

# Team-based learning as a strategy to facilitate active learning

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# Motivation

*“What I hear, I forget.*

*What I hear and see, I remember a little.*

*What I hear, see and ask questions about or discuss with someone else, I begin to understand.*

*What I hear, see, discuss and do, I acquire knowledge.*

*When I teach to another, I master.” Silberman, 1996.*



# How to foster active learning in a large class?

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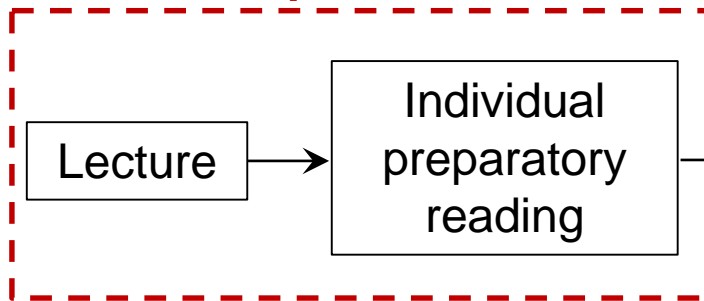
> 150 students



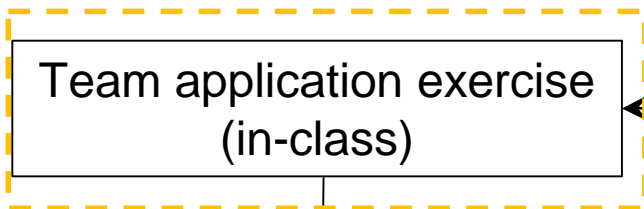
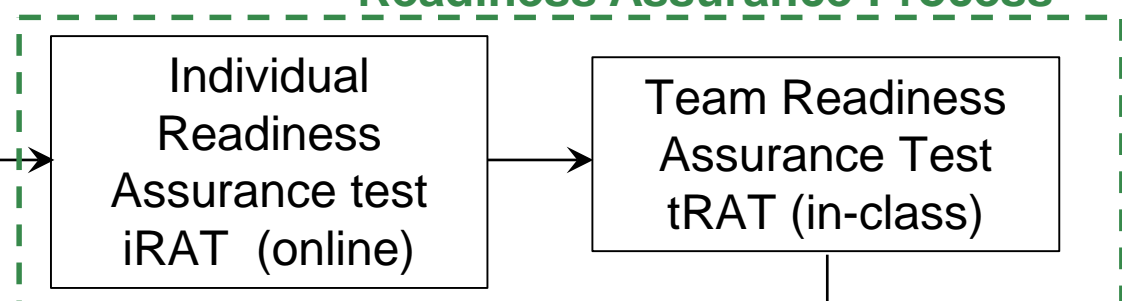
# Team-based learning

## Permanent teams

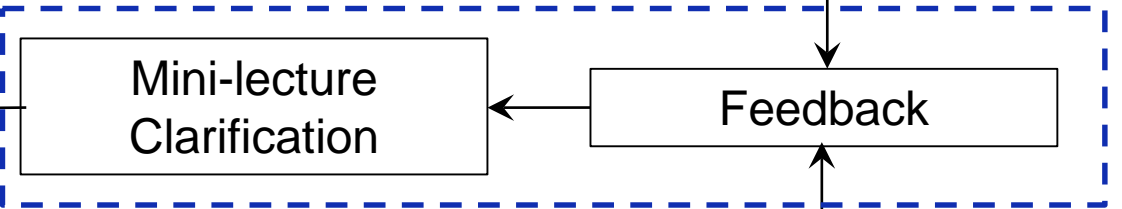
### Preparation



### Readiness Assurance Process



### Exam-like questions



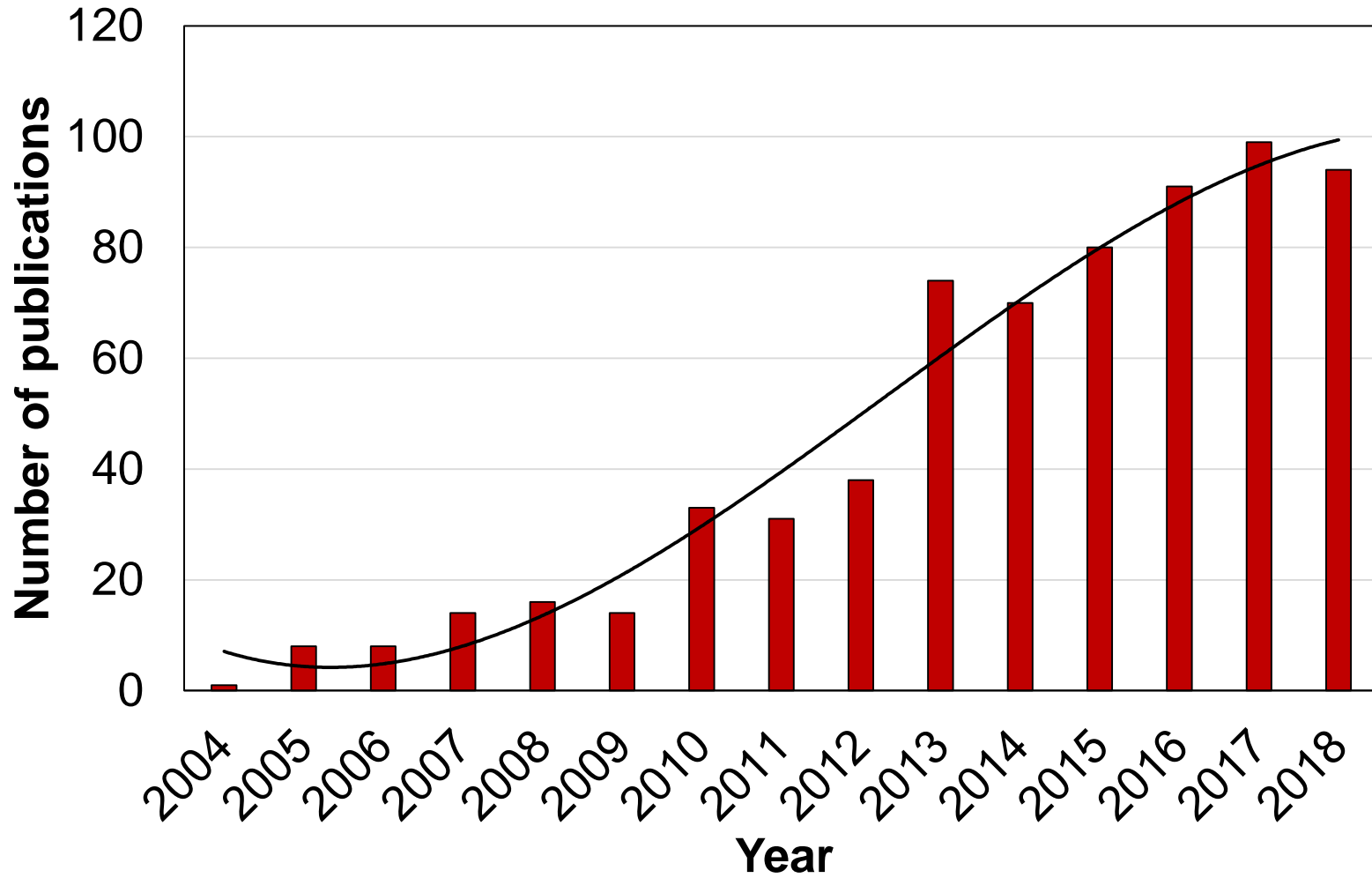
### Explanation



V. Najdanovic-Visak, “*Team-based learning for first year engineering students*”, Education for Chemical Engineers 2017, 18, 26-34.

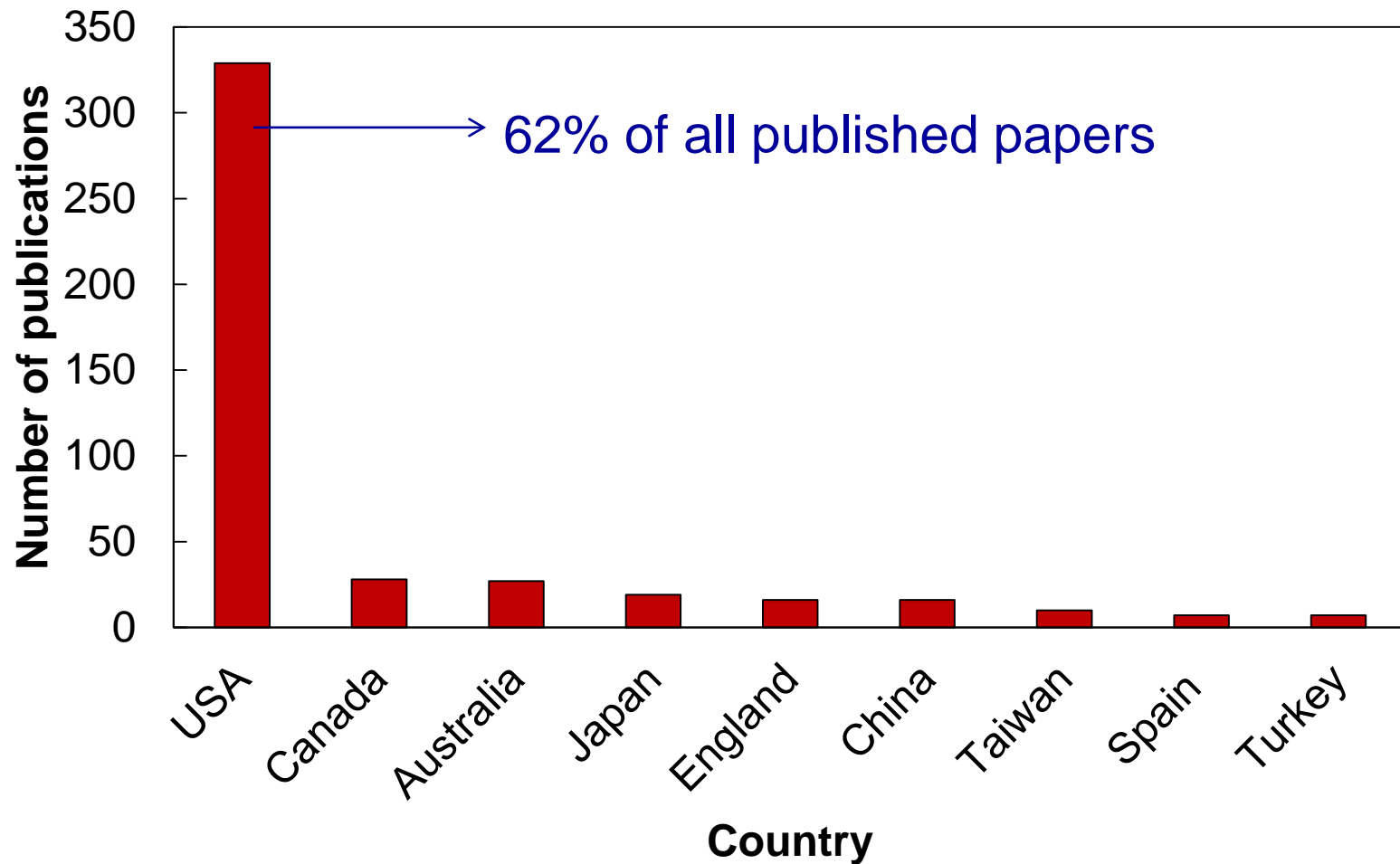


# Number of publications on TBL by year

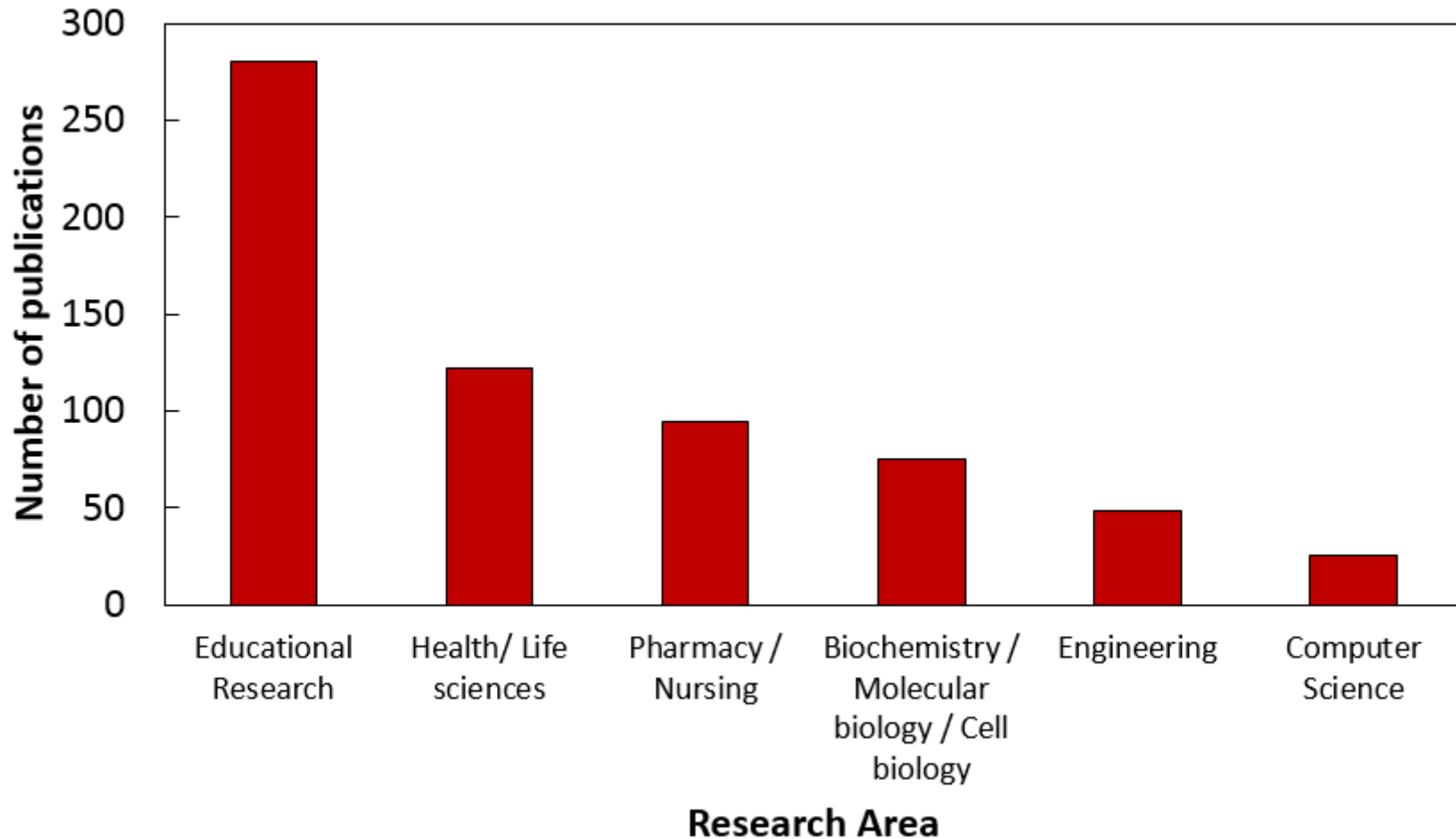




# Number of publications per country



# Number of publications per area





# Implementation at Lancaster University

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- Process Engineering Fundamentals (first-year module, 8 credits).
- Compulsory for all engineering student (courses: chemical, nuclear, mechanical and electrical and electronics engineering)
- 2 x 1 hour lecture per week  
1 x 2 hours practical session per week  
(for ten weeks)
- 24 teams of 6-7 members.
- Three units: 1) process variables;  
2) mass balances;  
3) single and multiple phase systems.





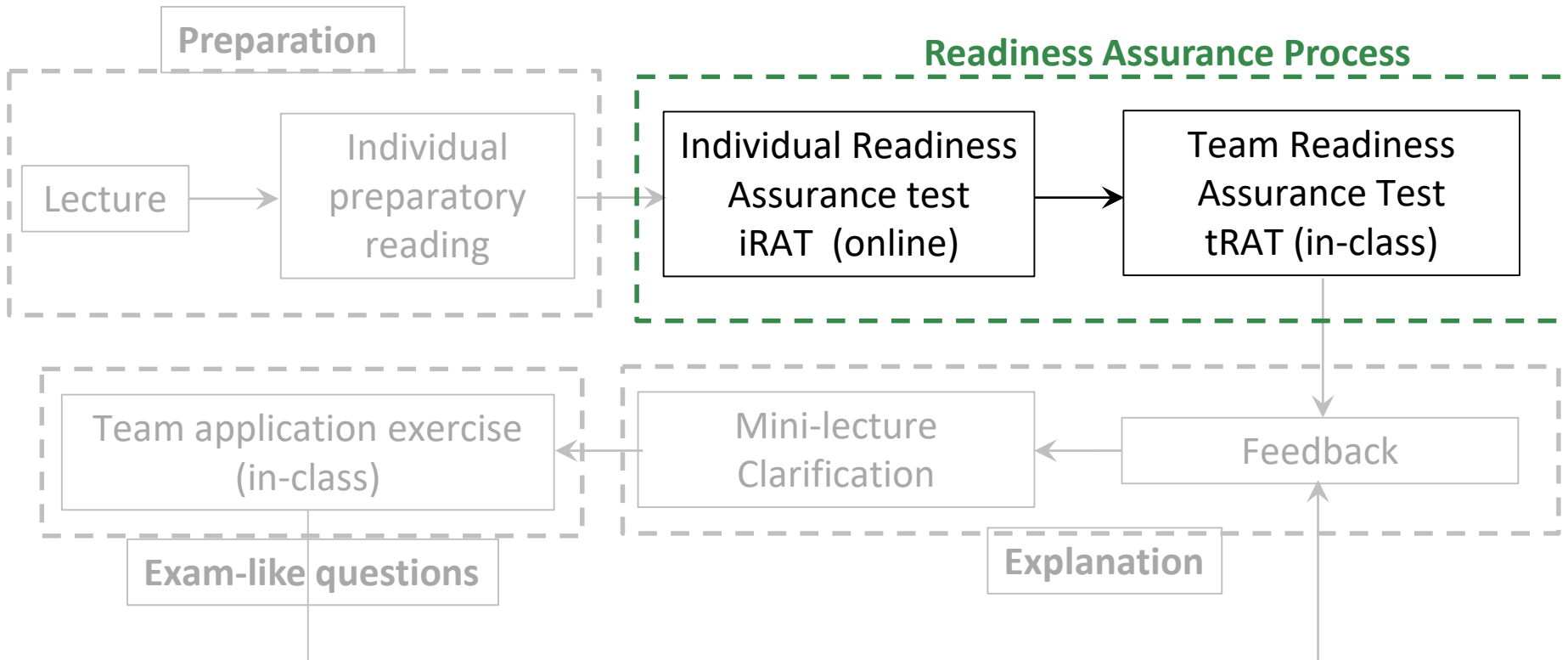
# Teams in TBL

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- One instructor simultaneously facilitates many small teams in a large class.
- Teams need to be large (typically 5 – 8 members):
  - sufficient intellectual resources to solve problems.
- Teams are created by instructor:
  - balanced and diverse teams with wide range of skills.
- Teams are permanent.



# Readiness Assurance Process



# Readiness Assurance Process

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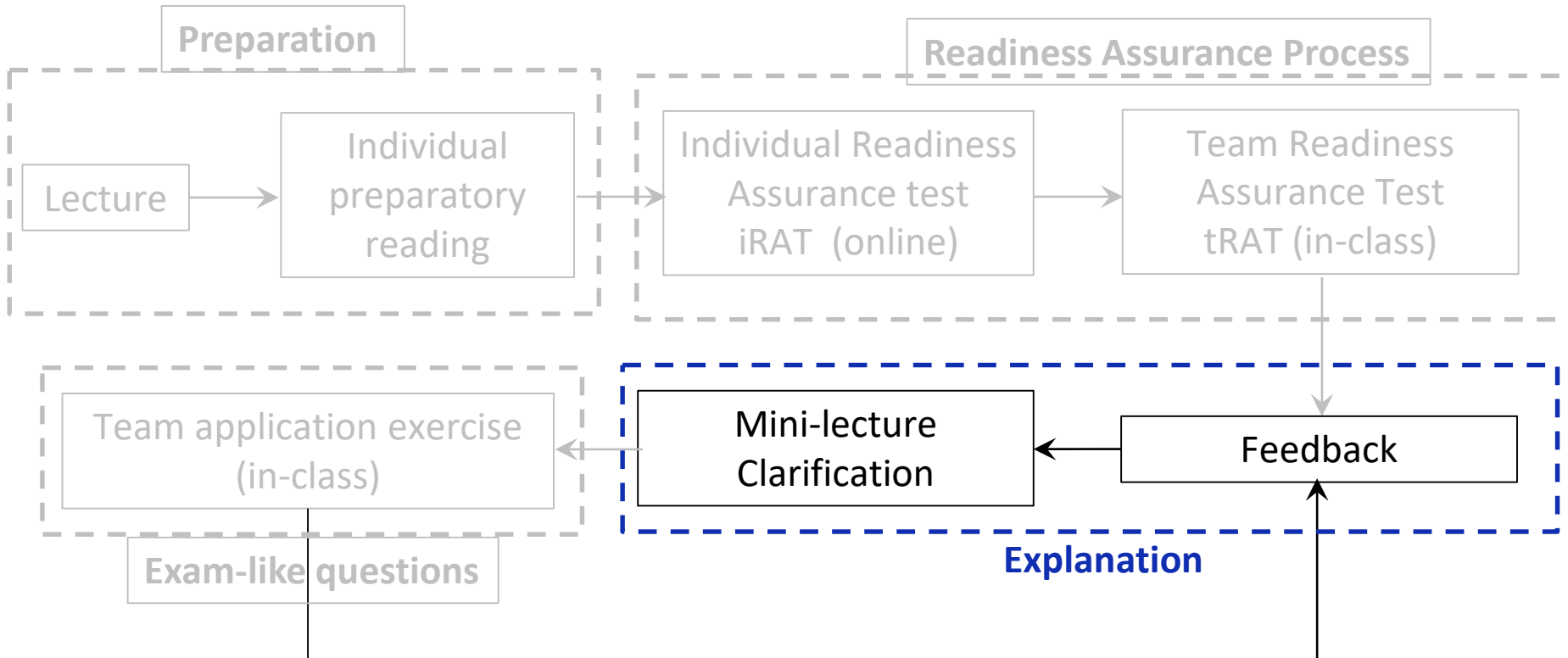


**Aims:** motivate students and guarantee their preparation

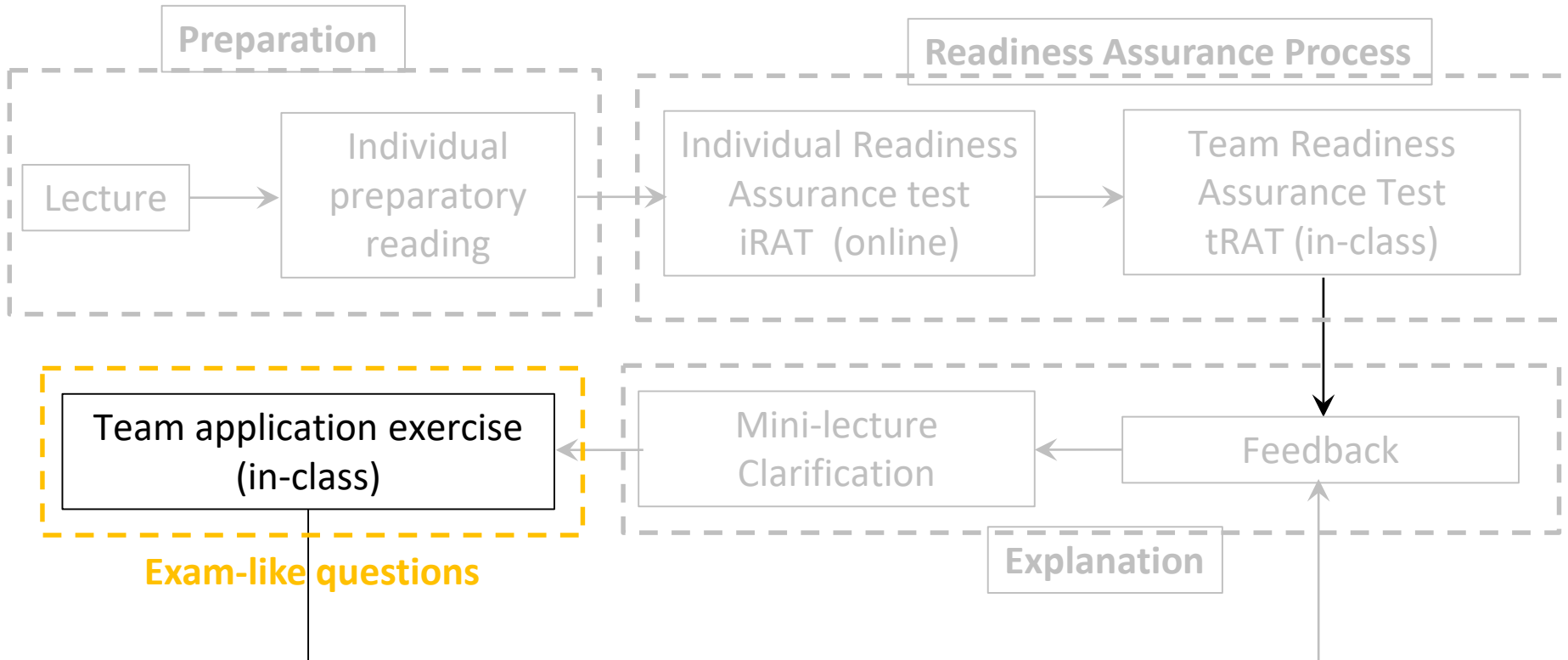
- iRAT and tRAT are the same, usually multiple choice questions.
- Main concepts are tested - **lower Bloom's levels of learning** (knowledge, comprehension and application).
- During tRAT students come to consensus on their answers, which assures mutual transfer of knowledge.



# Feedback – closing the loop



# In-class application assignments





# In-class application assignments

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Students work in teams on progressively more difficult questions - **higher Bloom's levels of learning** (abilities to analyse, evaluate and create).

- Significant problem.
- Same problem.
- Specific choice.
- Simultaneous reporting.



# Peer assessment

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Team score is adjusted for each member of a team by peer evaluation:

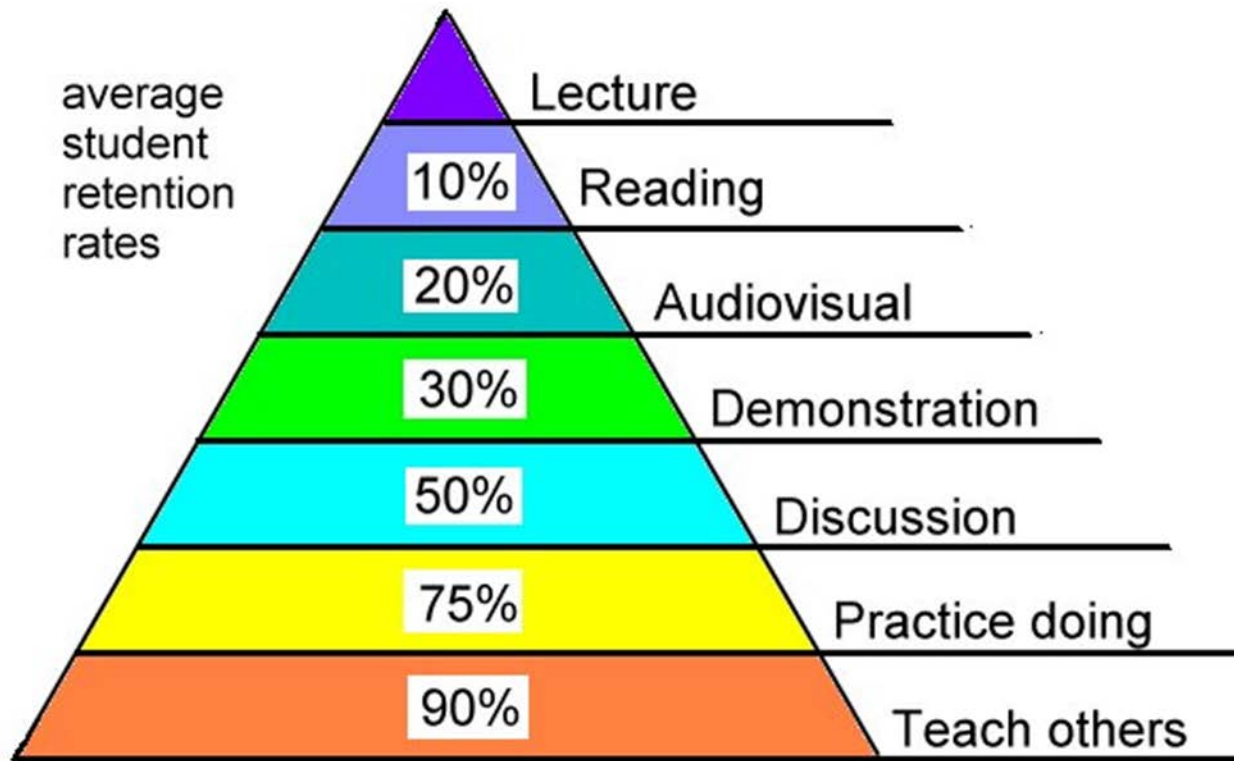
- holds team members accountable to their teams.
- lessens the likelihood of social loafing.
- avoids potential “free-riders”.
- enhances motivation and ability to work together effectively.



# Conclusions



## Learning Pyramid



Source: National Training Laboratories, Bethel, Maine



# Resources

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- Team-Based Learning Collaborative  
(organization of educators from around the world who encourage and support the use of TBL in all levels of education) -  
<http://www.teambasedlearning.org/>
- European TBL Community-  
<http://www.teambasedlearning.org/committees/european-tbl-community/>
- Team-based Learning: A Transformative Use of Small Groups in College Teaching, Larry Michaelsen, Arletta Bauman-Knight, and Dee Fink (2003)  
Sterling, VA: Stylus Publishing