# Synapse-based Learning (SBL) - New Method of Training on Small Groups: A Randomized Controlled Study

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Context: The Synapse-based Learning Method, inspired by the Problem-based Learning (PBL), is a hybrid method between the traditional class and tutorial group, that has as innovation, the composition of the participant audience based on the principles of segmentation proposed by Rogers[1] in the Adoption of Innovations. In this sense, peer interaction promotes majority-minority conformity, as elaborated by Cialdini (1998)[2]. Therefore, Figure 1 shows Rogers's Curve of the Adoption of Innovation and the selection of the audience according to the SBL segmentation.

Figure 1 – Adopter Categorization on the Basis of Innovativeness (Rogers, 1995) & Synapse-based Learning Audience Segmentation
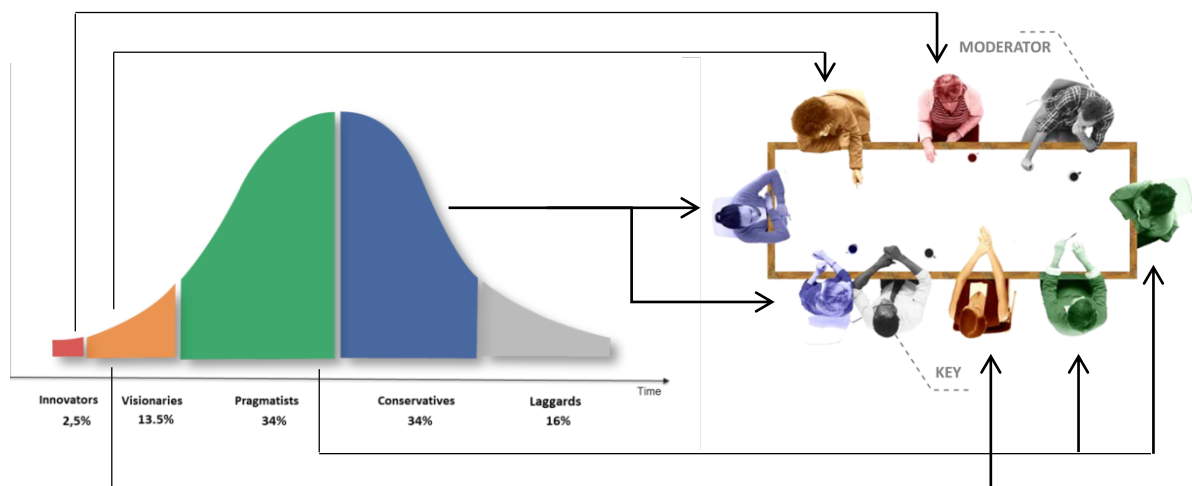
In this way, SBL uses mini-lecture and problem-discussion in small groups, with a pre-trained MODERATOR (as tutor) who leads the group formed by one KEY (teacher or researcher), as a guest, and two or three experts (advanced learners or references of the community) that promote peer to peer effect as INFLUENCERS to 6 to 10 LEARNERS (majority-minority conformity), as can be seen in the illustration above. An SBL training section lasts for 1.5 hours and has seven steps: welcome (rapport), icebreaker (mini-discussion), contextualization (mini-lecture), problem-situation (description), problem-diagnosis (discussion), decision-making (discussion), and problem-solution (mini-lecture).

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[1]Rogers, E. M. (1995). *Diffusion of innovations* (5th ed). New York: Free Press.
[2]Cialdini, R. B., & Trost, M. R. (1998). Social influence: Social norms, conformity and compliance. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (pp. 151-192). New York: McGraw-Hill.

In Brazil, small coffee farmers organize themselves in cooperatives and receive collective training about sustainable practices, but the connection between socio-environmental, commercial and technical concepts is a challenge. The aim of this study is to evaluate SBL on deep learning in technical education.

Method: continuing education is one of the most important approaches in teaching farmers about the adoption of new technologies and farming methods. SBL method was tested in agricultural technical education in Brazil in two different studies. In the first one, 25 agricultural technicians were submitted to SBL and other 25 were trained through a traditional class (TC). All groups were submitted a multiple-choice question pre and post-test on sustainable agricultural practices. The test correctness percentage was compared between the groups. In the second study, 96 small coffee growers were randomly placed in three groups: SBL, traditional lecture, and control (non-intervention) group. All groups tried to solve a hypothetical problem and answer a questionnaire about sustainable practice and optimism regarding the future. The answers were transcribed verbatim and different types of knowledge were coded and quantitatively analyzed according to correctness percentage. The written explanations were translated into networks of concepts. Both the concepts and the links between them in growers' networks were compared to model networks according to an expert.

Results: 49 agricultural technicians completed the study, 23 in SBL group and 26 in TC group. Although the TC group had more previous knowledge according to test correctness percentage (20.0% *versus* 6.1%; $p<0.05$) and both groups improved their knowledge after intervention ($p<0,05$ for both), the learning was significantly higher in the SBL group (98.3% *versus* 43.8%; $p<0.05$). In the second phase, SBL group had 29 growers, TC group had 33 and control group, 31 participants. There was no difference in basal characteristics between the groups. The test correctness percentage was significantly higher in SBL group (71.7%; $p < 0.05$) when compared to TC (35.8%) and control (1.2%) groups. The concepts and network analysis showed that SBL group had a significantly higher performance in judgment accuracy in reflexive questions and in the overall score.

Conclusion: both studies suggested that SBL is superior to a traditional lecture in promoting learning. The second study also showed that SBL seemed to promote deep learning, especially in questions that depend on reflection.

Keywords: active learning, technical education, innovation methods of teaching