Training the next generation in aviation with technology enabled team-based learning

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Objectives

After this session participants should be able to:

1. **Define:** team-based learning (“TBL”)  
2. **Explain:** benefits and considerations of TBL  
3. **Describe:** the backwards design approach to TBL
Landing objective
Too fast?
Too slow?

Too high?
Too low?
Team-based learning...

Educator

Entrepreneur

Speaker

Parent

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My path
Problem: employability gap

Learning 1.0

Laurentius de Voltolina, School of Bologna 14th century.

Learning 2.0

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Problem

Boeing says Asia needs 240,000 pilots over next two decades

By Leahta Santorelli
BBC Business reporter

© 28 August 2016
Solution: team-based learning ("TBL")

In class: theory
1. Pre-work
2. Quiz
3. Team quiz
4. Clarify doubts

In class: apply
5. Team applications

Also 360° teammate evaluation

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TBL in practice

Originated in 1970s by Larry Michaelsen in Marketing

Used by 100s of universities globally

Many fields
- Health sciences (~50% of US medical schools)
- Business
- Computer science
- Engineering
- Social sciences
- Law

Emerging K-12, government, employability and corporate

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1. Pre-work

Module 3 – Aircraft Performance
Learning Objectives

After this module you should be able to:

- Calculate aircraft performance metrics:
  - Take-off and landing distances
  - Fuel consumption
  - Crosswind
  - Weight and balance
- Describe what factors affect aircraft performance such as altitude, temperature, weight, air pressure, head/tailwind, etc.
- Compare aircraft types on performance
2. Individual Readiness Assurance Test ("IRAT")
3. **Team Readiness Assurance Test (“TRAT”)** with *immediate feedback*
4. Clarifications
5. Applications

- Significant problem
- Same problem
- Specific choice
- Simultaneous report

Sydney

Canberra

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After class appeals

- Students have an opportunity to provide a written “appeal” of any question
- Appeals help faculty to improve questions
- Appeals help students by requiring them to review material at a deeper level

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After class: peer evaluation

- Team members “grade” each other on their performance as team members
  - Mitigates “free rider” problem
  - Learn by evaluating performance

<table>
<thead>
<tr>
<th>Teammate</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team member 1</td>
<td>9</td>
</tr>
<tr>
<td>Team member 2</td>
<td>11</td>
</tr>
</tbody>
</table>

Divide 20 points among your two teammates
In a study of over 1,500 teams...

- Score of Best Member
- Team Score: Delayed Feedback: +11%
- Team Score: Immediate Feedback: +23%

Source: Larry Michaelsen, David Ross Boyd Professor Emeritus of Management at the University of Oklahoma, Founder of TBL. Personal communication.
My class: teams outperform individuals

Before:
- Individual Test: 76%
- Team Test: 93%

Increase:
- +22%
My class: individuals retain team gains

Before:
- Individual Test: 76%
- Team Test: 93%

After:
- Individual Final Exam: 95%
My class: high-low range narrows

Individual Test BEFORE
High: 80
Low: 54

Team Test

Individual Final Exam AFTER
High: 98  +23%
Low: 92  +70%

Source: Embry-Riddle Aeronautical University, Bachelor of Science in Aviation Business course in Airport Administration and Finance
## Top 10 skills required in 2020

<table>
<thead>
<tr>
<th>Skill</th>
<th>Lecture</th>
<th>TBL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Complex Problem Solving</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>2. Critical Thinking</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>3. Creativity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. People Management</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>5. Coordinating with Others</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>6. Emotional Intelligence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Judgement and Decision Making</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>8. Service Orientation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Negotiation</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>10. Cognitive Flexibility</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Embry-Riddle Aeronautical University, Bachelor of Science in Aviation Business course in Airport Administration and Finance

TBL supported by research

300+ journal articles
Curriculum and resource savings

Classroom time

- Traditional
- TBL

Faculty time

- Traditional
- TBL

Better exam scores


Note: Classroom and faculty time are unpublished estimates. Exam scores versus US national average published as cited.

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Effectiveness in large classes

Traditional class

Outcomes *decline* as class size increases

TBL class

Outcomes *rise* and *maintain* better as class size increases

Illustrative

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Considerations

▪ Design of TBL course materials (pre-work, questions and cases)

▪ Change management for educators and learners

▪ Administrative process to implement
Backwards design

**TBL Class Flow**

- Pre-work
- IRAT
- TRAT
- Clarify
- Apply

**Backwards Design**

- Design RATs
- Select pre-work
- Create Application Exercises
- Form Learning Objectives
Team formation

▪ Always instructor created
▪ Assembled to create a diverse team
▪ Same teams for the entire term
▪ Sizes:
  • Typically 5-7 in face-to-face
  • Online smaller usually 3 or 4
Schedule examples

3-hour (1x per week)

Readiness Phase (75 min)
- IRAT (20 MCQ) 25 min
- TRAT (20 MCQ) 25 min
- Clarify doubts 25 min

[Break]

Application Phase (75 min)
- Application cases 3-6x (5-15 min each)

1-hour (3x per week)

Monday
- IRAT (10 MCQ) 15 min
- TRAT (10 MCQ) 15 min
- Clarify doubts 30 min

Wednesday
- Cases ~3x (5-15 min each)

Friday
- Cases ~3x (5-15 min each)
Summary

- Team-based learning ("TBL"): specific type of blended learning
- Positive impact on scores and alignment future skills
- Change management to implement

Learn more
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Team-Based Learning Collaborative
www.teambasedlearning.org

TBL software
www.intedashboard.com