This project investigates learning through interaction in conversational, task-oriented, multi-turn environments using dialogue games as a training mechanism for Large Language Models (LLMs). Building on the established *clembench* framework and the *playpen* environment, we explore how collaborative problem-solving through linguistic interaction can improve LLM capabilities during post-training. The research addresses three key questions: whether dialogue games can serve as a basis for acquiring linguistic knowledge in LLM post-training, which learning algorithms best suit self-play training on dialogue games, and what performance side-effects occur post-training. Our approach targets the challenging multi-turn, sparse reward environment of dialogue games, where agents must collaborate strategically using natural language within large action spaces. We will employ various Reinforcement Learning algorithms to explore the effects of post-training LLMs to find out which learning methods is able to improve the overall LLM capabilities. Initial experiments demonstrate that training on dialogue games improves language capabilities and generalizes to unseen domains. The project also emphasizes resource efficiency by focusing on smaller models (8 billion parameters) before scaling to larger ones (70 billion), aiming to improve open-weight models without relying on human-annotated datasets.