What is it that we call simulation-based teaching and learning?

Preliminary results from a systematic-narrative hybrid literature meta review – work in progress

Elisabet Malvebo

Doctoral student Malmö univ, CAKL

Educational developer at SNWC

Marie Leijon

Associate professor Educational sciences

Malmö univ, CAKL

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Why this review project?

The aim is to get an organized overview of the nature of the research done in the field of simulation-based teaching and learning in academic education to professions, with an entry from higher education pedagogy.

A critical, interpretative and integrative approach.

Evidence-informed practice - what we research paves the way for educational development!

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RQs

1. Why, what and how is researched within simulation-based teaching and learning?

2. What similarities, differences and gaps can be identified in this body of research?

3. What takeaways are there?

So, it is not about ’what works’, typical of an aggregative review, but instead a configurative approach, what is’.

(Levinsson & Prøitz 2017)

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A few definitions

Simulation

Interaction with a real or virtual object, device, or person and the opportunity to alter the flow of this interaction with the decisions and actions made by learners

(Heitzmann et al., 2019, in Chernikova, 2020).

Simulation as educational tool

Simulation as an "educational tool or device with which the learner physically interacts to mimic real life" and in which they emphasize "the necessity of interacting with authentic objects"

(Cook et al.,2013, p. 876).

Simulation-based teaching

Simulation is used to offer "opportunity to alter and adjust some aspects of reality in a way that facilitates learning and practicing (e.g., they address less frequent events, shorten response time, provide immediate feedback to the learner, etc.)"

(Chernikova et al., 2020, p.502).

Simulation-based learning

Simulation in education understood as "knowledge application in more or less complex situations"

(Chernikova et al., 2020, p.499).

Simulator

A computer program or a device or a space that replicates or mimics the behavior of a real-world system or process or space.

(ChatGPT 3.5)

Learning environment

Dimensions that together help shape the learning situation, (where teachers and students are agents); the pedagogic, social, physical and digital/technological dimensions

(Olsson, 2022)

Higher education

Tertiary/post-secondary formal education conducted at universities and colleges.

(UHR.se)

Design (for learning)

All arrangements and resources that are thought of, produced and used by teachers in different contexts to support learning processes.

(Selander & Kress, 2017)

Review

A "secondary analysis of explicit knowledge".

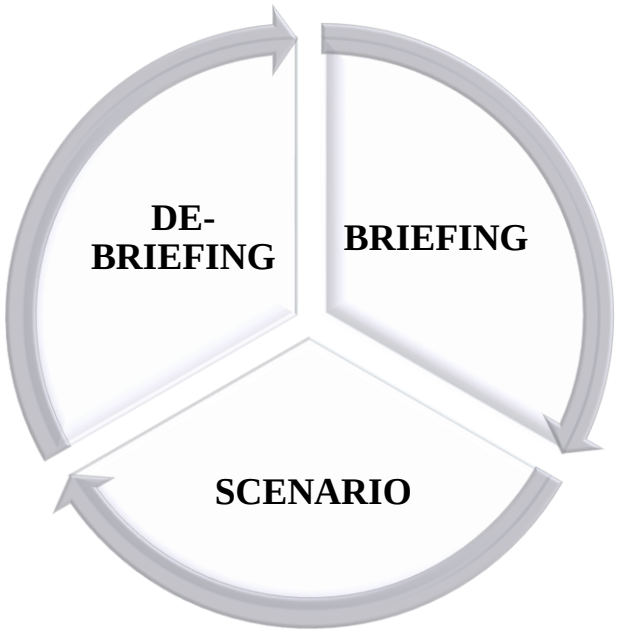
(Jesson, Matheson, & Lacey, 2011, p.9)

Evidence-informed practice

Teachers' critical stance on how research results can enlighten teachers and open new perspectives for their actions.

(Levinsson, 2013)

SBTL on the surface



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Simulated learning environment

"If the **power of simulation** is to be fully realized, it is vital that it be used in ways that are consistent with principles of educational science and effective teaching practices. It is expected that with the basic knowledge of educational science presented in this article, through selected **education and learning theories and principles**, the clinician **educator** will have an **enhanced understanding of how to design educational simulation experiences** such that they focus on the learning process and guide teaching practice. Further, this article presents the clinician educator with application-based information on **key elements of the teaching and learning process**, inextricable from educational science, which facilitate the **motivation** to learn, **construction of knowledge**, **deep learning**, and **retention** of accurate and appropriate information. The information herein also highlights the role that **prior knowledge** plays in the construction of new knowledge, the value and essential components **experiential learning, reflection,** the relationship between **intrinsic motivation** and **deep learning,** and **situated learning**. It is expected that the reader will apply the information to **strengthen** the **impact of their teaching on the learning of those they teach** and their subsequent **competency** in the required skills of clinical medicine to better **facilitate** achievement of patient care outcomes."

(Pasquale, 2015, p.11)

Simulated learning environment

“If the **power of simulation** is to be fully realized, it is vital ... used in ways that are
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Further, this article ... ication-based information on
key elements of the teaching ... icable from educational science,
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retention o ... highlights
the role th ... the construct ... value and
essential c ... **rning, reflect** ... en **intrinsic**
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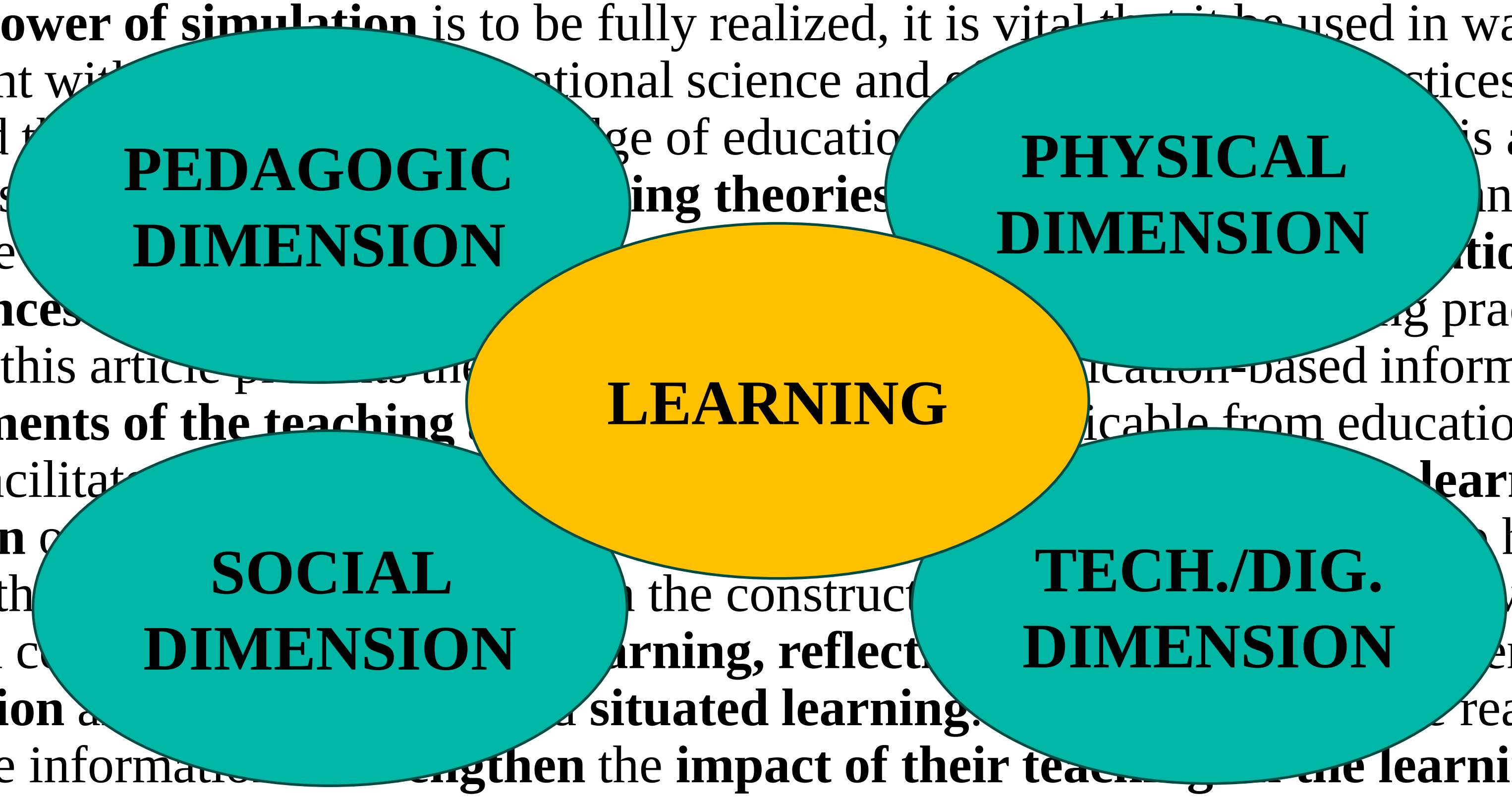

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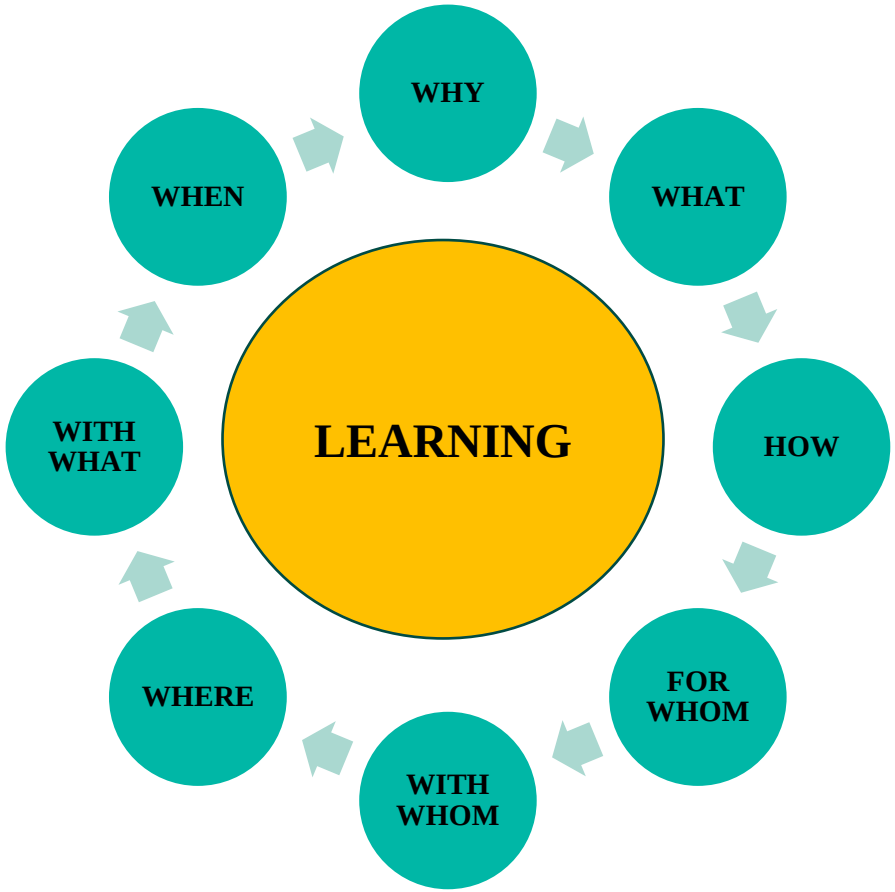
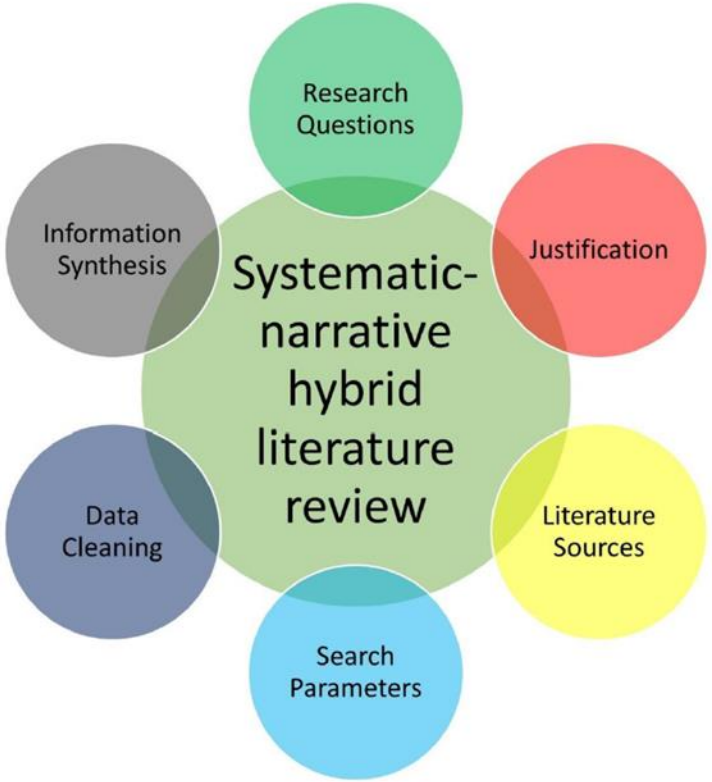
Designing for learning



Animated illustrations by Creative Commons

The systematic-narrative hybrid review method

A collaborative systematic review method holding robustness of a traditional systematic review analysis and the synthesis of a qualitative or narrative analysis.



Key elements of the systematic-narrative hybrid literature review approach (Turnbull et al., 2023, p.2).

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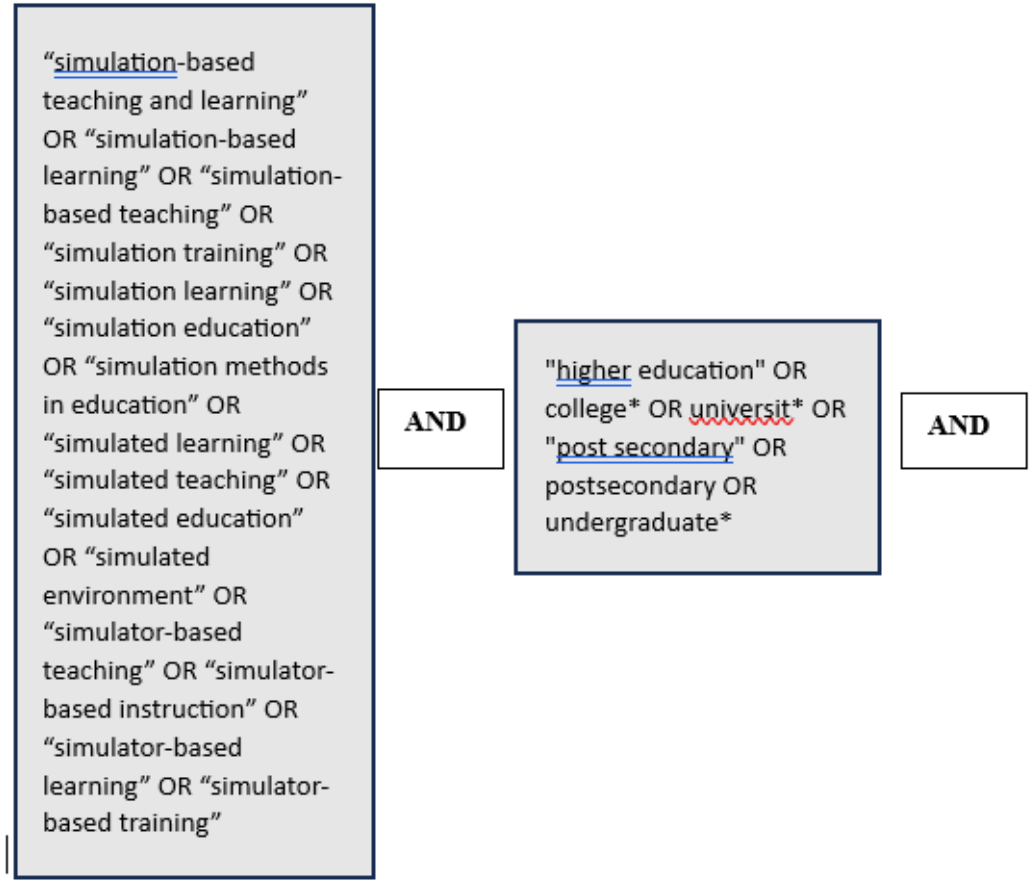
Search components



- Jan. 1st, 2013 to Feb. 1st, 2024
- SCOPUS, ERC, ERIC
- English, Swedish, Norwegian, Danish
- Peer reviewed, published, accessible
- Exported to Covidence

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Guide

WHY

aim and RQ, review type, for whom, what discipline, focused on simulation or comparing methods

WHAT

type of sim, expected learning outcomes, aspect, modes etc.

HOW

type of study, theory, publication where and when

RESULTS

type of analysis, synthesis and discussion, further research

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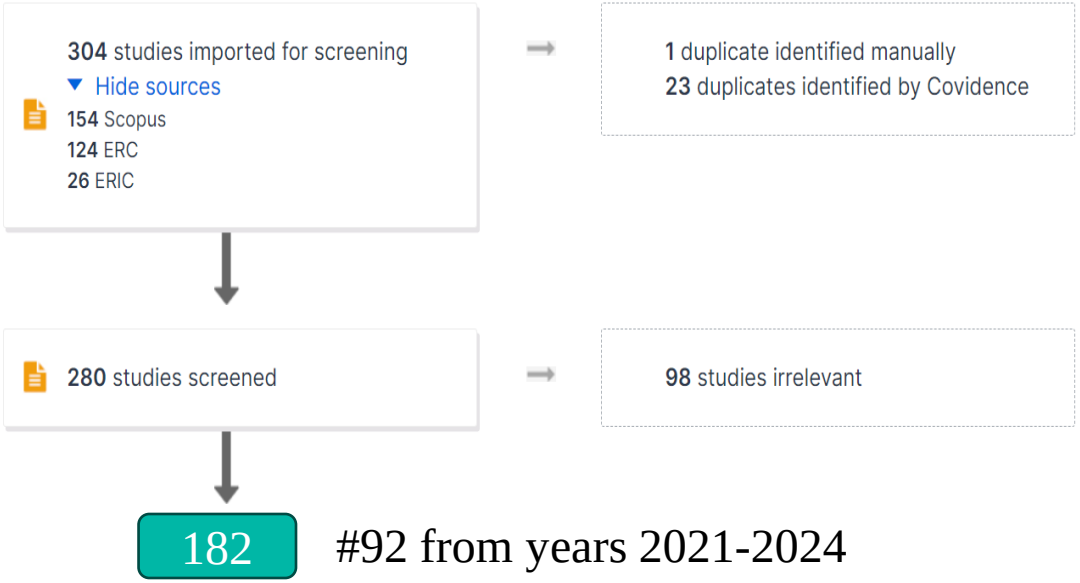
Tentative results



182 #92 from years 2021-2024

Cohen's Kappa: 0.48397

- Seems to be more quantitative reseach in our bulk of articles.
- Is dominated by health disciplines - or is it just easily accessible articles?
- Seems to be many international author collaborations.
- Terminology and definitions unclear.
- Is interested in value of SBT for learning, validity, cognitive-psychomotor skills, soft skills etc.
- De-briefing seems to be the focus.
- Three major perspectives: teacher, student, technology.
- Builds on a few educational theories.

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Examples of studies

Comparative effectiveness of instructional design features in simulation-based education: Systematic review and meta-analysis (Cook et al., 2013)

Simulation-Based Learning in Higher Education: A Meta-Analysis (Chernikova et al., 2020)

Impact of scenario validity and group size on learning outcomes in high-fidelity simulation: A systematics review and meta-analysis (Au, M. L. et al. 2023)

Healthcare students' perceptions and experiences of making errors in simulation: An integrative review (Palominos et al., 2019)

The effectiveness of simulation-based training on the competency of military nurses: A systematic review (Niu et al., 2022)

Mapping the Terrain of Faculty Development for Simulation: A Scoping Review (Gardner et al., 2024)

ON FIDELITY…

Fidelity encompasses “different facets related to the simulation activity, including the characteristics of the simulator that mediate sensory impressions (visual, auditory, olfactory, and tactile/haptic), the nature of the learning objectives and task demands, the environment, and other factors that might affect learner engagement and suspension of disbelief. Labeling a simulation as ‘‘high fidelity’’ conveys such diverse potential meanings that the term loses nearly all usefulness. Based on our experiences during this review, we suggest that researchers and educators employ more specific terminology when discussing the physical and contextual attributes of simulation training.”

(Cook et al., 2013, p.853)

ON TEACHER COMPETENCE…

While the included studies featured multiple disciplines and professions learning with each other to become better simulation faculty, there remains significant further potential to develop and extend explicit and intentional interprofessional approaches in simulation FD. Simulation FD programs can provide positive interprofessional learning experiences for faculty while modeling thoughtful and explicit interprofessional education, potentially creating interprofessional communities of practice. Thus, we recommend creating truly interprofessional programs by creating venues and activities that allow participants from different professions and specialties to learn from and with each other.

(Gardner et al., 2024, p.86f)

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Across the 4 domains identified as critical (professional values and capabilities, healthcare and simulation knowledge/principles, educational principles applied to simulation, and simulation resources and environments), debriefing and curriculum design are just 2 areas listed along with 36 other specific competencies expected for simulation educators. In addition, Kinnear et al found that the minimum components of any FD course in simulation should include (in order): scenario design, creating a supporting learning environment, debriefing, human factors, feedback, and communication. Our findings indicate that no studies are meeting these expectations within one FD program, resulting in ample opportunities to expand course content to align with expert- and society-driven recommendations.

(Gardner et al., 2024, p.84)

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ON STUDENT ERRORS…

Despite the negative feelings experienced by some students regarding making mistakes in SBL, there were key factors that minimized the impact of these feelings and transformed mistakes into learning opportunities. These included: the provision of a safe and non-threatening learning environment where constructive feedback was provided by skilled educators, and where students were supported to take responsibility for their mistakes. The take-home message from this review is that it cannot be assumed that SBL is a safe experience where learners are able to make and learn from their mistakes. Optimizing learning from mistakes in SBL requires a deliberate and thoughtful approach in which educators plan for and support learners to recognize, acknowledge and respond effectively to errors.

(Palominos et al, 2019, p.38)

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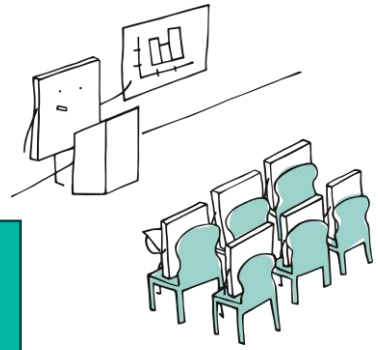
Tracing educational theories in the results

- Experiential learning, by Kolb
- Situated Learning, by Lave and Wenger
- Reflection on action/in action, learning through reflection, by Schön
- Tacit dimension of knowing, by Polanyi
- Praxis and acquiring expertise and mastering complex skills, by Lave
- Teaching as a design science, by Laurillard

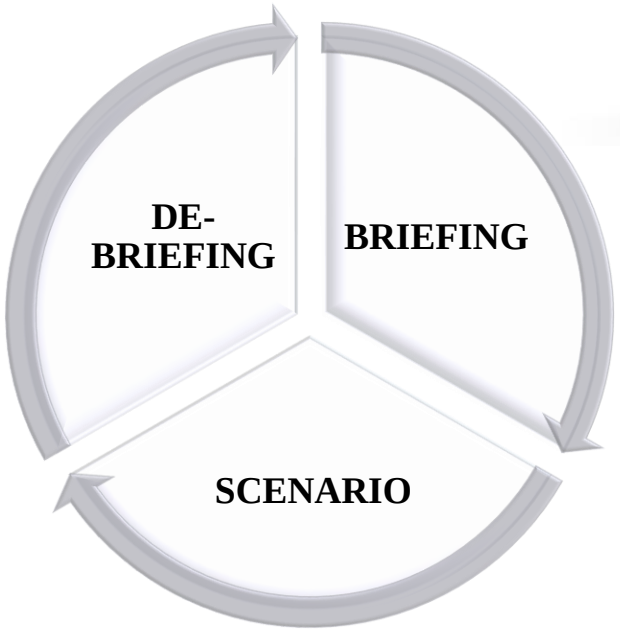
Under the surface

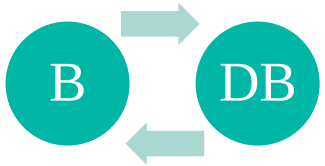
How can learning be understood to strengthen the teaching?

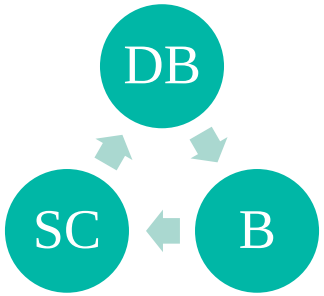
Learning what?
Build on prior knowledge
Reflect before



Learning through reflection
Learning together with and from others
Reflect after







Reflect on oneself and the situation.
Metacognitive skills
Reflection-in-action

Learning through experience
Learning where, when, how, with whom, with what
Reflect during

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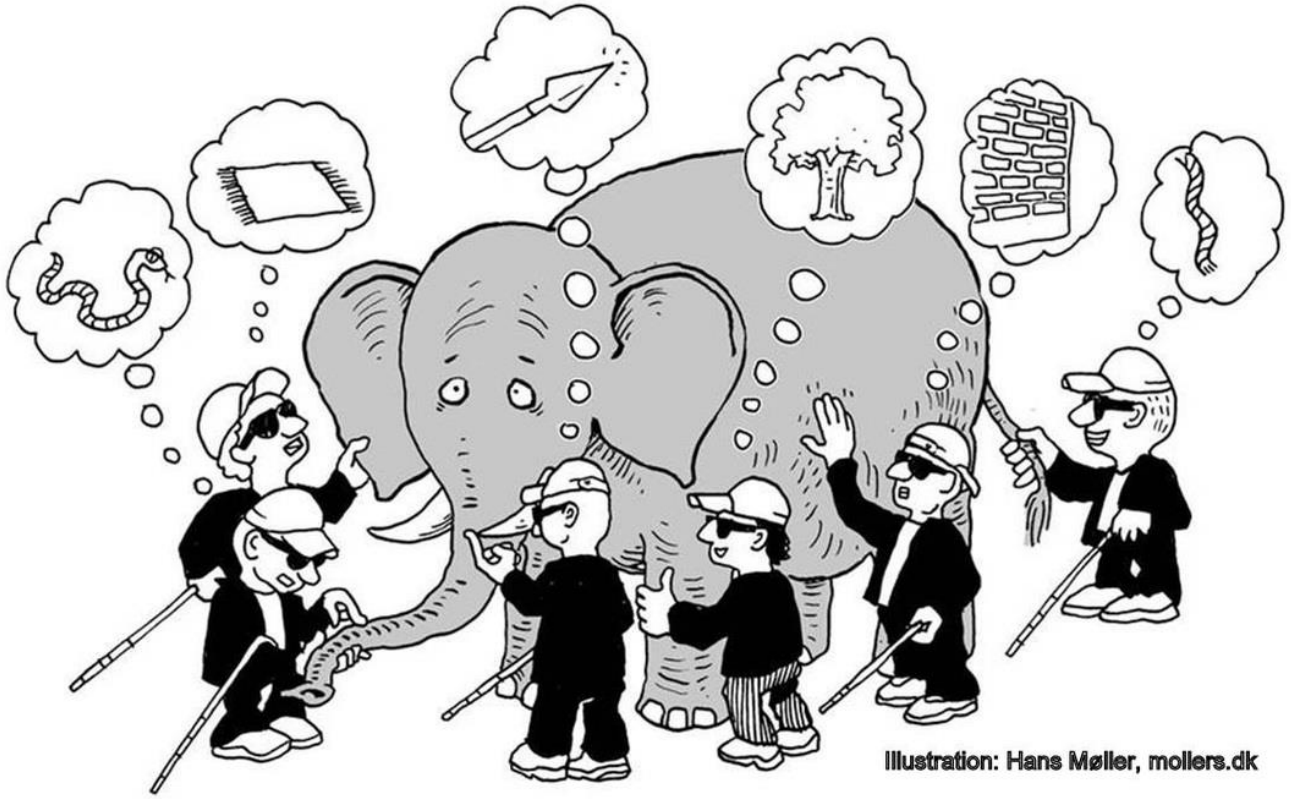
How do we understand results?



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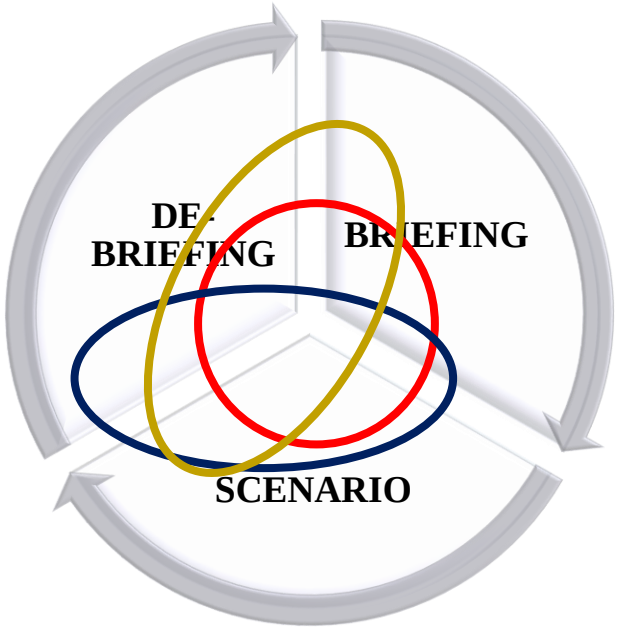
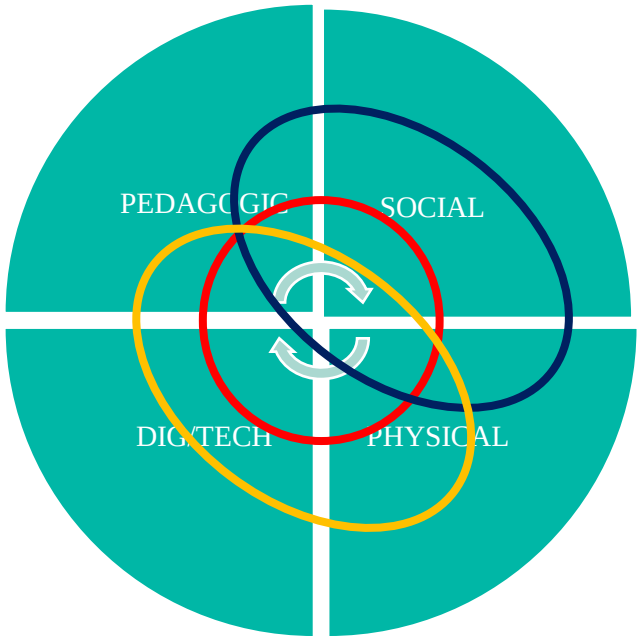
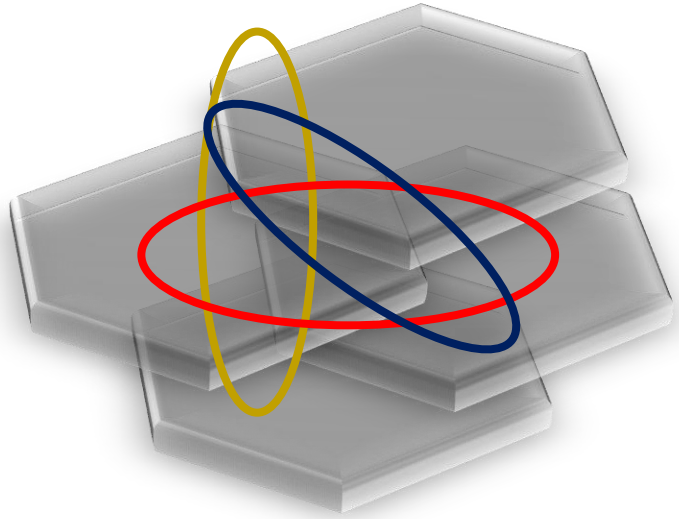
Analysis?







What/which of the three phases of SBTL is researched, and how?

What/which of the learning environment dimensions is researched, and how?

How do we cut the cake?

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Researching learning is difficult - SBTL not excluded

How teaching unfolds is largely situation-dependent in unique encounters between teachers and students around specific content. There will always be a need for critical distance between scientific findings and considerations of how teaching can evolve, as teaching primarily depends on how professional judgment—exercised on-site by a teacher—can interpret the scientific findings that may be relevant.

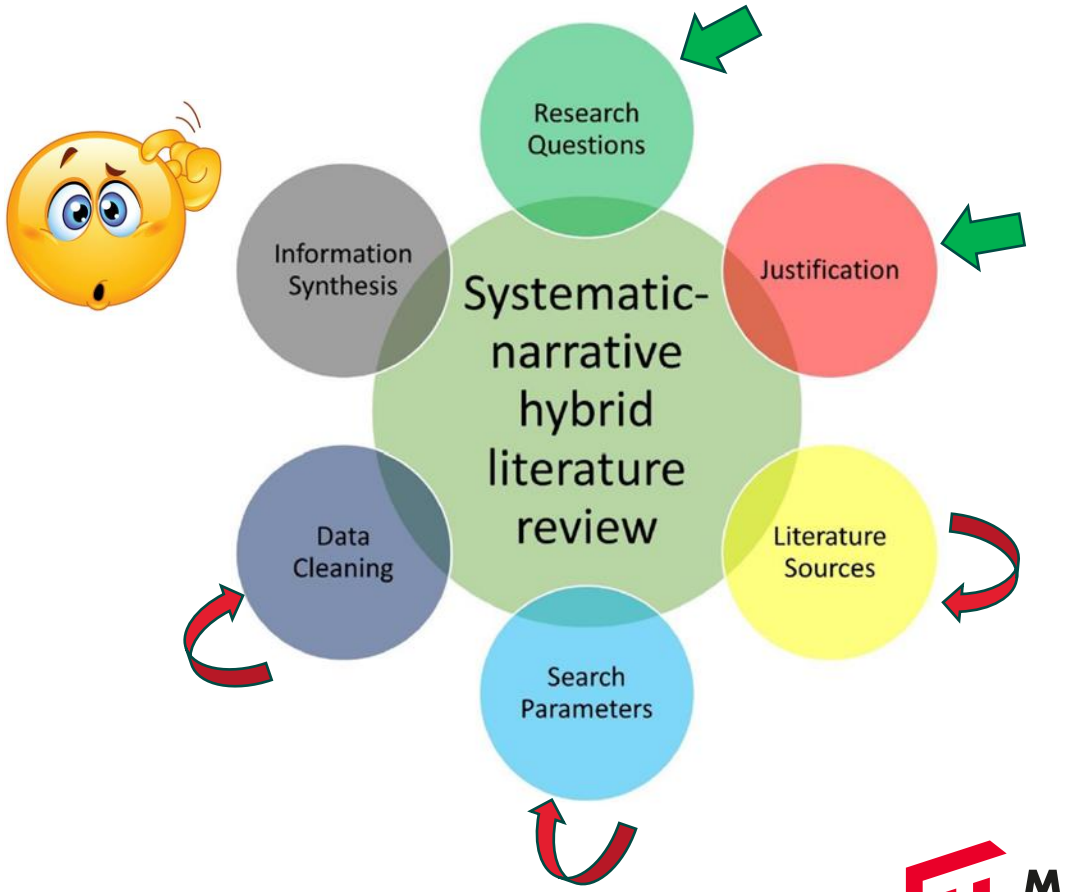
(Lindberg-Sand 2023, p.52) [translated from Swedish by ChatGPT 3.5]

The problem is that there is no definite relationship between such ready-made, generally described methods and results, which has been assumed. The lack of a general relationship between educational methods and educational outcomes is probably the most well-established research finding in all educational research.

(Svensson, 2009, s. 154) [translated from Swedish by ChatGPT 3.5]

Next steps

- Full text review ongoing
- Extraction and focused analysis
- Updated search to cover Feb. 3rd 2024 + 6 months
- Additional database(s)
- Additional desktop search
- Thematic analysis
- Synthesis and conclusion



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Discussion

1. Thoughts on this project, its aim and research questions?

2. How can higher education pedagogy research contribute to development of teaching and learning in the simulated learning environment?

Literature

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