

The role of nonverbal gestures combined with speech for effective
learning/teaching STEAM
(Science, Technology, Engineering, Art and Mathematics)

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Nonverbal gestures combined with speech (NGCS) have an important role for effective teaching/learning STEAM. The presented framework analyzes and explains the effect of NGCS from receptive and expressive perspectives. From the receptive perspective: a) NGCS enhance understanding of the content and prevent communication shortcuts. This outcome is explained based on the process that NGCS clarify the verbal message. Pupils learn better when the messages are accompanied by nonverbal gestures. b) NGCS enhance the perception of the content. This is explained by the process that NGCS add information, which contributes to the acquisition of new and complex concepts. Speech accompanied by gestures is symbolically richer and supplies information that is not expressed in spoken language. NGCS help to demonstrate the verbal message, particularly when describing objects of a special shape or size. c) NGCS increase attention to the learning process and the mutual interaction. d) Speech together with gestures enhances memorizing the message, because the message is perceived by the brain through both vocal and visual senses. Additionally, NGCS enable a better recollection of the message. From the expressive perspective, NGCS contribute to the sender. a) NGCS increase the involvement in the learning interaction. This is explained based on the process that when both verbal and nonverbal communication modes are used, the transfer of the message is characterized by a higher cognitive, emotional, and behavioral intensity. As one partner's involvement increases, his/her use of NGCS increases. b) Moreover, from the expressive perspective, NGCS include behavioral facets that increase activity and vitality levels. c) NGCS help the sender formulize the message. Using nonverbal gestures accompanied by verbal communication increases accuracy and fluency of the transmitted message and linguistic qualities. d) NGCS create reciprocity processes between teacher and pupils, which have an important cognitive, emotional and behavioral role for achieving effective teaching/learning STEAM.