lesson were chosen for comparison. In both segments, the teacher introduced a discussion topic, then asked the class to talk with a partner. The segments selected were the fourth and fifth discussions for the lesson. In the first, the teacher taught as she normally would, nodding in encouragement to students who asked questions and interacted with her, and to signal the end of her conversational turn. In the second, following the cue to increase nodding, the teacher nodded more often, and the vertical range of head motion was much greater. In addition to the functions mentioned above, she also nodded decisively when choosing an example to illustrate her point, and when setting the time limit for the class to undertake the activity.

The way that student participants undertook pair-work activities in these two segments was markedly different. The first of these is illustrated by Figure 1. This video still was taken 14s03ms milliseconds after the students were asked to begin the first activity. Nine participants are visible, eight students and the teacher. Pair 1 is seated closest to the camera, and Pair 4 furthest away.

In the first segment, the time between the teacher asking the class to begin the activity and the first utterances from the student participants ranged between 1s37ms and 6s45ms. It took between 3s09ms and 10s22ms for the four pairs of students to reach their closest physical positions to one another. Postural mirroring was achieved by three of the four pairs within 1m46s68ms. In Figure 1, Pair 2 can be seen to have the same torso direction and angle, and a shared focal point. While Pair 1, closest to the camera, began talking first of the four pairs

visible, they did not make eye contact, share a joint focal point, or mirror one another's torso angle during this segment.

Figure 1. Screenshot of Activity 4 (14s03ms milliseconds elapsed)

In the second segment, however, all parameters occur measurably more quickly. As can be seen in Figure 2, taken 5s00ms from the start of the activity, Pair 1 have turned their torsos parallel to one another, a mirroring action that was not fully achieved by any of the pairs in the previous segment. They also share eye contact. Pair 2 are also sharing a focal point, leaning towards one another, and mirroring posture with one dropped shoulder.

Figure 2. Screenshot of Activity 5 (5s00ms milliseconds elapsed)

## 4. Conclusions

While only three parameters are analysed here in a small number of participants, the measurable differences in their postural responses show clearly that the frequency with which their teacher nods has a positive effect on the learning environment. The next stage of this preliminary research project will make use of the data gathered on micro-level interactions to develop technological support mechanisms to be

used in the classroom to support teacher-student interactions. Under consideration is advice to prompt the teacher to nod more frequently, and thereby ensure the continued impact of this low-investment, high-return intervention.

## References

Allen, K. A., Slaten, C. D., Arslan, G., Roffey, S., Craig, H., & Vella-Brodrick, D. A. (2021). School belonging: the importance of student and teacher relationships. In M. L. Kern & M. L. Wehmeyer (Eds), *The Palgrave Handbook of Positive Education* (pp. 525-550). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-64537-3_21

Briñol, P., & Petty, R. E. (2003). Overt head movements and persuasion: a self-validation analysis. *Journal of Personality and Social Psychology, 84*, 1123-1139. https://doi.org/10.1037/0022-3514.84.6.1123

Buck, R. (1980). Nonverbal behavior and the theory of emotion: the facial feedback hypothesis. *Journal of Personality and Social Psychology, 38*(5), 811-824. https://doi.org/10.1037/0022-3514.38.5.811

Chandler, J., & Schwarz, N. (2009). How extending your middle finger affects your perception of others: learned movements influence concept accessibility. *Journal of Experimental Social Psychology, 45*(1), 123-128. https://doi.org/10.1016/J.JESP.2008.06.012

Chartrand, T. L., & Bargh, J. A. (1999). The chameleon effect: the perception–behavior link and social interaction. *Journal of Personality and Social Psychology, 76*(6), 893-910. https://doi.org/10.1037/0022-3514.76.6.893

De Gelder, B. (2009). Why bodies? Twelve reasons for including bodily expressions in affective neuroscience. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences, 364*(1535), 3475-3484. https://doi.org/10.1098/rstb.2009.0190

ELAN. (2022). *Version 6.4* [Computer software]. Max Planck Institute for Psycholinguistics . The Language Archive. https://archive.mpi.nl/tla/elan

Förster, J., & Strack, F. (1997). Motor actions in retrieval of valenced information: a motor congruence effect. *Perceptual and Motor Skills, 85*, 1419-1427. https://doi.org/10.2466/pms.1997.85.3f.1419

Godfrey, D. K., Jones, E. E., & Lord, C. G. (1986). Self-promotion is not ingratiating. *Journal of Personality and Social Psychology, 50*(1), 106-115. https://doi.org/10.1037/0022-3514.50.1.106

Helweg-Larsen, M., Cunningham, S. J., Carrico, A., & Pergram, A. M. (2004). To nod or not to nod: an observational study of nonverbal communication and status in female and male college students. *Psychology of Women Quarterly, 28*(4), 358-361. https://doi.org/10.1111/j.1471-6402.2004.00152.x

Meier, B. P., Schnall, S., Schwarz, N., & Bargh, J. A. (2012). Embodiment in social psychology. *Topics in cognitive science, 4*(4), 705-716.

Mussweiler, T. (2006). Doing is for thinking! Stereotype activation by stereotypic movements. *Psychological Science, 17*(1), 17-21. https://doi.org/10.1111/j.1467-9280.2005.01659.x

Wells, G. L., & Petty, R. E. (1980). The effects of overt head movements on persuasion: compatibility and incompatibility of responses. *Basic and Applied Social Psychology, 1*(3), 219-230. https://doi.org/10.1207/s15324834basp0103_2

Wubbels, T. (2018). My journey in the learning environments research community: research on teacher–student interactions and relationships. In D. B. Zandvliet & B. Fraser (Eds), *Thirty Years of Learning Environments* (pp. 20-40). Brill. https://doi.org/10.1163/9789004387720_002

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