

Learning by Teaching AI (LBT-AI): Using Teachable Machine as a Cognitive Tool

Oral Presentation proposal submitted to WERA Focal Meeting & TERA Conference 2026

Woei Hung, University of North Dakota
Jordan Trottier, Surrey Elementary School, ND

Research Overview

Learning by Teaching (LBT) helps students deepen their learning. This present study tested an alternative way of employing LBT by using Teachable Machine (AI) and its effects on enhancing students' learning. The results showed that the 5th grade LBT-AI students significantly outperformed their counterpart on the categorization of clouds.

Purpose of Study

This study was to investigate the effects of Learning by Teaching (LBT) using Teachable Machine AI on 5th grade students' learning of categorical science concepts.

Methods

This research employed mixed-methods with a quasi-experimental design, incorporating pre-test and post-test comparisons between a control group and an experimental group to assess the effects of LBT-AI learning.

Participants 32 5th grade students from two separate classes in an elementary school in rural Midwest of the US participated in this study during Spring semester, 2025.

Procedure The study spanned four instructional days, alternating between cloud and bridge classification modules. One 5th grade class served as the Clouds Experimental (CE) and Bridges Control (BC) group, while the other class functioned as the Clouds Control (CC) and Bridges Experimental (BE) group.

Day 1. All students completed a pre-test of four cloud types, followed by the teacher's direct instruction on the characteristics, formation, and classification of these clouds.

Day 2. The CE group engaged in LBT-AI classification training activity using Teachable Machine. These students first classified 60 images into different types of clouds and then used them to train a machine learning model, followed by testing the AI model for its accuracy using a different set of images of cloud. At the end of the lesson, both groups completed a post-test. The control group completed the cloud categorization worksheet as in-class activities. Additionally, the CE Group completed the survey.

Day 3 & 4. Same procedure was implemented for Bridge module.

Data Collection

Four sets of data were collected: knowledge pretest, knowledge posttest, perception toward LBT-AI survey, reflections.

Data Analysis

The CE (experimental) group significantly outperformed the CC (control) group on the cloud posttest ($t = 2.67$, $p = 0.006$). For the Bridge module, though not statistically significant, the BE (experimental) group also outperformed the BC (control) group on the bridge posttest ($t = 0.725$, $p = 0.24$). One-way ANCOVA on the posttest scores with pretest scores as a covariate was also performed. Again, the results showed a significant difference between the CE group and the CC group's Cloud posttest mean scores ($F = 6.977$, $p = 0.013$, $\eta^2p = 0.194$). On the other hand, for the Bridge module, no significant difference was found between the two groups with the control of pretest scores ($F = 3.712$, $p = 0.064$, $\eta^2p = 0.113$).

The students also perceived the intervention very positively. The overall mean score of the students' perceptions about working with Teachable Machine was 3.89 on a 5-point Likert scale. The most common themes in these reflections were that the students deemed the LBT-AI activity *fun; making learning easier; helping them remember different types of bridges or clouds*.

Results & Discussion

Overall, the intervention of LBT using AI Teachable Machine showed a great promise on enhancing elementary students' categorical concepts learning, which were types of clouds and bridges in this study. The LBT-AI group did better than the traditional instruction group on their comprehension and retention of both topics (types of clouds and bridges). Moreover, the LBT-AI group's significantly outperformed the traditional group on the types of cloud, with or without the control of pretest scores. This result indicated that the LBT-AI intervention had very positive and impactful effects on the students' learning of categorical concepts.

This result may be explained by the novelty effects of the AI tool, Teachable Machine. However, we are more inclined to attribute to the effects of LBT (Learning by Teaching) combining with Teachable Machine. The novelty effects of AI and Teachable Machine may have motivated the students to engage in such activities initially. However, we believe training (and therefore teaching) the Teachable Machine, which was LBT, was more likely the key to the learning outcomes. This conjuncture is based on that to train the AI model, the students had to first sort the images into different types of bridges or clouds. This task required the students to apply their knowledge about the characteristics of different types of bridges or clouds not once but multiple times as the AI model needs to be trained with a variety of looks of the same type, which was likely to increase the depth of understanding and retention.

Furthermore, the students showed great enthusiasm about using and training an AI model to create a machine that could identify different types of clouds or bridges. The intervention was not only fun for the students but empowered the students with a sense of being able to create something that could perform scientific tasks.