A Team-Based Learning Approach to Linear Algebra

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Saint Vincent College

July 28, 2017

Introduction

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- Benedictine, Liberal Arts College
- About 1,700 undergraduates

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- Summer home of the Pittsburgh Steelers

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- Faculty-Led Mentoring Program - TEMP

The Answer

- Team-Based Learning, (TBL)

Questions

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- Each module can last 1-3 weeks

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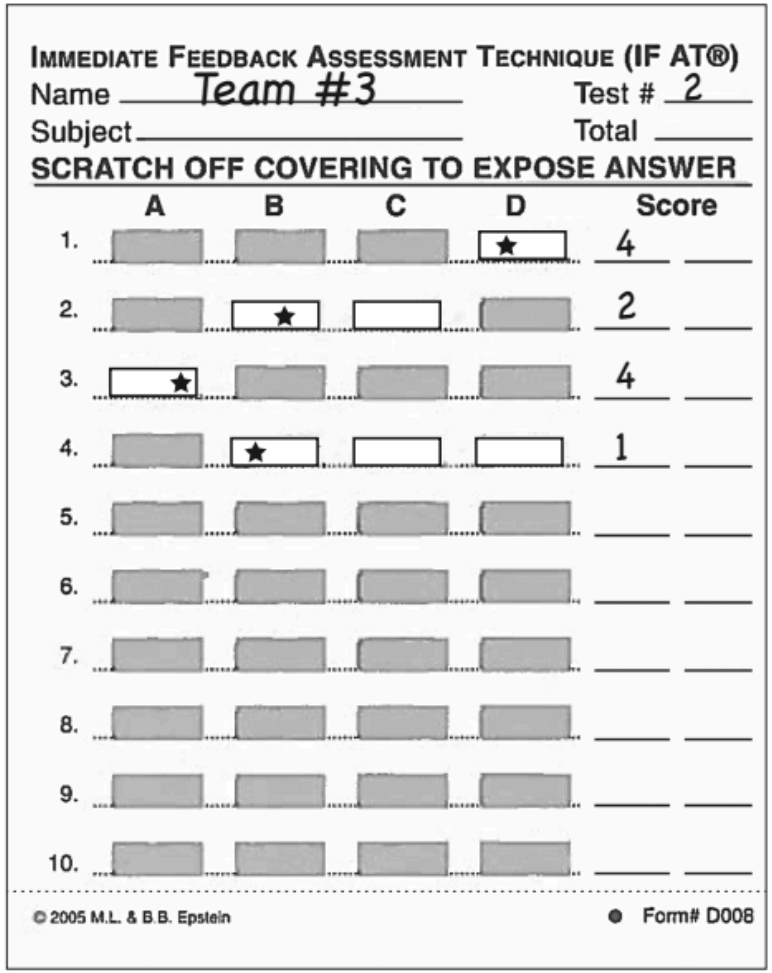

IMMEDIATE FEEDBACK ASSESSMENT TECHNIQUE (IF AT®)

Name Team #3 Test # 2

Subject _____ Total _____

SCRATCH OFF COVERING TO EXPOSE ANSWER

	A	B	C	D	Score	
1.				★	4	
2.		★			2	
3.	★				4	
4.		★			1	
5.						
6.						
7.						
8.						
9.						
10.						

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- Class 7: Assessment Experience

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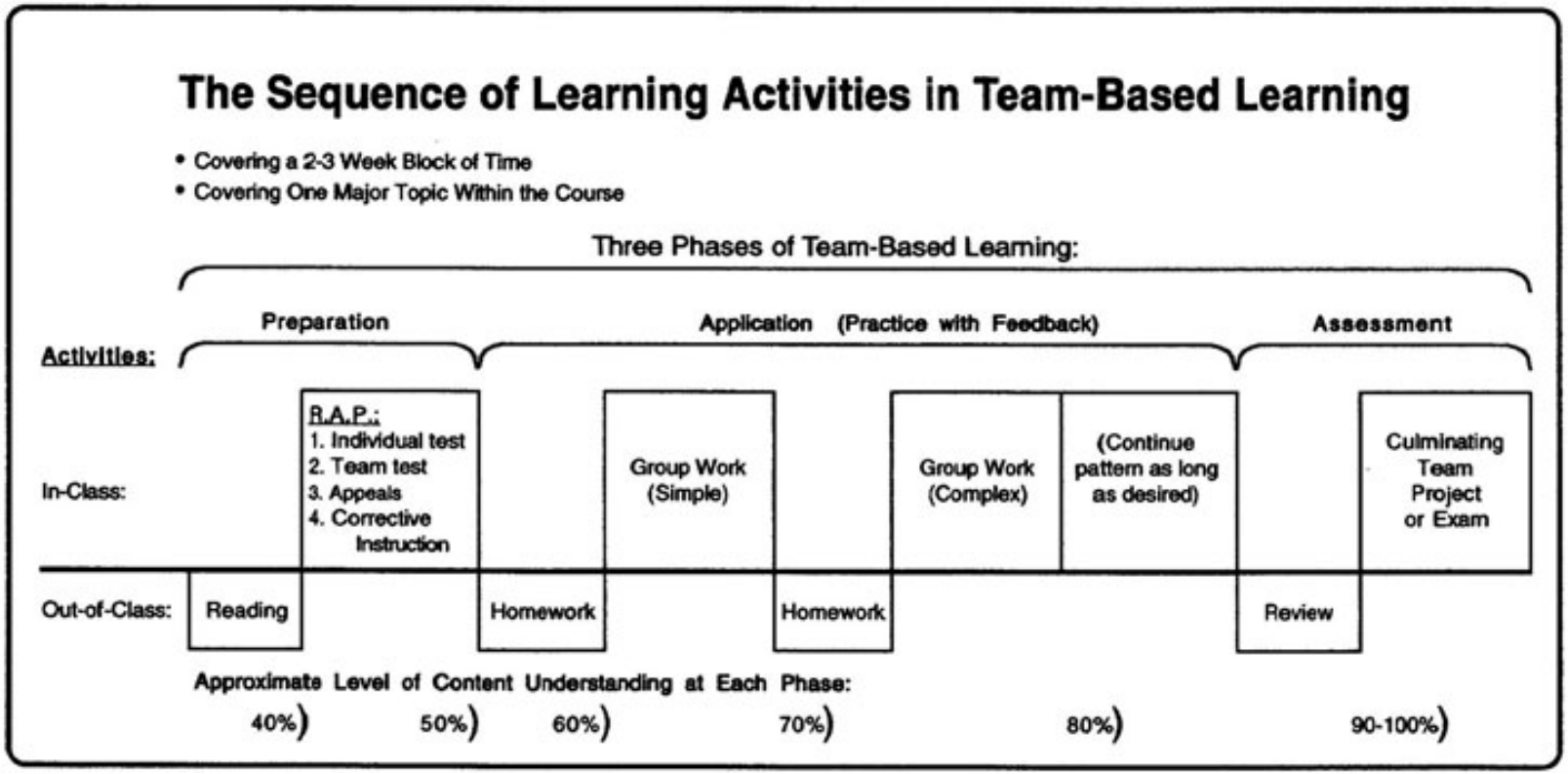

- Michaelsen LK, Knight AB, Fink LD. Team-based learning: a transformative use of small groups. Greenwood Publishing Group; 2002.

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- Multiple modules will be included in assessment experience
- Breaks up readings
- Class time is at a premium

What adaptations can be made: Module Length

Date	Lesson(s)	Notes
1/18	1.1, 1.2	RAP 1
1/20		Application
1/23	1.3	RAP 2
1/25		Application
1/27	1.4, 1.5	RAP 3
1/30		Application
2/1	1.6, 1.7	RAP 4
2/3		Application
2/6	1.8	RAP 5 & Application
2/8	2.1, 2.2	RAP 6
2/10		Application
2/13	2.3	RAP 7
2/15		Application
2/17	3.1	RAP 8
2/20		Application
2/22	3.2, 3.3	RAP 9 & Application
2/24		Review
2/27		Exam I

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- Reading Guides
- Helped focus material

What adaptations can be made: Can sophomores read?

RAP 11

4.2

- What is a subspace of a vector space V?

- What two conditions have to hold for W, a subset of a vector space V, to be a subspace?
  1.
  2.
- In Example 4, why is W not a subspace of R^2?

- In Example 5, if W is the set of symmetric $n \times n$ matrices, then is W a subspace of M_{nn}?

- In Example 6, why is W not a subspace of M_{22}?

- What does $F(-\infty, \infty)$ and $C(-\infty, \infty)$ mean?

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- Specific Choice: developing mathematical tools
  - Completing problems now for future work

What adaptations can be made: Applications

In this application, we are going to calculate the determinant of the following matrix by cofactor expansion:

$$\begin{bmatrix} 3 & 3 & 0 & 5 \\ 2 & 2 & 0 & -2 \\ 4 & 1 & -3 & 0 \\ 2 & 10 & 3 & 2 \end{bmatrix}$$

1. What row or column should we apply cofactor expansion on? (On Board)

2. Compute the cofactors .

3. Find the determinant.

Future Adaptations

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- More mini-lectures

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- More mini-lectures
- Rework RAP & Application system
- Mid-semester peer review

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- Daily student involvement
- Better interactions with students
- Students helping students
- Improved grades

Why would we implement this?

Final Exam

Class	Number	Mean	Median	St Dev
Lecture	19	87.8	90	10.5
TBL	39	92.4	93	8.1

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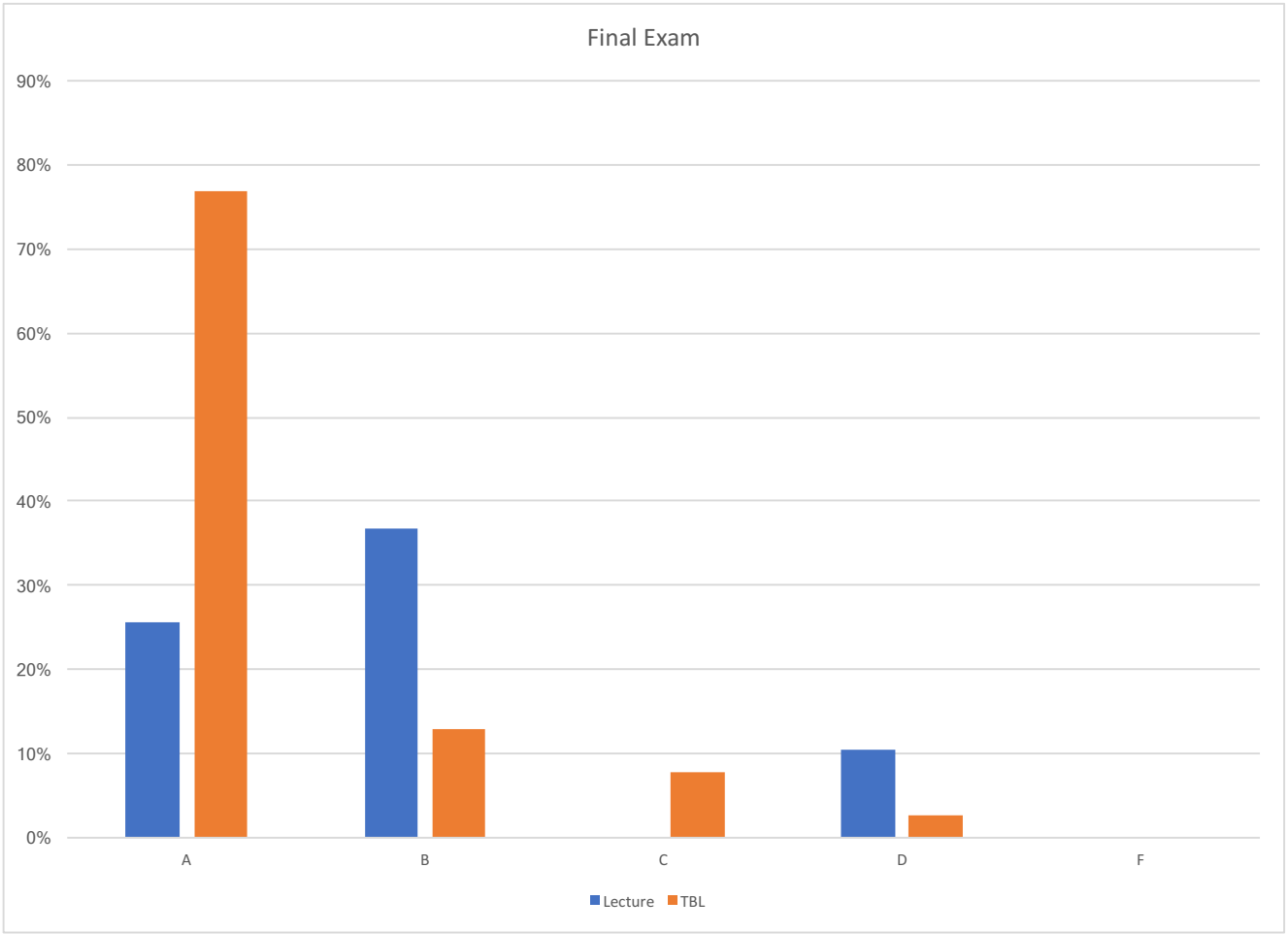

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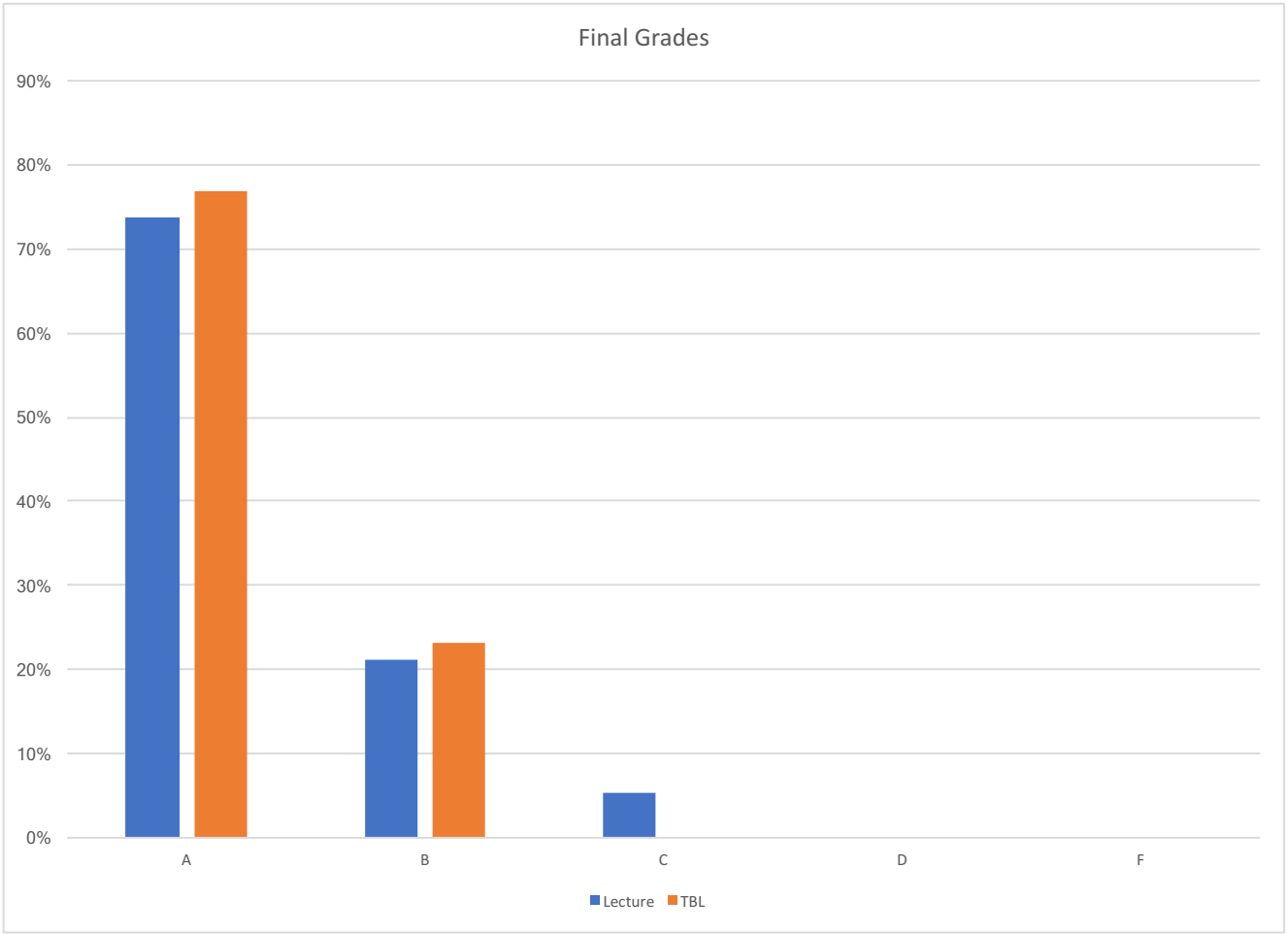

Why would we implement this: Liberal Arts

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- What can my students get out of my class?
- More than math

Thank you