

Flipped-Out

Learning Outcomes and Responses to a Flipped-Classroom Medical Embryology Course

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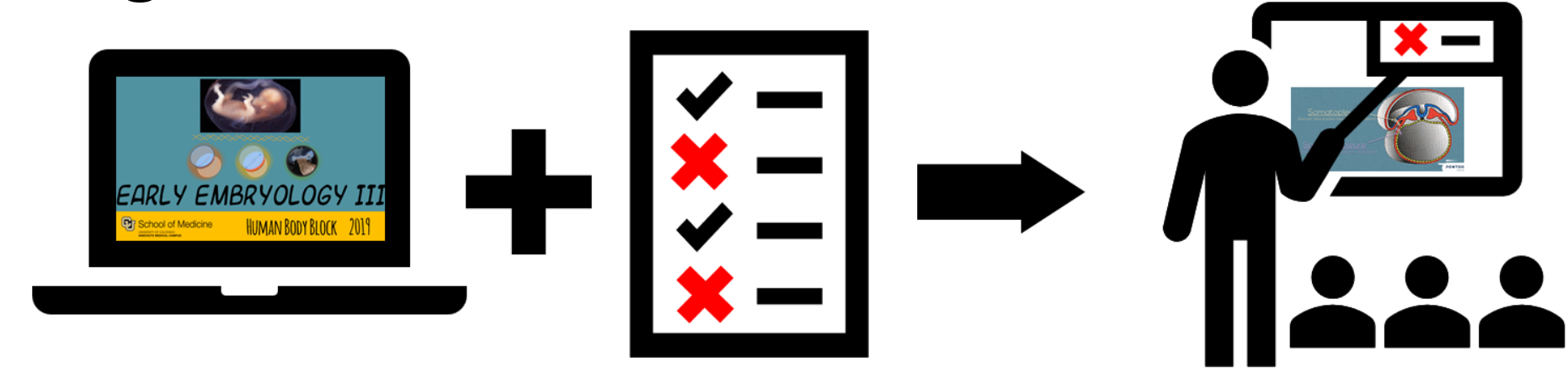
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Background & Rationale

- Flipped classroom (FC) is a pedagogical innovation with increasingly broad adoption among medical schools¹



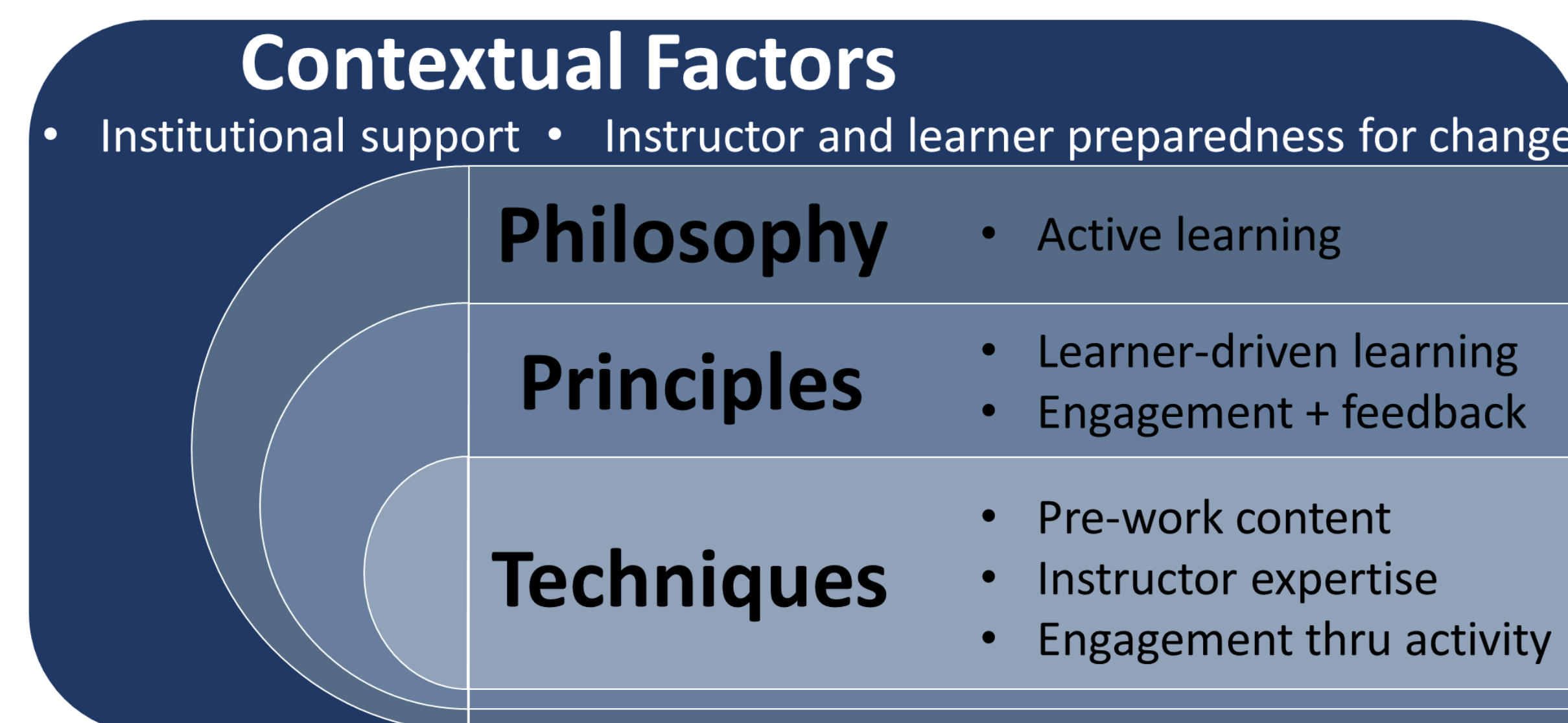
- The effectiveness of this pedagogy is poorly understood beyond student satisfaction and exam scores²
- Evaluation should focus on what about the design and the implementation worked and did not work that might help understand how to positively impact future learning³

Objective:

- To explore the efficacy of a Flipped Classroom model within a medical student embryology curriculum.

Methods

This mixed-methods, retrospective study engaged layered analysis for a Fall 2019 FC implementation.



Compared to FL2018 cohort, which received identical content in didactic format.

Intervention	n	Pre-Quiz	Exams	Optional Survey
FC % complete (FL19)	184	99% (11)	100% (4)	95%
Didactic % complete (FL18)	184	N/A	100% (4)	N/A

Data Analysis:

Exam data were analyzed using Item Response Theory (IRT), which allows for a direct comparison of student ability.

Results triangulated with qualitative analysis of open-ended responses.

Themes were inductively developed for analysis of open-response prompts by two authors (TK and LL) and disagreements were resolved by third reviewer (JC).

Results

Finding #1: The 2019, flipped-classroom cohort demonstrated higher average embryology ability levels on all four exams, compared to the 2018 cohort.

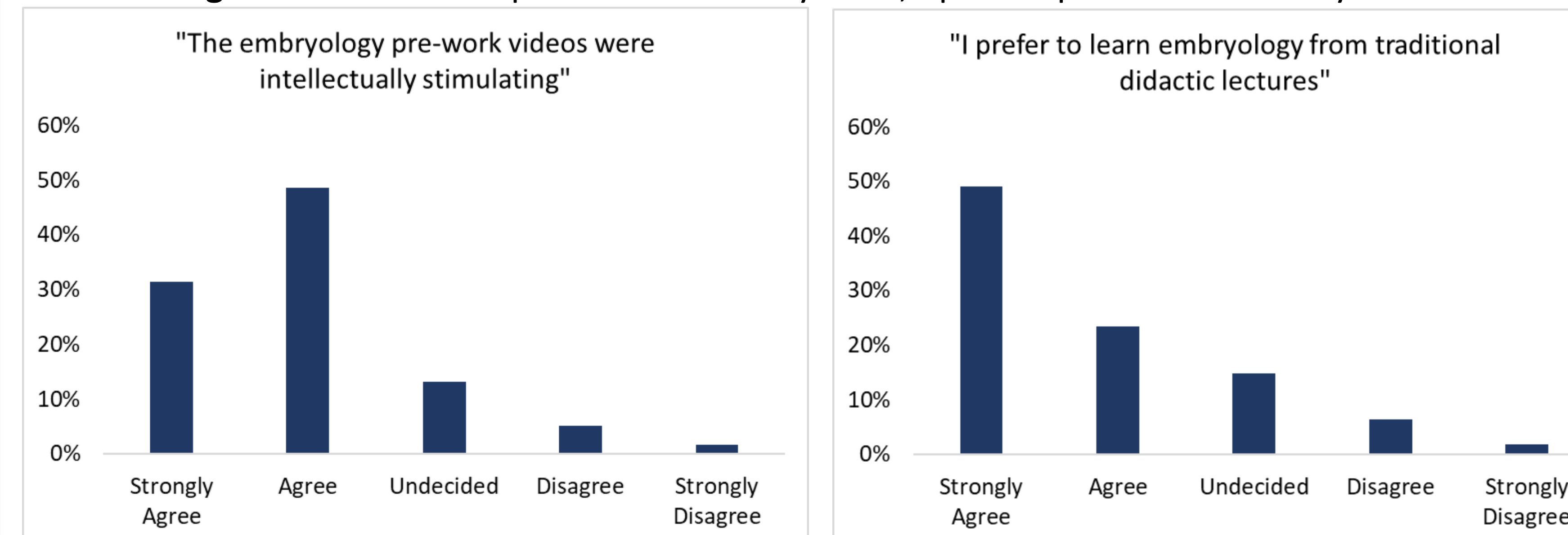
Table 1. Comparison of didactic (2018) vs flipped-classroom (2019) average IRT ability scores with two-sample t-test statistical analysis.

Exam	Average Score		Average IRT Ability		Ability Difference
	2018	2019	2018	2019	
1	91%	91%	2.03	2.11	.08
2	86%	84%	2.22	2.47	.25*
3	89%	89%	2.35	2.44	.09
4	88%	88%	2.43	2.67	.26**

*p < 0.01
**p < 0.05

Finding #2a: Post-course survey revealed that students perceived the pre-work videos positively, though they preferred didactic lectures.

Figures 1a and b: Responses to an anonymous, optional post-course survey.



"I liked the videos, but wished we had a more didactic classroom setting..."

Finding #2b: Students perceived the instructor as effective, preferred supplemental use of pre-work videos and expect deeper in-class teaching.



"It's not that the videos were bad...They would be great to introduce and supplement lecture...Full lectures were much more fluid and thorough because Dr. Lee does a great job teaching this content, which is her expertise."



"...I would prefer traditional didactic lectures, even if it is redundant."

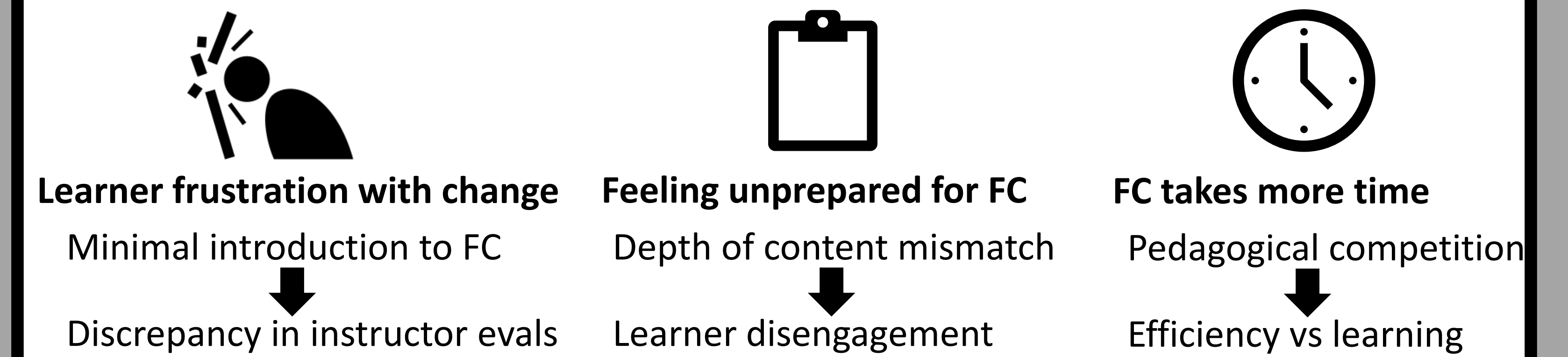


"...I would leave the flipped classroom session feeling as if we had jumped around from topic to topic and I only really grasped superficial concepts"

Themes were derived from both mandatory and optional post-course surveys.

Results (continued)

Finding #3: Layered analysis revealed the following major themes:



Discussion

- This study is consistent with literature on FC effectiveness
- Students variably accept FC and vary in their perception of learning efficacy
- Limitations:**
 - This experience was during a sub-section of the larger anatomy course at one school
 - Extraneous cognitive load related to transitioning⁴ and negative emotions⁵ can impede learning
 - This implementation took place during the first course of medical school, while students are still adjusting to their new environment

Conclusions & Next Steps

- FC yielded improved learning outcomes and students did not perceive it to be beneficial
- Emphasis should be placed on providing effective introduction to FC
- Next Steps:**
 - Consider appropriate means of introduction to FC learning experiences
 - Longitudinal study could determine if creating consistent learning experiences reduces negative student perception of FC

References & Acknowledgements

Acknowledgements:

Thank you to Helen MacFarlane and Matt Cook from the CU School of Medicine META unit for your prompt support and to the CUSOM Curriculum Ambassadors Summer Program.

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