The Effectiveness of Team Based Learning on Learning Outcomes in Health Professions Education: A Best Evidence for Medical Education (BEME) Systematic Review

Mim S. Fatmi,[1] Lisa Hartling,[1] Tracey Hillier,[1] Sandy Campbell,[2] Anna E. Oswald[1]

[1]Faculty of Medicine and Dentistry, University of Alberta, Edmonton, Canada
[2]University of Alberta Libraries

Team based learning (TBL)

- An active learning method grounded in student-centred learning
- Requires less faculty time and fewer resources than other active learning methods
- First developed by Larry Michaelsen in a business curriculum

TBL Sequence of Learning

1. **Preparation**

Learners **acquire** desired knowledge

Faculty sets the objectives and specifies material to be mastered before coming to class.

2. **Readiness Assurance Process (RAP)**

Learners show **readiness** to use knowledge

Individual tests promote preparation
Team tests promote effective participation
Performance differences stimulate discussion

3. **Application**

Learners **apply** their knowledge in novel tasks

Significant problem – complex/challenging
Same problem for all teams
Specific answer/choice required
Simultaneous reporting

Peer evaluation

Learners **develop** self and peer assessment skills

Learners provide helpful feedback to each other

Background

- While TBL may have real pedagogical value, individual studies present inconsistent findings

- This is the first systematic review that examines the effects of TBL in health professions education

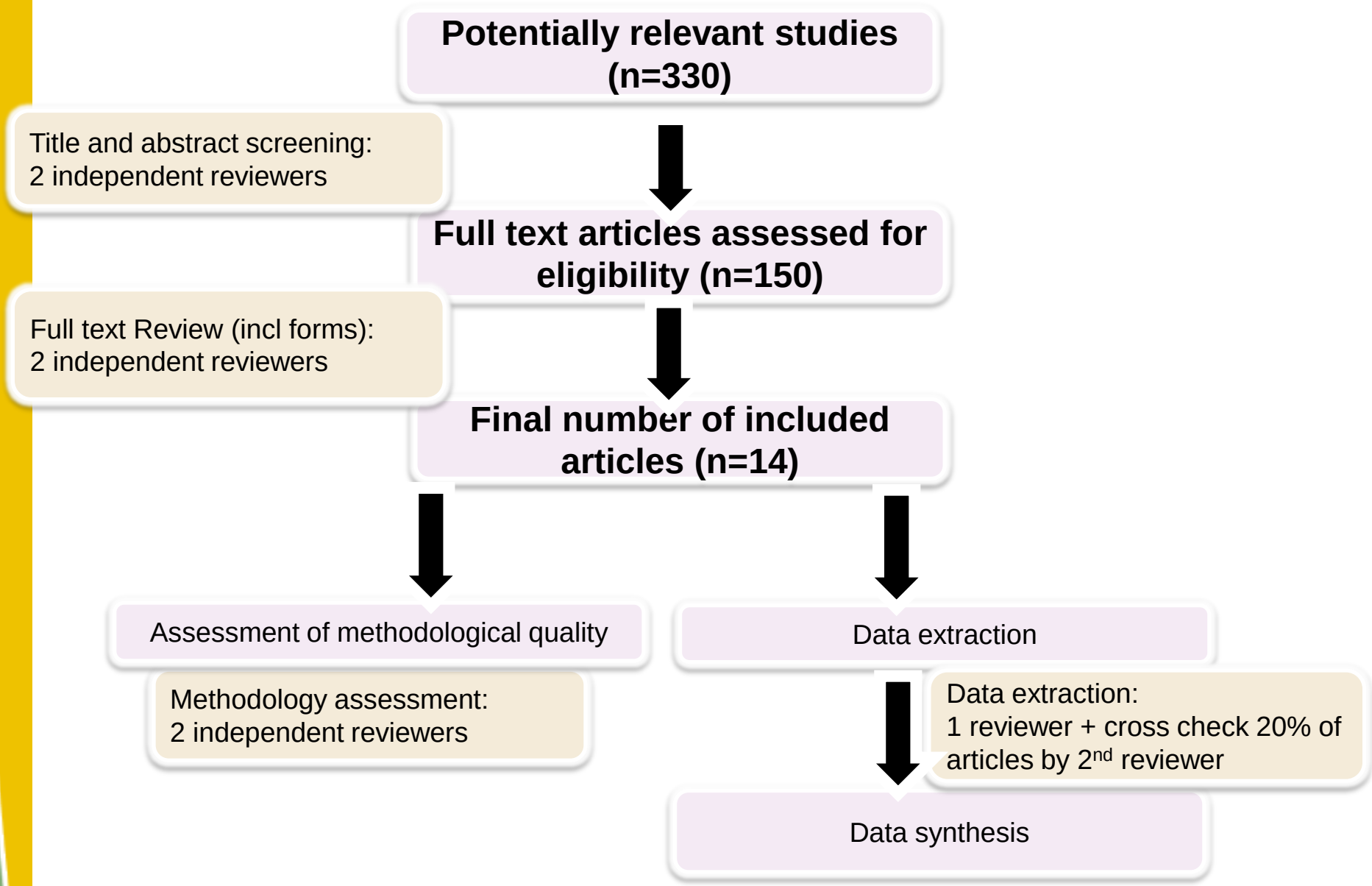
Aim

- To assess the effectiveness of TBL on improving learning outcomes in health professions education in order to provide curriculum planners with more direction in their decision-making with regard to TBL implementation

Methods

- Protocol prospectively registered with BEME

- Key Inclusion criteria:
  - Health professionals/trainees
  - Must comply with study TBL definition
    - verified with 2 experts in field
  - Must report an outcome
    - learner reaction, change in attitude/knowlegde/skill/behaviour
  - Must use a comparator


Potentially relevant studies (n=330)
Title and abstract screening: 2 independent reviewers
Full text articles assessed for eligibility (n=150)
Full text Review (incl forms): 2 independent reviewers
Final number of included articles (n=14)
Assessment of methodological quality
Methodology assessment: 2 independent reviewers
Data extraction
Data extraction: 1 reviewer + cross check 20% of articles by 2nd reviewer
Data synthesis

Results

- 14 included studies, >3,535 participants
  - exact # not known as 3 studies did not report # of controls
- 13 undergraduate & 1 postgraduate study
- Medicine, pharmacy, dentistry, and nursing programs
- All 14 studies assessed knowledge
- 7 studies also assessed learner reaction

Common Methodologic Weaknesses

- Blinding
  - due to nature of intervention
- Comparability between intervention and comparison group
  - Particularly for cohort studies (10/11)
- Selection bias (3/4 concurrent cohorts)

Results: Knowledge Scores

- 7 of 14 studies: significant increase ($p < 0.05$) for TBL

- 4 studies: no significant difference
- 2 of these 4: significant difference in subgroup analyses, but not overall
  - Bottom quartile

- 3 studies did not report p-value & did not comment on significance, despite some suggestions of benefit for TBL

Results: Learner Reaction

- 1 of 7 studies significant preference ($p < 0.05$) for TBL
- 1 of 7 significant student preference for non-TBL comparator
- 3 studies non-significant differences
- 2 studies did not report p-values (1 pos, 1 neg)

Discussion

- Despite mostly positive knowledge scores, learner reaction mixed
  - All were new TBL curriculum
  - Do students become accustomed & react more positively over time?
- Limitations: methodological quality of studies
  - Most were cohort designs
  - Many had limited reporting re: statistical results
- Findings from cohort studies corresponded to those of trials, so likely do not skew the results

Conclusions

- TBL may improve knowledge scores but yields mixed learner reaction
  - We hypothesize this may be due to increased workload
- These results were stable across health education disciplines/settings
- More rigorous controlled studies, higher level outcomes & more thorough statistical reporting are needed in TBL research

Acknowledgments

- The Arthritis Society (Canada) Clinician Educator Award

- The University of Alberta Faculty of Medicine and Dentistry Education Advisory Committee Summer Studentship Grant

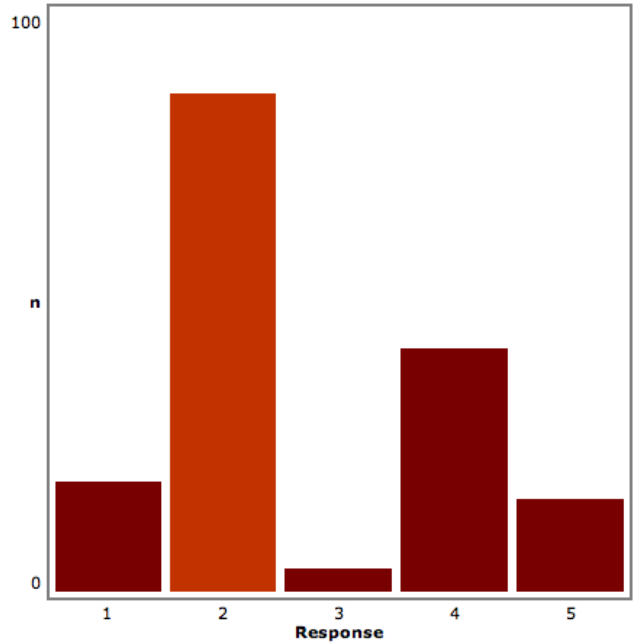
- The TBL Collaborative

Improved Results with Teamwork

Results for: All User Groups
Survey: TBL Week 2 - IRAT Questions (MED)

TBL Week 2 - Assessment Questions - Q01

Which of the following features best differentiates polymyalgia rheumatica and fibromyalgia?

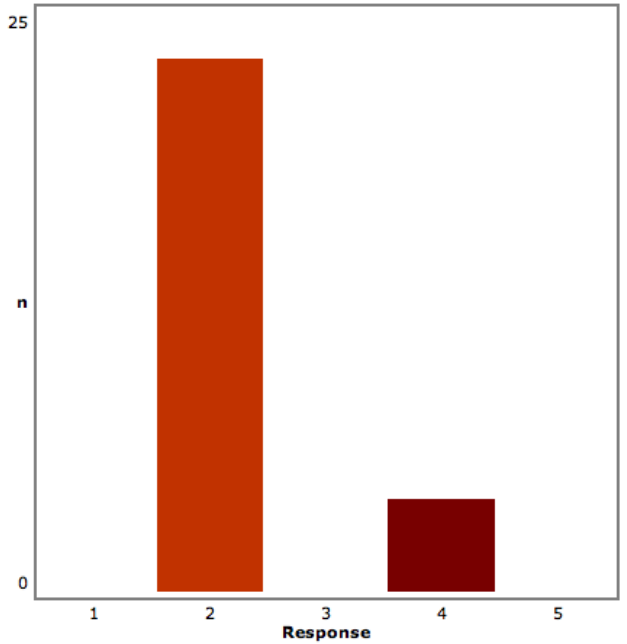


Label	Response	n
1:	A) Severity of pain	19 (11%)
2:	B) Age of the patient	86 (51%)
3:	C) Severity of fatigue	4 (2%)
4:	D) Functional impairment	42 (25%)
5:	E) Concurrent headaches	16 (10%)
categories=5	max=86, min=4, sum=451	mean=2.7, n=167

Results for: All User Groups
Survey: TBL Week 2 - GRAT and Cases (MED)

TBL Week 2 - Assessment Questions - Q01

Which of the following features best differentiates polymyalgia rheumatica and fibromyalgia?

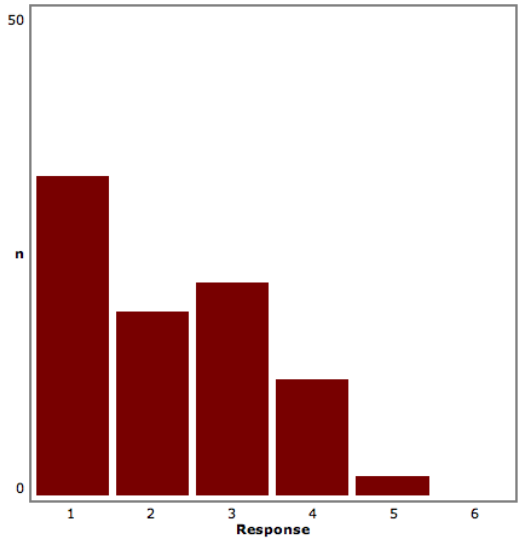


Label	Response	n
1:	A) Severity of pain	0 (0%)
2:	B) Age of the patient	23 (85%)
3:	C) Severity of fatigue	0 (0%)
4:	D) Functional impairment	4 (15%)
5:	E) Concurrent headaches	0 (0%)
categories=5	max=23, min=0, sum=62	mean=2.3, n=27

Results for: All User Groups
Survey: Class of 2014 - MED 523 MSK - Week 1 Evaluation

Team-Based Learning groups - Overall

Overall, the Team-Based Learning groups this week was excellent.
Your comments are welcomed below...



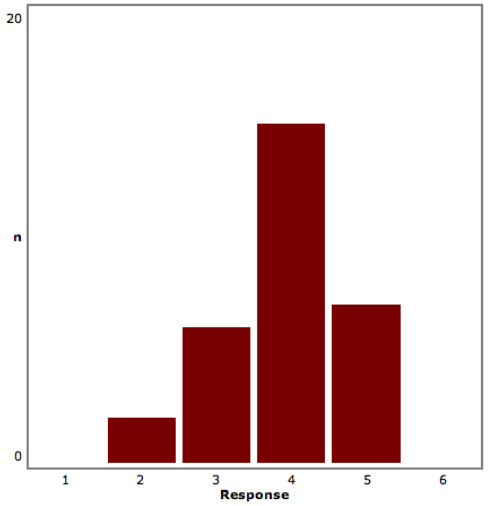
Label	Response	n
1:	++ Disagree	33 (38%)
2:	Disagree	19 (22%)
3:	Neutral	22 (25%)
4:	Agree	12 (14%)
5:	++ Agree	2 (2%)
6:	Don't Know	0 (0%)
categories=6	max=33, min=0, sum=195	mean=2.2, n=88

Results for: All User Groups
Survey: Class of 2014 - MED 523 MSK - Week 6 Evaluation

Team Based Learning - Overall

Overall, the **Team Based Learning** instruction these weeks was excellent.

Your comments are welcomed below...



Label	Response	n
1:	++ Disagree	0 (0%)
2:	Disagree	2 (7%)
3:	Neutral	6 (20%)
4:	Agree	15 (50%)
5:	++ Agree	7 (23%)
6:	Don't Know	0 (0%)
categories=6	max=15, min=0, sum=117	mean=3.9, n=30

What is the single most important way this person could alter their behavior to more effectively help your team?

- At least this week, it seemed you were slightly underprepared for the TBL session. You are clearly a very intelligent young man, but if you came prepared with a stronger knowledge base, I feel you could have contributed more thoroughly to the group process.
- Although I appreciate her enthusiasm, it might be helpful to both the members of our group and the groups around us if she tried to limit her comments during the whole class discussion. Alternatively, she might want to consider sharing her comments with the whole class.