

Adaptive Learning Pedagogy of Universal Design for Learning (UDL) for Multimodal Training

Authors

Principle investigators: Ziho Kang, Randa L. Shehab, Han Yuan, Lei Ding, and Stephen G. West
Research assistants: Mattlyn R. Dragoo, Lauren Yeagle, Ricardo Palma Fraga, Josiah Rippetoe

What

To address the students' needs in a learning environment, the concept of Universal Design for Learning (UDL) was introduced to provide as many diversified teaching methods as possible based on three classifications (i.e. information display methods, action and expression methods, and engagement methods). However, creating such diversified materials takes significant time and effort. One of the best approaches, the Index of Learning Styles helps in characterizing the student population into four classifications: perception, input, processing and understanding.

Preferred learning style		Corresponding teaching style	
Categorization	Levels	Categorization	Levels
Processing	Active	Student participation	Active
	Reflective		Passive
Perception	Sensory	Content	Concrete
	Intuitive		Abstract
Input	Visual	Presentation	Visual
	Auditory		Verbal
Understanding	Sequential	Perspective	Sequential
	Global		Global

Although UDL and ILS are very closely related, there is no clear mapping process among the three classifications of UDL and the four classifications of ILS. A better mapping of the classifications would effectively identify and address possible issues with the traditional teaching approaches, saving cost, time, and effort to develop the materials and leading to increased student performance.

Table I. Felder-Silverman model of different learning styles (Felder and Silverman, 1988)

Goals

- Identify whether or not the traditional ways of teaching that often use a single information display type (e.g. text summarized in PowerPoint slides) can affect the performance of the trainees if diversified needs among the students exist.
- Map the UDL with ILS, which could potentially improve the trainees' passing rate as the learning environment accommodates and fits their needs.

How

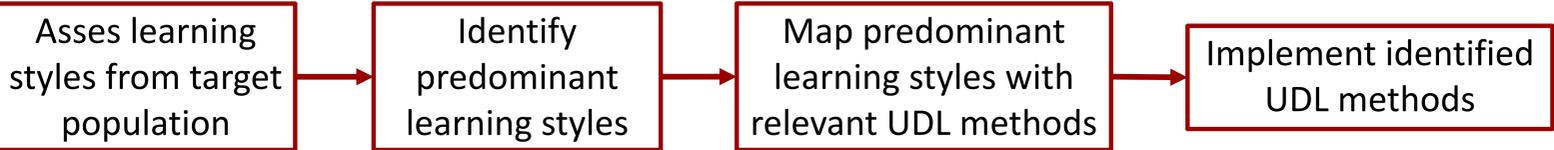


Figure 1. Proposed adapted learning pedagogy

UDL	Learning styles	Mapping of UDL and learning styles through practical scaffolding implementations
1.1. Provide options of customize the display of information	(ALL) All types	ALL.1.1.1. Provide options to change the size or contrast of text, figures, graphs, or tables. ALL.1.1.2. Provide options to highlight information for emphasis. ALL.1.1.3. Provide video or audio recordings that allows options (e.g. change speed or volume, toggle caption).
1.2. Offer alternatives to visual information (e.g. figures, graphs)	(VER) Verbal learners	VER.1.2.1. Provide auditory and text descriptions. VER.1.2.2. Provide auditory queues for key concepts. VER.1.2.3. Provide text-to-speech software. VER.1.2.4. Provide audio clips as needed.
1.3. Offer alternatives to auditory information	(VIS) Visual learners	VIS.1.3.1. Provide additional visual guidance as a scaffold if only verbal guidance is provided. VIS.1.3.2. Provide captions. VIS.1.3.3. Provide speech-to-text software. VIS.1.3.4. Provide video clips as needed.

The procedure is designed to effectively use the time and resources available to implement UDL methods into the current curriculum. In detail, after assessing the overall learning styles of the student population using Felder and Silverman's (1988) ILS, we would identify some of the prominent learning style combinations among all identified combinations. After, the UDL implementation examples are extracted from the mapped tables, taking the highest immediate priorities for implementation to create the most impact given the limited time and resources.

Table II. Example of mapping UDL methods with learning styles: Total of 58 classifications were created.

Pilot Study

Participants

Four students, with mean age of 21.2 ($SD = 1.3$) who have been preparing to enter the FAA Academy training program, participated in the learning style assessment. The students were taking courses such as AVIA 4013 En Route Radar Lab, AVIA 4023 Tracon Radar Lab, and the AVIA 1013 Intro to Air Traffic Control classes at the OU Aviation Laboratory.

Learning Assessment

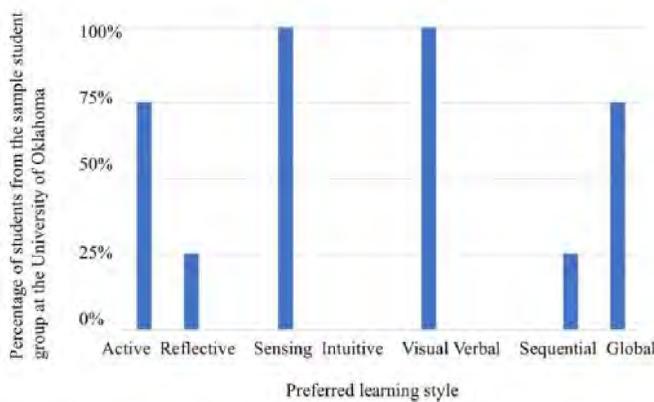


Figure I. Percentage of OU Aviation students with assessed learning style using ILS approach (N = 4)

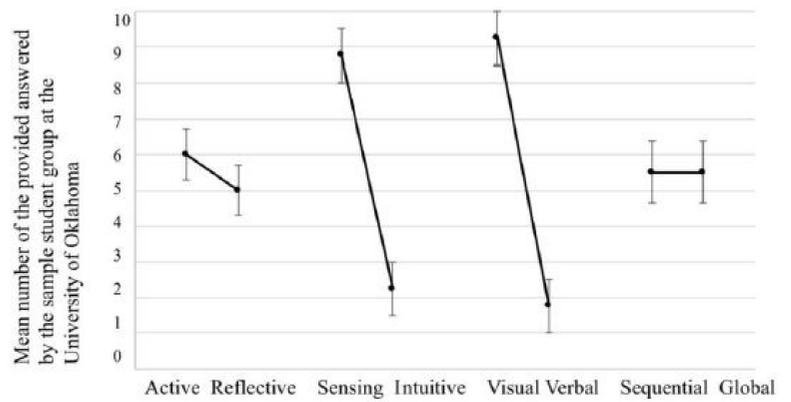


Figure II. Plot of means and standard errors

The statistical test indicated that the biggest mismatch of learning style might arise from sensing/intuition and visual/verbal classifications. In this pilot study, the statistical analysis results indicate that the focus should be more on addressing the issues of sensing and visual learners. Since no significant differences were found in other classifications, the effect of implementing the UDL example of one learning style over another would be less than those identified as the highest priorities.

Why

FAA has been searching for effective ways to train a large number of air traffic control candidates to fill the growing number of vacant positions; however, it has been challenging to increase the trainees' passing rate. The results of this research project have the potential to improve the ATC candidates' performances through adapting the educational materials to their preferred learning styles.

Impact

The results from both the learning style mapping and classroom observations at the Department of Aviation at OU shows promise in implementing our proposed approach. We are in the process of analyzing the learning styles of the FAA Academy candidates to provide detailed examples and recommendations on using UDL for multimodal training.