

I learned more from TBL than from the traditional method of teaching?!

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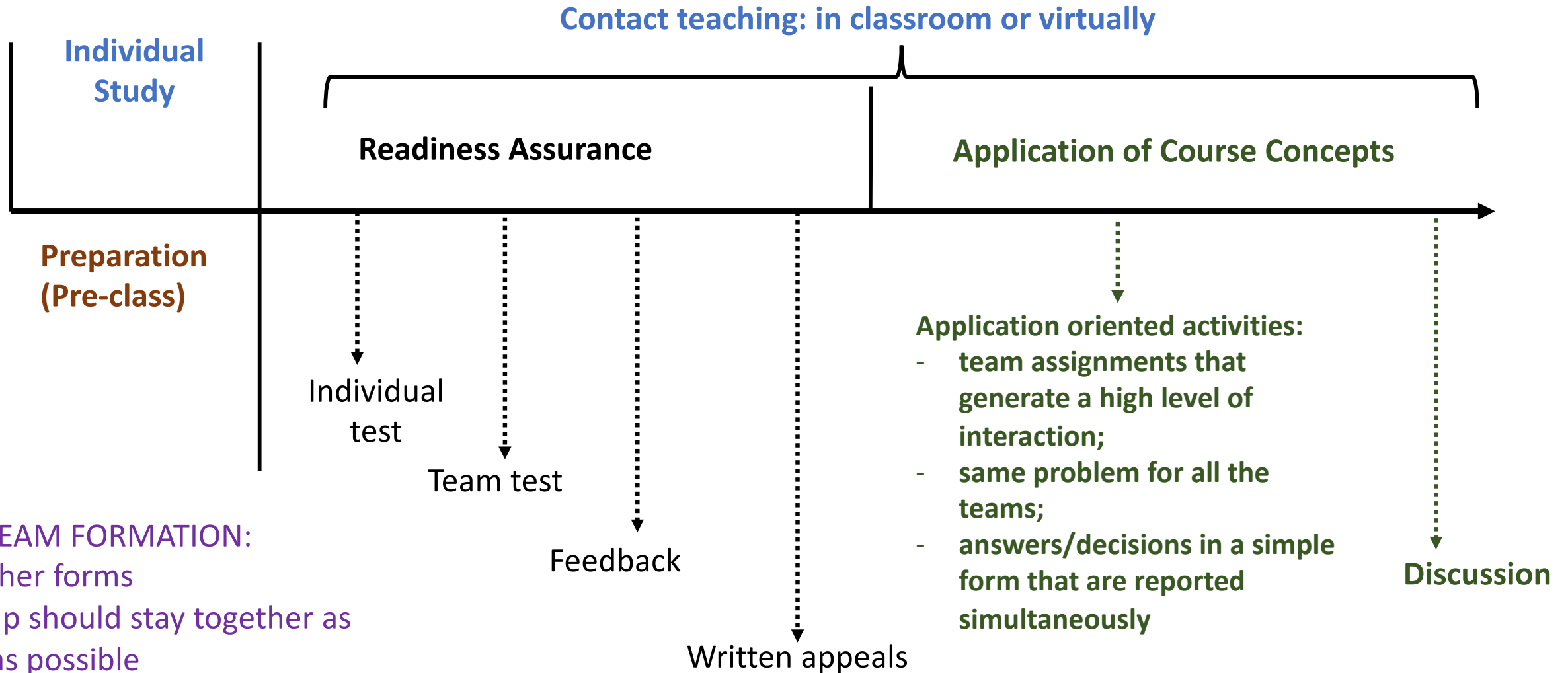


Why we need innovative teaching and what is team-based learning?

- It is widely acknowledged that in addition to **content knowledge**, it is essential to develop students' **transferable skills**, such as cooperation, problem-solving, and learning skills - these are essential also for STEM students for their working life (McGundale & Zizka, 2020; Hu & Guo, 2021).
- The development of deep content knowledge and transferable skills is more supported by **learning-focused or student-activating teaching-learning environments** (Uiboleht, 2019).
- One option is to adopt **team-based learning (TBL)** as a teaching strategy to design a student-activating teaching-learning environment for the course.
- TBL is a **small group instructional method** in which students are **guided to apply conceptual knowledge** through a recurring sequence of activities that involve individual work, teamwork, and immediate feedback (Kibble et al., 2016).

Team-Based Learning Instructional Activity Sequence

(Michaelsen, Knight & Dee Fink 2004; Parmelee *et al.*, 2012)



Why TBL?

- Studies indicate that in TBL settings, students' quality of learning outcomes increases and they also develop transferable skills as they are more engaged (Hagen, 2016; Swanson et al., 2019).
- TBL enables learners to be engaged.
- TBL as a teaching strategy can be adopted for large groups, and one teacher can deliver the course.

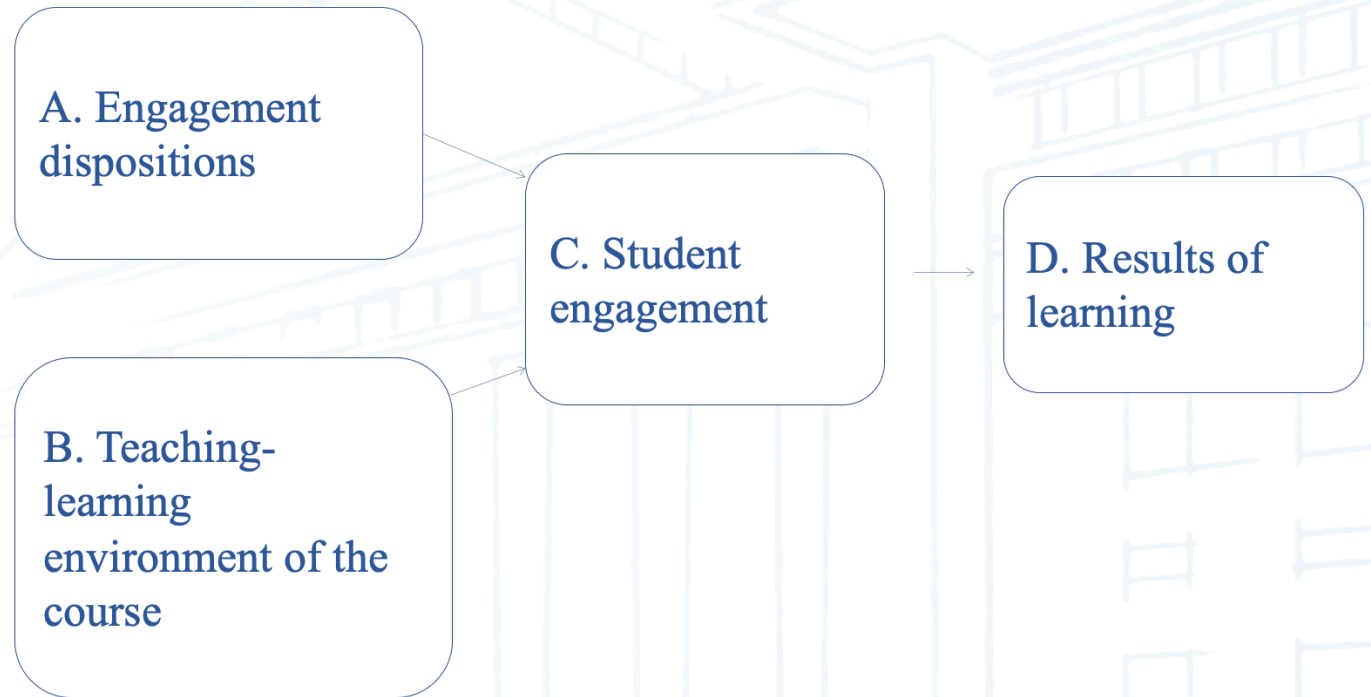


Figure. The model of student engagement (Lawson & Lawson, 2013)

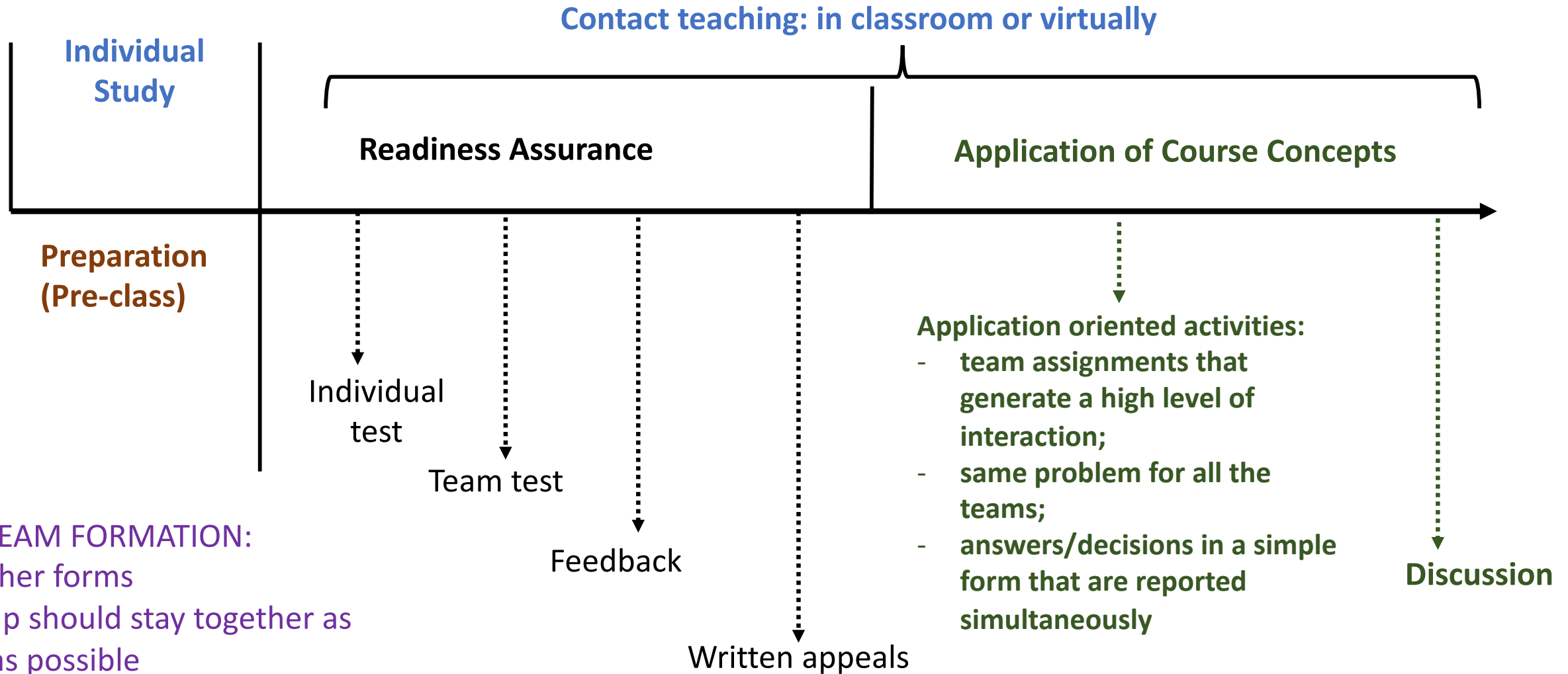
Context

Team-Based Learning was adopted to teach three chemistry courses:

- A. General Chemistry** (3 ECTS, 1st-year natural sciences and technology international group students, N=39; TBL was adopted 25% of contact sessions)
- B. Physical Chemistry** (3 ECTS, 1st-year gene technology students, N=51; TBL was adopted for the whole course)
- C. Environmental Chemistry** (3 ECTS, 1st-year environmental technology students, N=16; TBL was adopted for the whole course).

Team-Based Learning Instructional Activity Sequence

(Michaelsen, Knight & Dee Fink 2004; Parmelee *et al.*, 2012)



Research questions

Research questions:

1. How TBL supported the learning process?
2. Whether and how pre-tasks and learning materials prepared for independent learning support learning?
3. Whether TBL helps to understand better the course material than the traditional teaching methods?

Methods

- A questionnaire was prepared to evaluate the effectiveness of the team-based learning process and students' perceptions of learning outcomes.
- To understand students' learning experiences of the learning process in the TBL learning environment, we designed a questionnaire considering previous studies (Craig et al., 2020; Jarjoura et al., 2014; O'Neill et al., 2020).
- The questionnaire consisted of 5 items with a 4-point Likert-type scale and an open-ended question where students could comment and justify the answers.
- Qualitative content analysis (Graneheim & Lundman, 2003) was adopted to analyse the answers to the open questions and explanations.

RQ 1: How TBL supported the learning process?

Items:

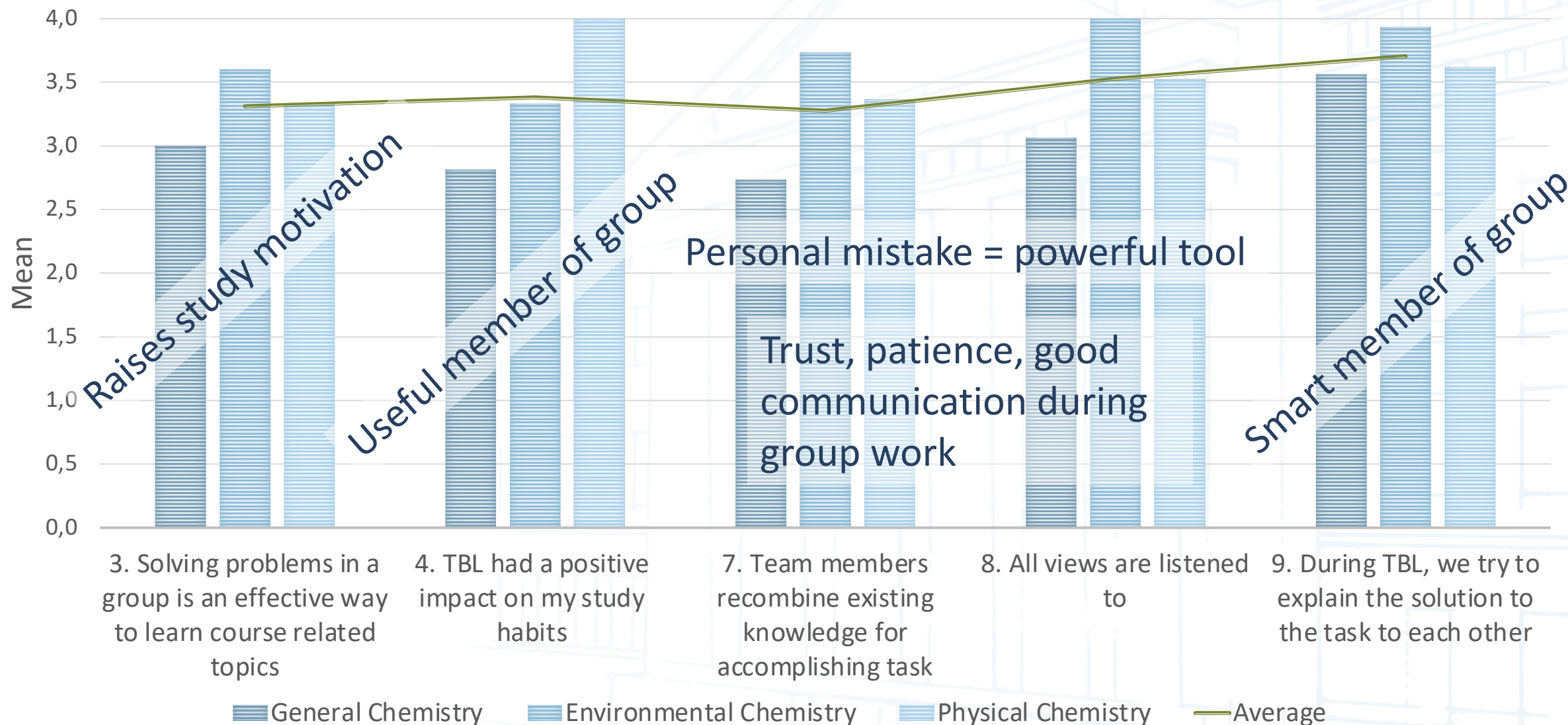
3. Solving problems in a group is an effective way to learn course related topics.
4. TBL had a positive impact on my study habits.
7. Team members recombine existing knowledge for accomplishing task.
8. All views are listened to.
9. During TBL, we try to explain the solution to the task to each other.

4- point Likert scale

References:

- [1] J. M. Craig, B. Nodeland, R. Long, and E. Spivey, "Student Perceptions of Team-Based Learning in the Criminal Justice Classroom," <https://doi.org/10.1080/10511253.2020.1742756>, vol. 31, no. 3, pp. 372–389, Jul. 2020, doi: 10.1080/10511253.2020.1742756.
- [2] C. Jarjoura, P. A. Tayeh, and N. K. Zgheib, "Using Team-Based Learning to Teach Grade 7 Biology: Student satisfaction and improved performance," <http://dx.doi.org/10.1080/00219266.2014.967277>, vol. 49, no. 4, pp. 401–419, Oct. 2014, doi: 10.1080/00219266.2014.967277.
- [3] T. A. O'Neill *et al.*, "Team dynamics feedback for post-secondary student learning teams: introducing the 'Bare CARE' assessment and report," <https://doi.org/10.1080/02602938.2020.1727412>, vol. 45, no. 8, pp. 1121–1135, Nov. 2020, doi: 10.1080/02602938.2020.1727412.

Results: How TBL supported the learning process?



RQ 2: Results: Whether and how pre-tasks and learning materials prepared for independent learning support learning?

One open-ended question about the pre-task (learning materials) was asked in all three courses.

39 answers were analysed.

Please explain whether and how the learning materials provided for independent study helped you learn.

You can consider, for example, the volume, complexity, and format of the study materials.

Pre-task: Learning materials in courses

	General Chem.	Colloid Chem.*	Physical Chem.
Book/lecture materials/articles	*	*	*
	Suggested textbook	Suggested textbook	Conspectus/synopsis
Videos	*	*	*
	Recorded lectures from previous years	20 min recorded videos	30-40 min videos, sample ex. included
Lecture slides	*	*	*
Pre-tests	—	—	*

Whether and how pre-tasks and learning materials prepared for independent learning support learning?

The study material must have a solid system and structure.

Books/ conspectus/ article

The **conspectus** is important as it gives the **whole picture** in concentrated form.

It is easier to learn if the materials are in the **native language**.

Lecture or video slides

Slides **do not support individual learning** because they do not have enough context and are usually designed to support following a lecture (or video).

*"Sometimes the **lecture slides aren't enough**, and I generally prefer to read about every detail of everything to understand the full picture better."*



Whether and how pre-tasks and learning materials prepared for independent learning support learning?

Videos

Learning from **videos** is supported if there are **structured slides** or a **lecture outline**.

The video supports learning:

-**If they are in optimal length** (suggested shorter than 30-40 min), **have good structure**, and are given at **the right time**.

-Students can watch the videos at a **suitable time and speed** or watch them **multiple times**.

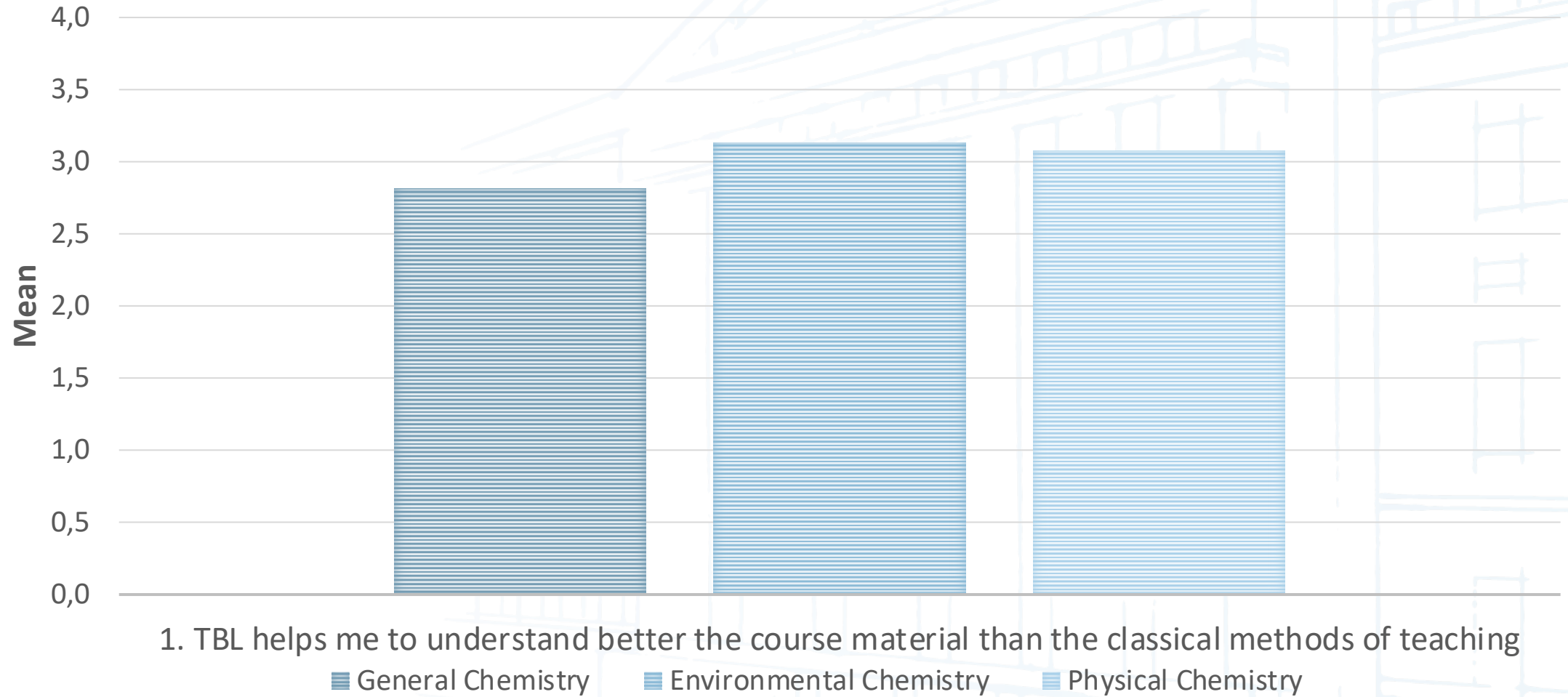
-Together with the theoretical part, some **shorter sample exercises are explained** (it is good to see how the lecturer thinks and what the logic is).

If the learning materials do not support learning, the learner prefers the lecture format!

"The videos were definitely the best option for independent learning, because different exercises were explained, which gives a better understanding of the practical side of the given topic."



RQ 3: Whether TBL helps to understand better the course material than the traditional methods of teaching?



Students' feeling of learning and actual learning (Deslauriers *et al.* 2019)

Feeling of learning: students' self-reported perception of learning

Actual learning: measured at the end of learning process with tests, exams etc.

Student activating
teaching-learning environments

Traditional teaching-
learning environments

Feeling of learning < Actual learning

Feeling of learning > Actual learning

Measuring actual learning versus feeling of learning in response to being actively engaged in the classroom

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Conclusions

- TBL increased study motivation and raised study motivation.
- Size of the group/team: up to 4 members – depends on students' motivation to learn (the proportion of students who has low motivation to learn).
- If possible, TBL should be adopted as much as possible during the course.
- Learning materials should be provided in time, and there should be enough time to work with them.
- Video materials support learning when they offer examples of how theory/content knowledge is used in solving easier problems.
- Be very critical about learning materials!

References

- Craig, J. M., Nodeland, B., Long, R., & Spivey, E. (2020). Student Perceptions of Team-Based Learning in the Criminal Justice Classroom. *Journal of Criminal Justice Education*, 31(3), 372-389.
- Entwistle, N. J. & Peterson, E. R. (2004). Conceptions of learning and knowledge in higher education: Relationships with study behaviors and influences of learning environments. *International Journal of Educational Research*, 41:407-428.
- Graneheim, U. H., & Lundman, B. (2003). Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today*, 24(2), 105-112. doi:10.1016/j.nedt.2003.10.001.
- Hagen, J. P. (2016). Team-Based Learning in Physical Chemistry. In *The Flipped Classroom Volume 1: Background and Challenges* (pp. 55-72). American Chemical Society. (kättesaadav UT raamatukogust võrguteavikuna)
- Hu, W., & Guo, X. (2021, October). Toward the development of key competencies: A conceptual framework for the STEM curriculum design and a case study. In *Frontiers in Education* (Vol. 6, p. 684265). Frontiers Media SA.
- Kibble, J. D., Bellow, C., Asmer, A., Barkley, L. (2016). Team-based learning in large enrolment classes. *Adv Physiol Educ*, 40, 435-442.
- Lawson, M. A., and Lawson, H. A. (2013). New Conceptual Frameworks for Student Engagement Research, Policy and Practice. *Review of Educational Research*, 83:3, 432-479.
- McGunagle, D. and Zizka, L. (2020), "Employability skills for 21st-century STEM students: the employers' perspective", *Higher Education, Skills and Work-Based Learning*, Vol. 10 No. 3, pp. 591-606. <https://doi.org/10.1108/HESWBL-10-2019-0148>
- Parmelee, D., Michaelsen, L. K., Cook, S., & Hudes, P. D. (2012). Team-based learning: a practical guide: AMEE guide no. 65. *Medical teacher*, 34(5), e275-e287.
- Prosser, M., & Trigwell, K. (1999). *Understanding learning and teaching: The experience in higher education*. McGraw-Hill Education (UK).
- Ramsden, P. (2003) *Learning to Teach in Higher Education*. 2nd edition
- Swanson, E., McCulley, L. V., Osman, D. J., Scammacca Lewis, N., & Solis, M. (2019). The effect of team-based learning on content knowledge: A meta-analysis. *Active learning in higher education*, 20(1), 39-50.
- Uiboleht, K. (2019). *The relationship between teaching-learning environments and undergraduate students' learning in higher education: A qualitative multi-case study* (Doctoral dissertation, Tartu University).

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