

ICDE Presentation, Wellington, New Zealand

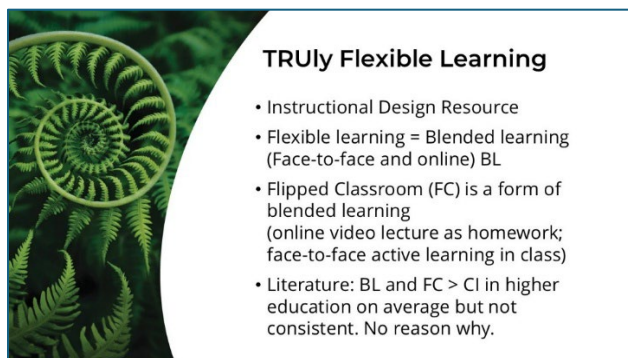
November 11, 2025

1. Introduction



- Hello, Weyt-kp [white kup], Kia Ora [key-OR-uh].
- I am delighted to attend ICDE in beautiful New Zealand. I wish to acknowledge the Māori, and pay my respects to their elders, past, present, and emerging.
- My name is Carol Sparkes and I come to you from Thompson Rivers University (TRU) in Canada. TRU is located within Secwepemcúł'ecw, the ancestral and unceded territory of the Secwépemc people.

2. TRUly Flexible (Flipped) Learning

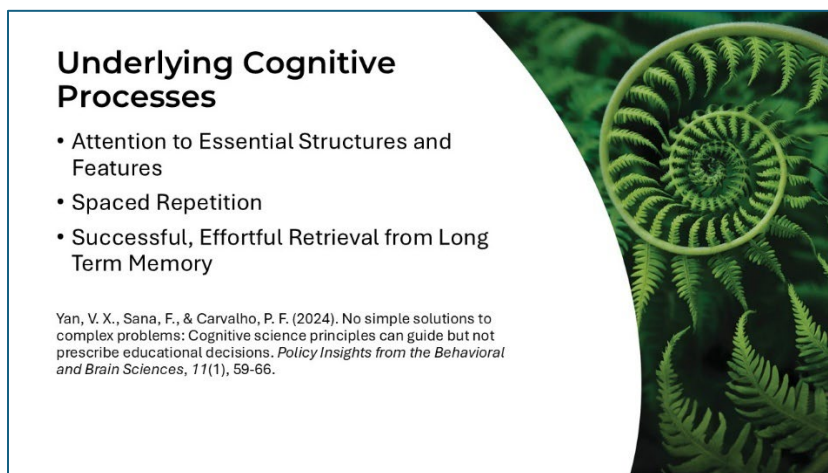


- TRUly Flexible is a play on acronym TRU – Thompson Rivers University. As TRU encourages F2F courses to become more flexible to provide more options for students to learn besides coming to class. I proposed a sabbatical project to create an evidence based resource based on the research that compared Classroom

Instruction (that is primarily lecture) with the flipped classroom form of blended learning.

- The flipped classroom [definition] flips what is done in the traditional classroom and homework around so that students watch the lecture for homework and come to class to solve problems together in class.
- The research confirms that on average blended learning (including the flipped classroom) approach to teaching significantly outperforms lecture-based classroom instruction. The results are heterogeneous though and so are not consistently positive for all students. Some studies show that the flipped classroom produces worse results than lecture. The 1st and 2nd order meta-analyses, that is the study of all studies, have not explained why so far. (Bredow et al, 2021; Hew et al, 2021; Schmid et al., 2023; Sparkes, 2019)
- Instead of attempting to update my PhD dissertation to see if the answer would reveal itself in yet another meta-analysis, I am looking at this problem from another perspective, that is of the underlying cognitive processes of learning strategies. As Yan et al said, “even empirically supported practices can fail if one does not understand their underlying processes”

3. Cognitive Processes



- Yan, Sana, & Carvalho (2024) in their article titled “No Simple Solutions to Complex Problems” explained how the top learning strategies (when studied empirically) were not a simple solution that consistently improved learning. Learning strategies need to consider the students’ knowledge level and the content before choosing which strategy to use. The most effective strategy on average (according to the research) was not always the correct one to use in any given circumstances.

- Instead, the authors explain the cognitive processes that underlie the learning strategies. I considered how these cognitive processes can also explain why a teaching approach such as the flipped classroom might outperform lecture teaching or vice versa depending on how the instructional approach was designed.
- Explanations of these processes are included on the WordPress site.
FLEX.TRUbox.ca

Cognitive process 1: Attention to Essential Structures and Features

Underlies interleaving (shows differences) and blocking (shows what binds the concepts together). Neither is good or bad, but if you draw attention to what is challenging to learn, then learning improves.

Cognitive process 2: Spaced Repetition

This process considers how long is too long between repetitions. Repetition is effective when recalling is challenging but not impossible. The timing between repetition should be longer and more frequent when you want the memory to last longer.

Cognitive process 3: Successful, effortful retrieval from long-term memory.





This process addresses why retrieval (e.g., quizzing) would be more effective than re-studying or worked examples in some cases but not others. Quizzing engages in retrieval which improves learning by slowing forgetting, however, if the information is not encoded or learned successfully in the first place then quizzing will not improve learning. If the knowledge needs to be integrated or practiced before being memorized, then re-studying worked examples may be more effective than quizzing until the knowledge is integrated.

[Keep in mind that the retrieval of knowledge needs to be at the appropriate level and that it needs to be learned first as well.]

In the following slide I have aligned the underlying cognitive process with the different elements of the flipped classroom.

4. Cognitive Learning Processes and FC Table

Cognitive Learning Processes	Flexible (Flipped) Classroom
Attention to Essential Structures and Features	<ul style="list-style-type: none">• Video lecture and worked examples (homework)• In class mini-lecture• Activities
Spaced Repetition	<ul style="list-style-type: none">• (Intro) Online video lecture• (Repeat) Pre-class quiz• (Repeat) In class mini-lecture• (Repeat) In class active learning
Successful, Effortful Retrieval from Long Term Memory	<ul style="list-style-type: none">• In class active learning• Assignments, projects, tests and exam

- In this table you can see that **Attention to Essential Structures and Features** is seen in the flexible flipped classroom in:
 - Video lectures and worked examples
 - In class mini-lectures, and
 - In class activities.**Spaced Repetition** is seen in the flipped classroom in....
 - (Intro) Online video lecture
 - (Repeat) Pre-class quiz
 - (Repeat) In class mini-lecture
 - (Repeat) In class active learning**Successful, effortful retrieval from long term memory** can be seen in....
 - In class active learning where ideas build on prior knowledge,
 - as well as assignments, project, tests and exams.
- The resource so far is available at Flex.TRUbox.ca . It is a work in progress and is expected to be more fully completed in the first half of 2026 after I finish my sabbatical.
- An instructional designer must consider the **students' prior knowledge** when making decisions about sequencing, spacing, and retrieval. In the flipped classroom prior knowledge can be determined by conducting a **pre-class quiz** or beginning of class quiz where the results provide immediate feedback (e.g.,

using Mentimeter) increased engagement, inclusivity and data collection. The results can influence how the instructor chooses to proceed.

- If students have little prior knowledge and are still trying to determine critical features of a topic, then more clarification is needed (e.g., using mini-lecture, study, or worked examples) before retrieval practice from quizzing will help extend the learning. If students have some prior knowledge and are experienced, then they can engage in applying those concepts in problem solving. Students may be at different levels of prior knowledge so they may be directed differently. (p.62)

Question: Does understanding the underlying cognitive processes help to explain the benefits of other teaching approaches or even UDL? Key concepts. Connect to prior learning. Multiple ways of demonstrating.

Next steps: I will review studies to see if they indicate how and when the cognitive learning processes were used in the more effective teaching approach.

References:

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