CHEMENG LINGO: A CARD GAME TO PROMOTE ACTIVE RECALL IN CHEMICAL ENGINEERING

Gamification of learning is an educational technique shown to positively influence deep learning, student behaviour, and learning outcomes [1], [2], and introducing an aspect of competition can be beneficial for student engagement and motivation to learn [3]. We created a card game called *ChemEng Lingo* based on the popular game *Taboo*® to use as a short activity to liven up a problem-solving session in our Separation Processes classes. We designed the game to assist students' understanding of key threshold concepts and promote verbal communication, active recall, and social learning with the ultimate aim of helping students link what they are learning with prior knowledge. *Taboo* stood out as a straightforward game that would engage students in social learning while prompting them to use their own words to explain threshold concepts, setting the stage to reflect on how well they understand them.

Figure 1. *ChemEng Lingo cards*

We designed and printed 200 cards (Figure 1) based on threshold concepts related to Separation Processes. The card game prompts students to describe a key concept by avoiding restricted phrases as their teammates guess what is being described. The restricted phrases are taken from the definitions provided in the lecture notes in order to encourage coming up with a description of the concept rather than relying on repeated definitions from memory. The main mode of gameplay involves competition among teams of students (we typically had five members/team). The team with the most correct guesses at the end of a set time wins. After the game, we ask each team to give us the cards that were skipped or guessed incorrectly, and then we review the relevant concepts to fill in gaps in knowledge/understanding. We found this activity to be useful at the beginning of class to promote a mindset of social learning and verbal participation. Seventy-nine students participated in the activity over three different sessions, and they overwhelmingly reported enjoying the activity as a warm-up to problem solving and discussion. Most students said they were likely to play the game or use the card deck as reference while reviewing for the exam. An online version of the game (with identical mode of play to the physical version) was created using the free flashcard website/app Quizlet® that allowed us to broadly distribute the card deck. In the phone app, students can swipe through the cards to either play the game or use as flashcards for reviewing concepts.

Overall, we noticed that this game creates a lively classroom environment, and by giving each teammate a turn to speak, it promotes verbal communication. Some students indicated they enjoyed starting the class this way after "being tired from a full day listening to lectures." Following the trials in the classroom, the student-run Chemical Engineering Society requested to use the card decks as an ice breaker exercise during their welcome session to meet the incoming first-year students, with positive feedback. The versatility of the card game allows for alternative gameplay methods, drawing on the games *Pictionary*® and *Heads Up*®, to promote different recall methods and maintain student engagement if used regularly during teaching. While currently focused on Separation Processes, ChemEng Lingo can be expanded to include terminology from other courses. A downloadable file for printing the cards as well as links to the digital versions on Quizlet are available at no cost at www.duyarlab.com/teaching.

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