

Friedrich Schiller University Jena
New Perspectives in Science Education – Edition 10
**Reimagining student laboratories –
design and evaluation of two innovative concepts**

Chemistry Education Department

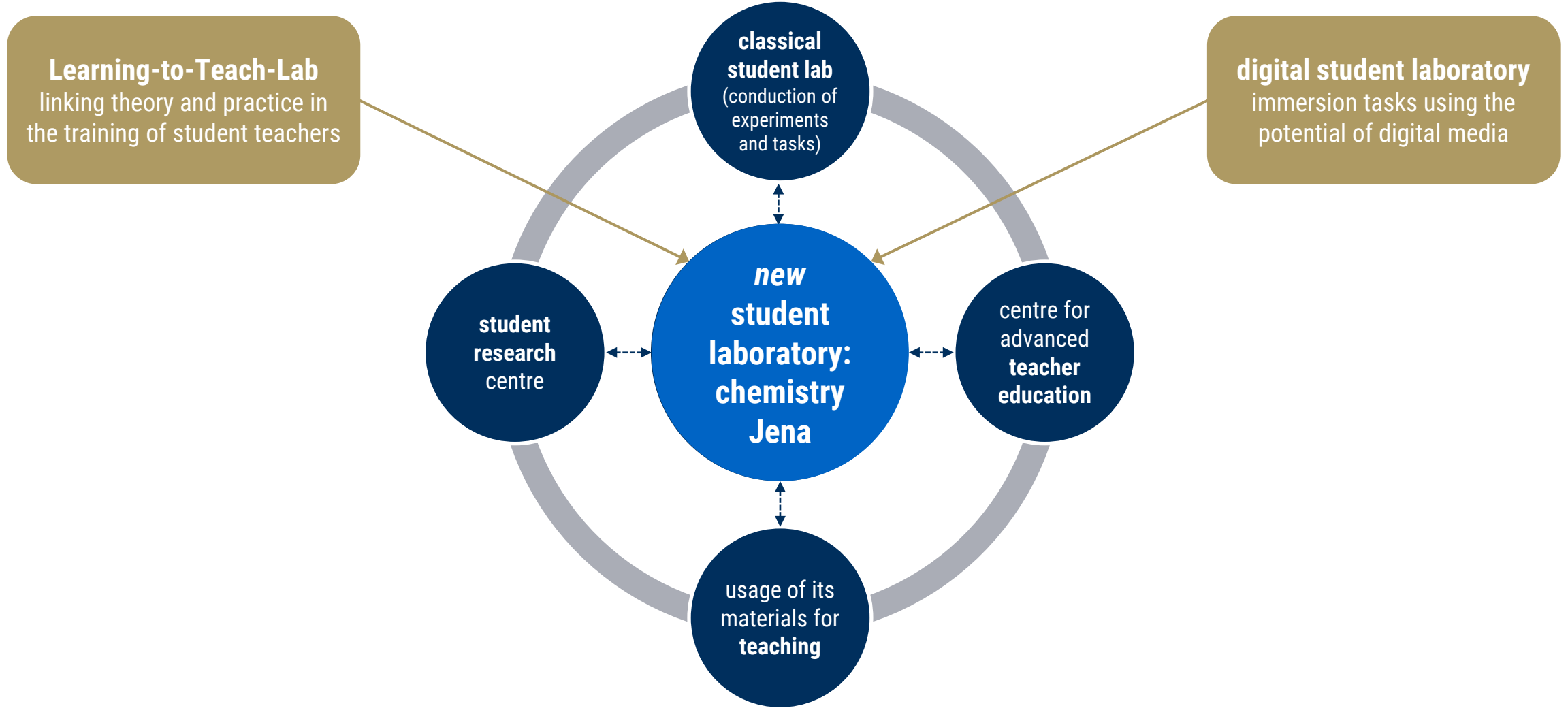
Marcel Simon, Nicolai ter Horst
Prof. Dr. Timm Wilke

18 - 19 March 2021

Overview

1. **introduction and general aspects**
2. student laboratories and teacher education
3. digitalization and expansion of the student laboratory
4. summary and outlook

1. introduction and general aspects – expansion of the existing student laboratory



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- 2. student laboratories and teacher education**
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2. student laboratories and teacher education – Learning to Teach-Laboratories (LTL): definition & concept

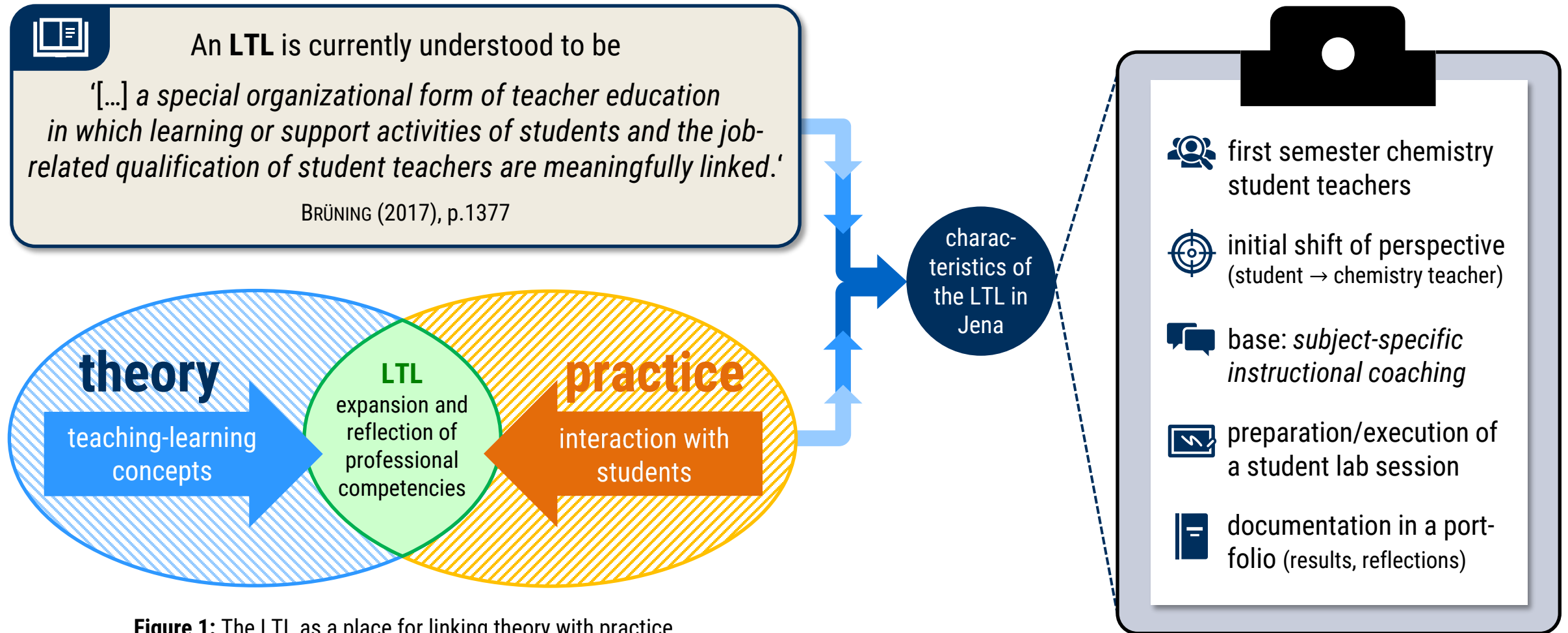
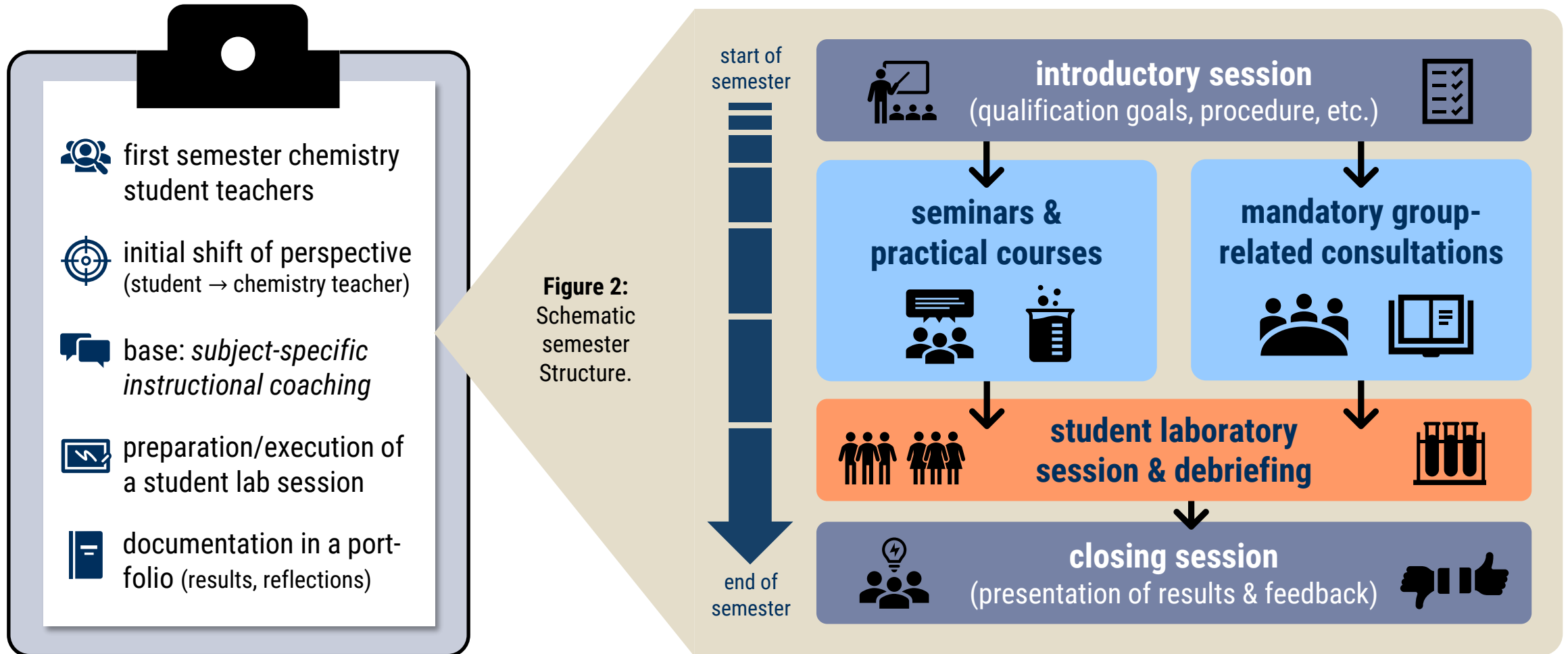


Figure 1: The LTL as a place for linking theory with practice.
(LEUCHTER & ZUCKER, 2018)

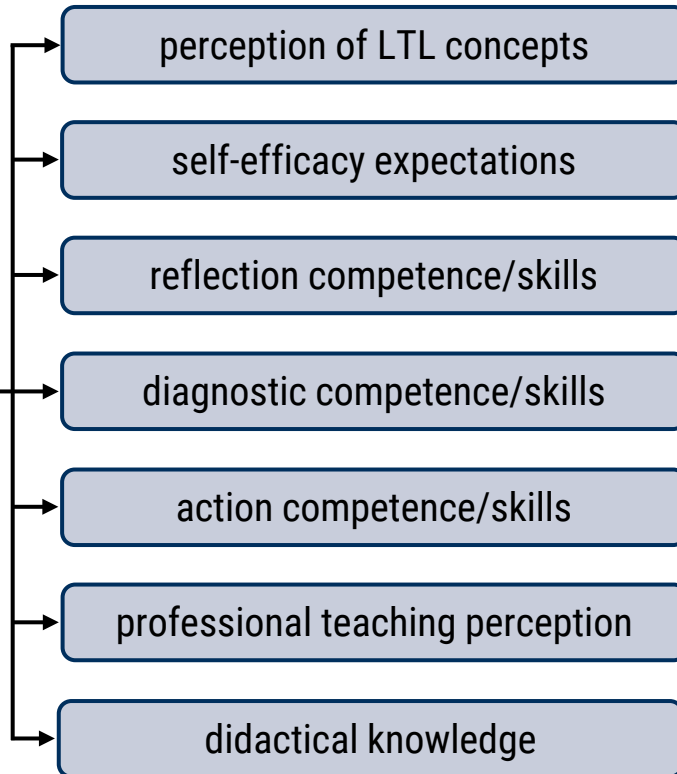
2. student laboratories and teacher education – Learning to Teach-Laboratories (LTL): definition & concept




2. student laboratories and teacher education – research & first results

target constructs of didactical research in the context of LTL in Germany

based on
PRIEMER, 2020



 **elaboration and evaluation of a course concept in the sense of a Learning-to-Teach-Laboratory for the professionalization of chemistry student teachers in their first semester**

focus: change of perspective from the role of a student to a chemistry teacher

perception of the LTL event format & early practical experience



How do student teachers perceive the LTL event format in terms of practical experience and understanding of theory?



What importance do student teachers attach to this theory-practice linkage in relation to their future careers as chemistry teachers?

career choice motivation and change in career aspirations



To what extent can experiences in an LTL allow for confirmation or correction of career aspirations early in the chosen career path?

change in self-efficacy expectations



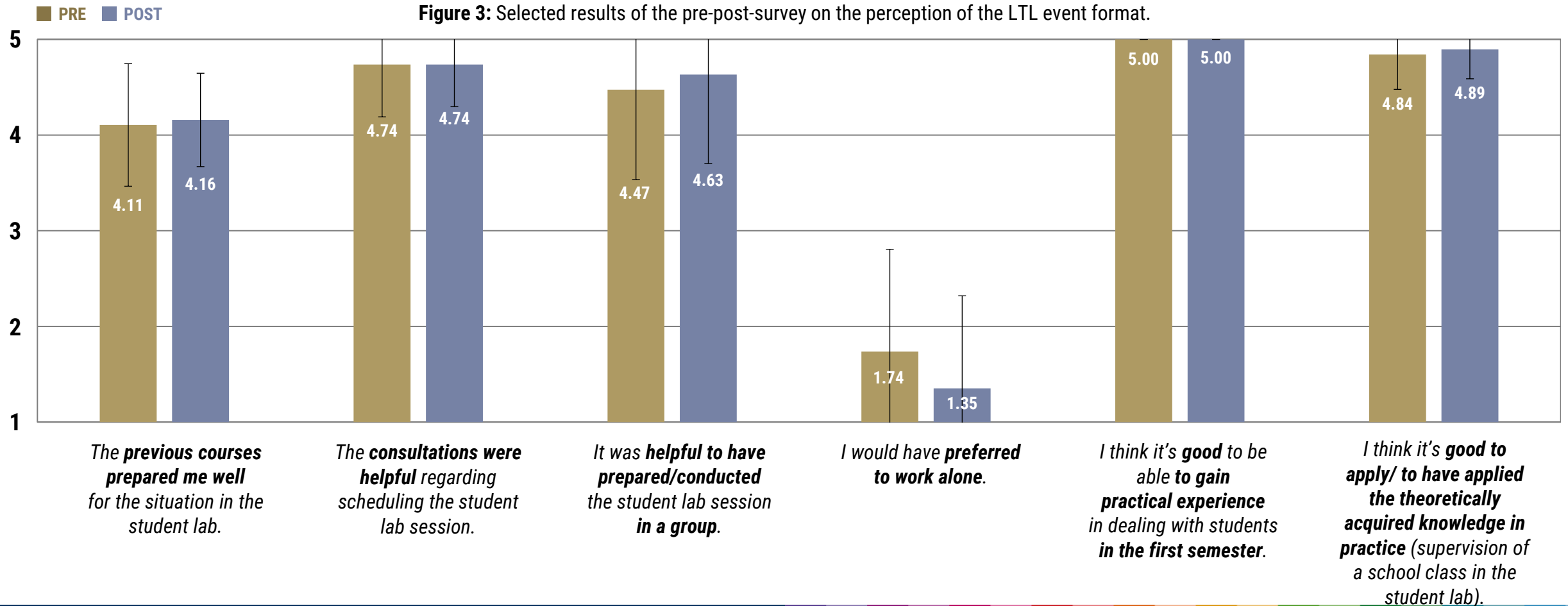
Do classroom-like experiences in an LTL lead to changes in beliefs about aptitude for the teaching profession and self-assessment of one's own competencies?

2. student laboratories and teacher education – research & first results

perception of the LTL event format & early practical experience

career choice motivation and change in career aspirations

change in self-efficacy expectations



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NPSE 2021 – asynchronous presentation

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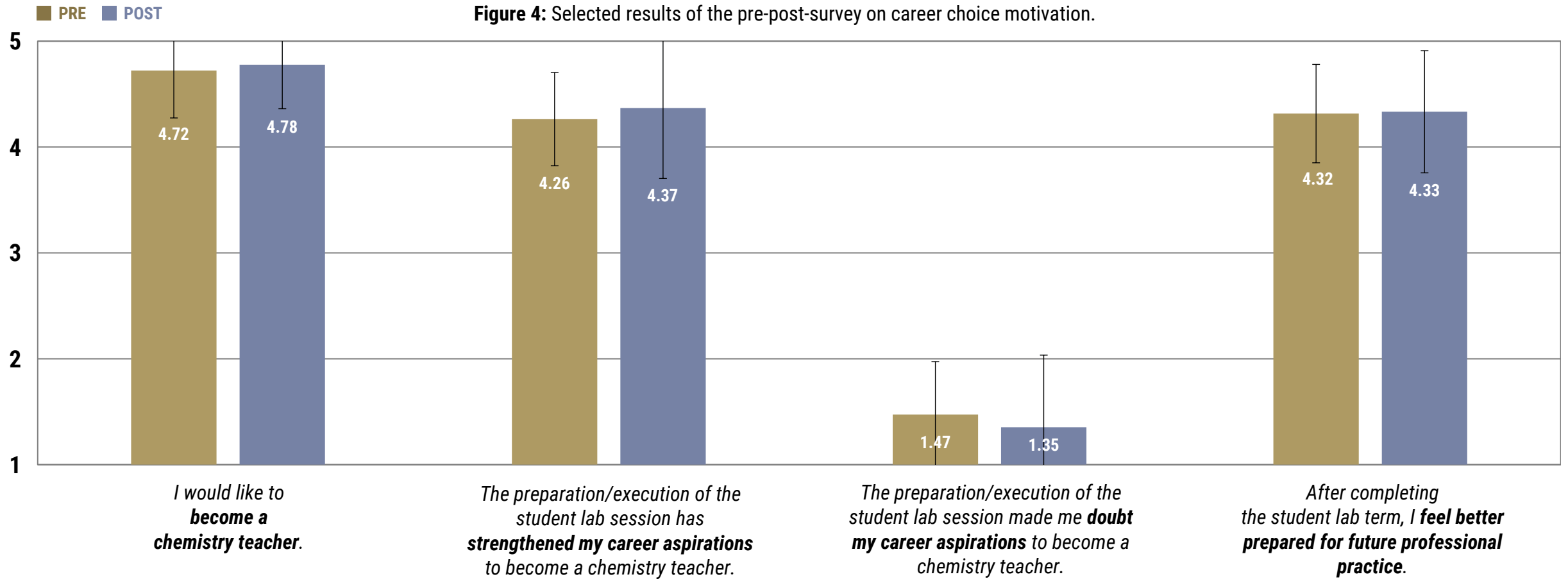


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career choice motivation and change in career aspirations

change in **self-efficacy expectations**

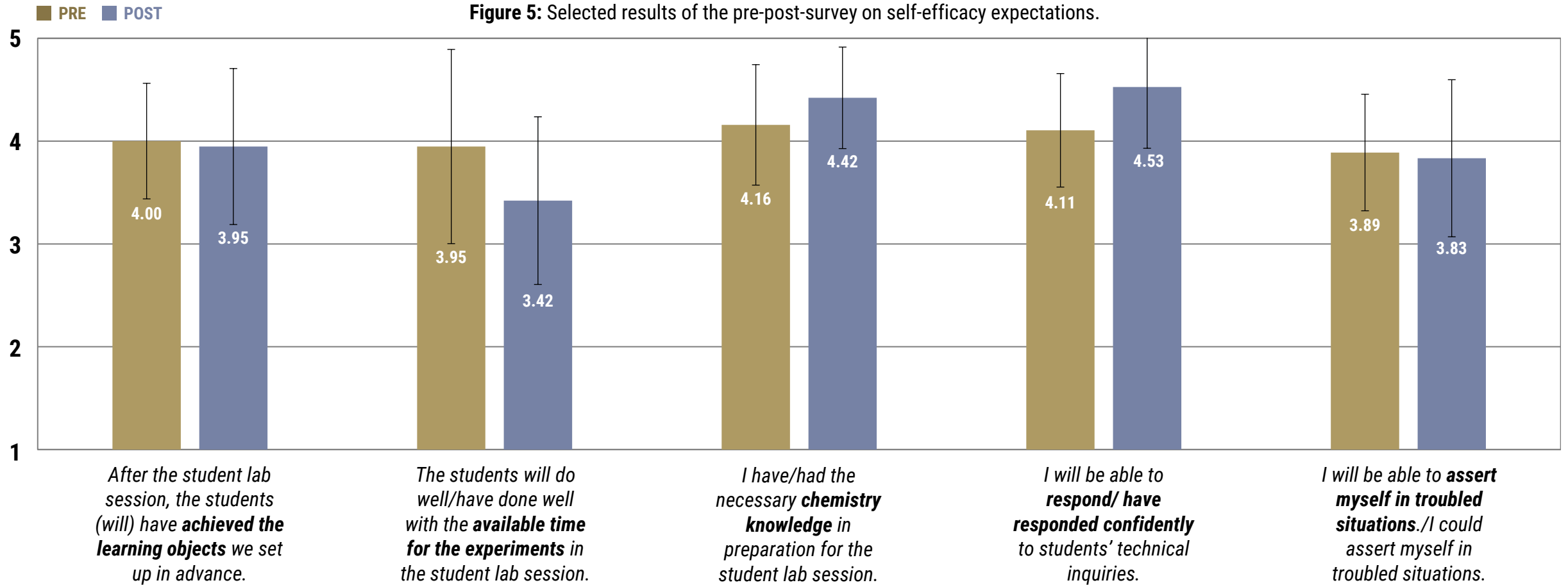


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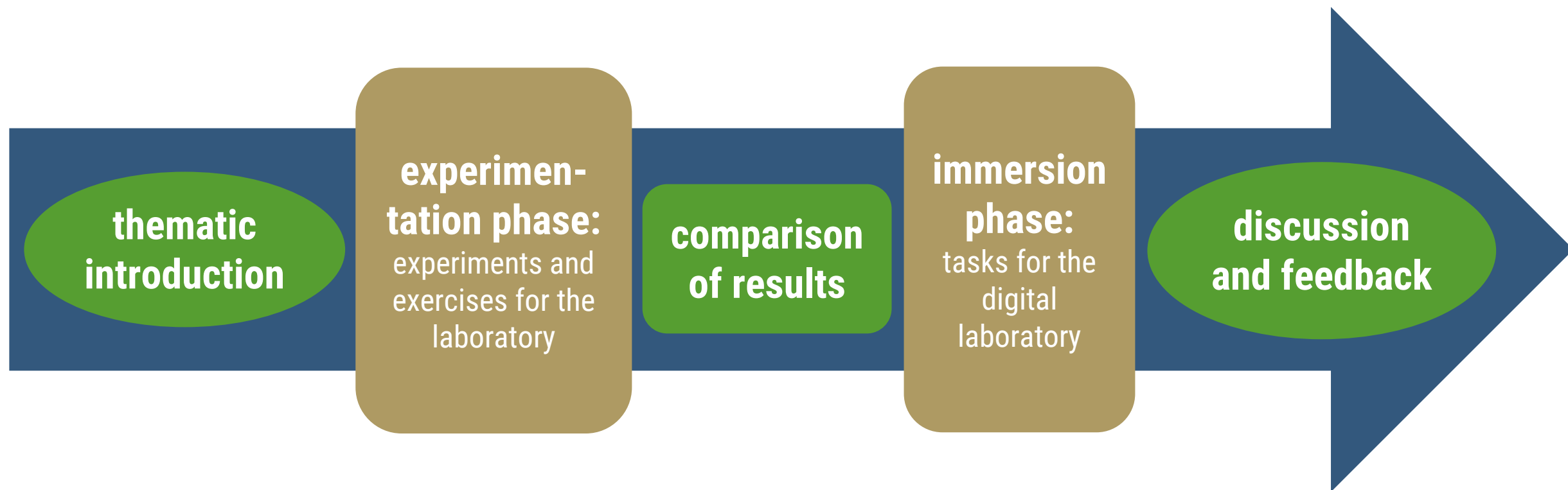
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3. digitalization and expansion of the student laboratory – concept of the *digitalchemlab*



3. digitalization and expansion of the student laboratory – concept of the *digitalchemlab*

thematic
introduction

- ❖ welcoming and overview of the schedule
- ❖ thematic self-introduction with the presentation app *Prezi*

15 min

experimen-
tation phase:
experiments and
exercises for the
laboratory

- ❖ self-guided stationary work in the lab in groups of two to four
 - reduced number of experiments compared to before
 - re-designed exercises connected to the experiments
- ❖ **lab-work e-book and usage of digital measurement technology**

90 min

break

15 min

3. digitalization and expansion of the student laboratory – concept of the *digitalchemlab*

comparison
of results

- ❖ solutions for the exercises and observations for the experiments
- ❖ individual comparison **on-screen**

15 min

immersion
phase:
tasks for the
digital laboratory

- ❖ personal selection of consolidating tasks:
 - working on exercises explaining the chemistry behind
 - insight into the otherwise unseeable particle level
- ❖ usage of **digital media i.e. the whiteboard app *Explain Everything***

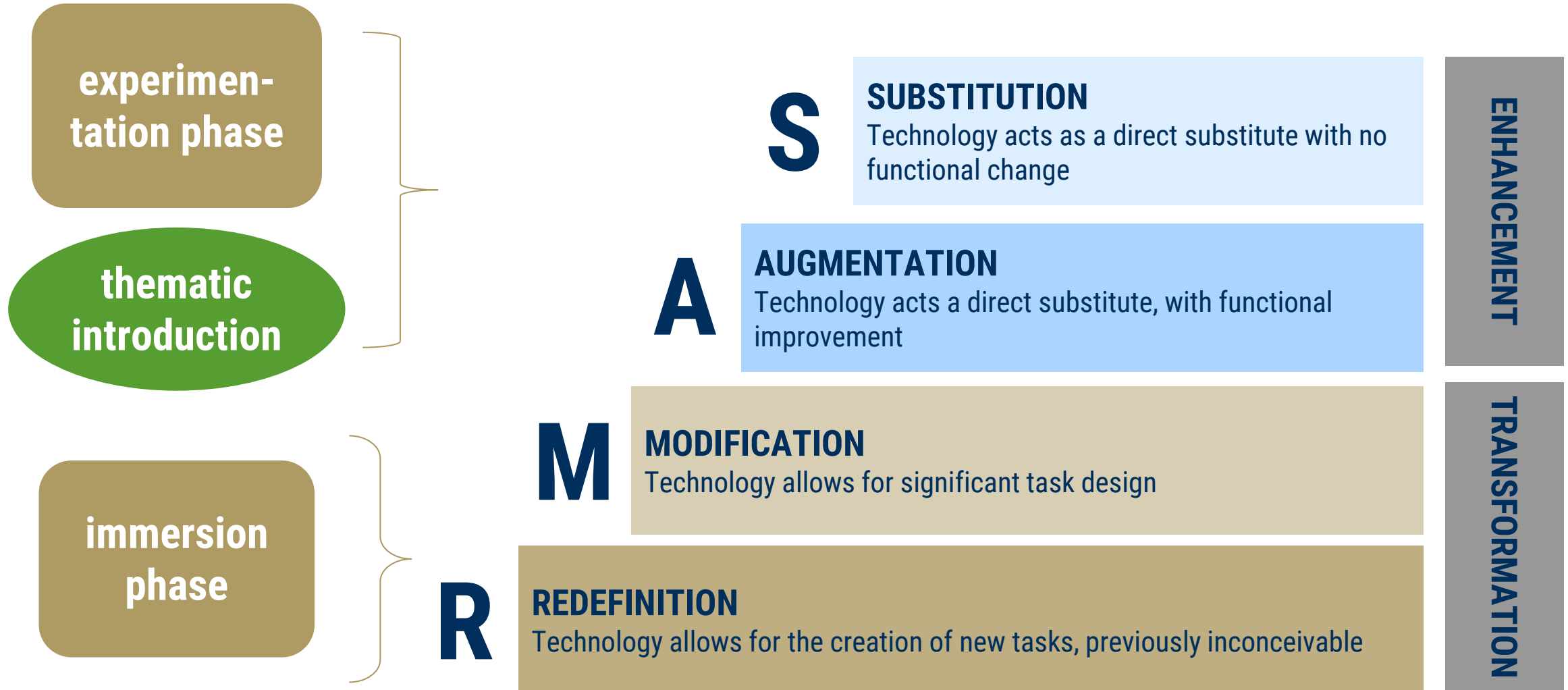
30 min

discussion
and feedback

- ❖ clarifying any questions and problems concerning the tasks
- ❖ **feedback** and goodbye

15 min

3. digitalization and expansion of the student laboratory – the SAMR-model for integration of learning technology



3. digitalization and expansion of the student laboratory – evaluation of the concept

study format

- sample group N = 100- 150, about four or five school classes
- pre-test, intervention, post-test design (follow-up possible)
- allocation of the school class into two groups:
 - prolonged experimentation phase
 - experimentation phase + immersion phase
- comparison of the results of the two groups

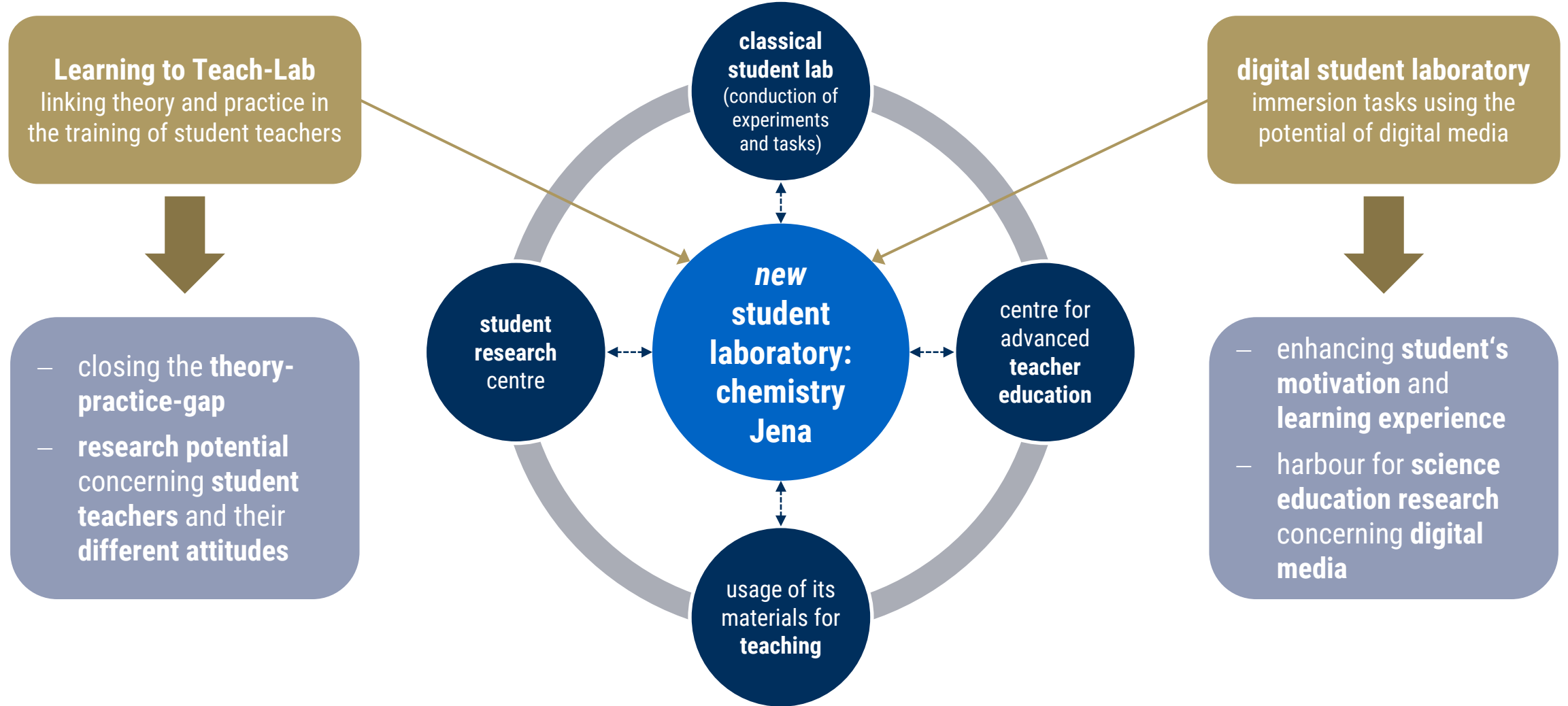


research question: does the combination of experimentation and immersion phase improve the students' learning in comparison to a pure experimentation phase ?

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references

- O. J. HAUPT, J. DOMJAHN, U. MARTIN, P. SKIEBE-CORRETTE, S. VORST, W. ZEHREN, R. HEMPELMANN, *MNU Journal* **2013**, 66, 324-330.
- B. PRIEMER, J. ROTH, in: *Lehr-Lern-Labore. Konzepte und deren Wirksamkeit in der MINT-Lehrpersonenbildung*, **2020**, Berlin, 2-7.
- A.-K. BRÜNING, in: *Beiträge zum Mathematikunterricht 2017*. U. Kortenkamp, A. Kuzle (Eds.), **2017**, WTM, 1377.
- J. BAUMERT, M. KUNTER, M. (2006), in: *Z Erziehungswiss*, **2006**, 4, 482.
- A. KREIS, F. STAUB (2013), in: *PraxisWissen Schulleitung*. A. Bartz, M. Dammann, S. Huber, T. Klieme, C. Kloft, M. Schreiner, **2013**, 33(3), 1-13.
- M. SIMON, V. WOEST (2020), in: *Naturwissenschaftliche Kompetenzen in der Gesellschaft von morgen. Gesellschaft für Didaktik der Chemie und Physik, Jahrestagung in Wien 2019*. S. Habig, **2020**, University Duisburg-Essen, 170-173.
- HAMILTON, E. R., ROSENBERG, J. M., AKCAOGLU, M. (2016). The Substitution Augmentation Modification Redefinition (SAMR) Model: a Critical Review and Suggestions for its Use. *TechTrends* **60/5**, 433–441.
- M. LEUCHTER & V. ZUCKER (2018): Lehr-Lern-Labore als Orte der fachdidaktischen MINT-Lehramtsausbildung. Förderung von Kompetenzen Lehramtsstudierender hinsichtlich des Diagnostizierens und Rückmeldens. In: *Mathematisch-Naturwissenschaftlicher Unterricht (MNU)* (06), S. 364–369

Thank you for your attention!



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