

Impact of Team-Based Learning on Second-Year Medical Students' Performance on Pathology-Based Exam Questions

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Background

- Team-based learning (TBL) ¹ was introduced into the Boonshoft SOM second-year systems-based curriculum as part of a prospective pilot study in 2002-2003. ²
- TBL has been more fully integrated into all second-year courses in subsequent years, and is now used in all 11 systems-based courses.
- Current Boonshoft second-year curriculum employs lectures (70%), non-graded laboratory exercises and case-based discussions (15%), and graded TBL modules (15%) as instructional methods.
- Medical education literature documents many favorable subjective evaluations of TBL by both students and faculty ^{3,4,5} but little is known about the impact of this method on students' performance on high-stakes examinations. ^{2,6,7}

Purpose

This study tests two hypotheses regarding students' performance on high-stakes exams:

1. Students will perform better on pathology-based exam questions ***related*** to content associated with a TBL module than on questions ***unrelated*** to TBL modules.
2. The difference in performance on TBL-related exam questions vs. TBL-unrelated questions will be greater for students in the lowest academic quartile than for those in the highest academic quartile.

Boonshoft SOM year 2 curriculum

Pathobiology & Therapeutics	Neuroscience	Blood	Musculoskeletal and Skin
3 weeks	8 weeks	2 weeks	2 weeks

Exams	2	3	1	1
TBL mods	3	4	1	1

CV	Respiratory	Renal	Endocrine	Reproduction	GI
4 weeks	3 weeks	3 weeks	2 weeks	2 weeks	2 weeks

Exams	1	1	1	1	1
TBL mods	3	1	1	1	1

Method: Study Design

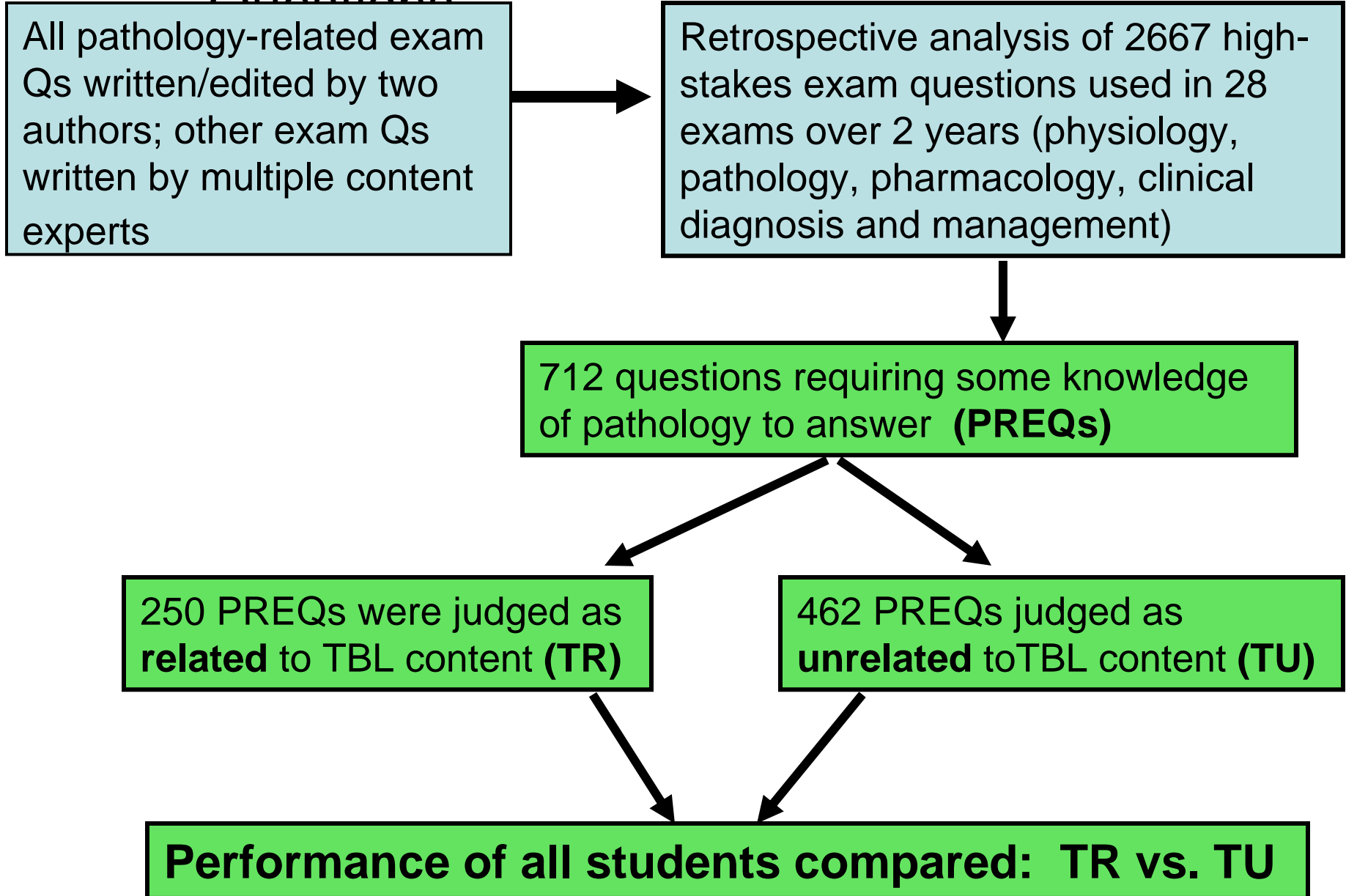
- Performance of 178 second-year students on 28 high-stakes examinations was retrospectively reviewed (2 classes; academic years 2003-2004 and 2004-2005)
- Four quartiles of students were defined for each class by cumulative exam performance for entire academic year.
- Examination questions were classified as **pathology-related exam questions (PREQs)** if knowledge of pathology was required to answer the question.
- All **PREQs** were then divided into **2 groups**:
 - 1) *Exam questions conceptually **related** to content included in a TBL module within that course (TR)*
 - 2) *Exam questions conceptually **unrelated** to any TBL module within that course (TU)*

Method: Statistical

- Students' scores on pathology-related exam questions were compared by paired t-tests: **TR (related to TBL) vs. TU (unrelated to TBL)**
- **Highest vs. lowest academic quartile students'** scores on **TR vs. TU** exam questions were compared by two-way ANOVA statistic

Method: Analysis of Exam

Questions



Summary of Data Base

group	students	TBL modules	Major exams	Total exam Qs	PREQs	TR	TU
2003-2004, term 1	91	8	7	670	204	62	142
2003-2004, term 2	91	8	6	620	148	59	89
2004-2005, term 1	87	9	8 (NS+1)	737	190	65	125
2004-2005, term 2	87	8	7 (CV+1)	640	170	64	106
4 terms, 2 years	178	33	28	2667	712 (26.8%)	250 (35.1%)	462 (64.9%)

Results: Performance of 178 Students on 712 Pathology-Related Exam Questions, TBL-related (TR) vs. TBL-unrelated (TU)

	All Students		Highest Quartile		Lowest Quartile	
	TR	TU	TR	TU	TR	TU
Mean	82.39	77.70	88.53	85.34	76.12	69.70
SD	6.66	6.84	4.78	3.09	6.04	4.45
Min	64.04	59.74	75.97	78.79	64.04	59.74
Max	96.90	91.77	96.90	91.77	85.96	77.49
n	178	178	45	45	45	45

t test	p < 0.001	p < 0.001	p < 0.001
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Results: Performance on Pathology-Related Exam Questions, TBL-related vs. TBL-unrelated, Highest vs. Lowest Academic Quartiles

45 Highest Quartile Students

45 Lowest Quartile Students

TR, mean	TU, mean	Δ (TR-TU)	TR, mean	TU, mean	Δ (TR-TU)
88.53	85.34	3.19	76.12	69.70	6.42

2 way ANOVA interaction, comparing differences in means (TR-TU) according to highest vs. lowest quartile of students: $p = 0.016$

Conclusions

- **Hypothesis 1:** Performance by second-year medical students on PREQs related to a TBL module (TR) is significantly higher than performance on PREQs unrelated to a TBL module (TU).
- **Hypothesis 2:** There is a significantly larger improvement in performance on TR vs TU PREQs for students in the lowest academic quartile as compared to students in the highest academic quartile

References

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