



Authentic Teaching in STEM Education – factors for success

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Teaching for authentic learning

- provide a real-world context (Rule, 2006; Resnick, 1987; Young, 1993; Harley, 1993)
- open learning environment with opportunities for students to consult with experts (Collins et al., 1989) and encounter different perspectives
- the tasks should be complex, and assessment should be integrated into activities (Herrington & Oliver, 2000)
- get to face real challenges with their task and thereby develop their thinking and acquire new knowledge (Rule, 2006)
- encounter "wicked problems" (coined in Rittel & Webber, 1973) and authentic ways of working, such as group work and debating, in a way that highlights the complexity of tackling these issues (Herrington & Herrington, 2006; Pitchford et al., 2021, Lönngren, 2021, Peters & Tarpey, 2019)



The theoretical frame

- Provide an authentic context that reflects the way the knowledge will be used in real life,
- Provide authentic tasks and activities,
- Provide access to expert performances,
- Provide multiple roles and perspectives,
- Support collaborative construction of knowledge,
- Promote reflection to enable abstractions to be formed,
- Promote articulation to enable tacit knowledge to be made explicit,
- Provide coaching and scaffolding,
- Provide for authentic assessment of learning. (Herrington & Oliver, 2000 and Herrington et al., 2010)



The aim of the study

The present work concerns a follow up study where we studied what emerged in teachers' descriptions of their teaching for authentic learning.

Teachers must dare to let go, relinquish control over the teaching, planning and assessment (Engström and Lennholm, 2023). In addition (and arguably the most crucial factor), they must have the full support of the management as well as back-up resources. The management's support in respect of contacts, skills and resources, acceptance, and self-assurance.

The aim was to explore what patterns appeared as enablers of authentic teaching. What emerges in teachers' descriptions of their teaching for authentic learning?

The aim of listening to more teachers about how they work for students' authentic learning and why, as well as what enables their teaching. The same theoretical framework for what may characterize the teaching was used; the "nine guiding design elements" by Herrington & Oliver (2000) and Herrington et al. (2010).

Methodology

- Six natural science- and technology teachers, teaching at all levels of primary and secondary education.
 - With an interest and experience in teaching for authentic learning.
 - Partly using Herrington and Oliver's nine guiding elements, and partly as an inductive thematic analysis aimed at finding patterns in teachers' statements related to what enables authentic learning.
 - The questions asked and discussed were: What examples of authentic themes have you taught? Describe what was taught and how the students worked. Can you describe how you think about such teaching? What is important and how do you assess it? What do you think is important for you to teach for authentic learning? Why do you think you do it and want to do it?
- The aim was to find themes related to what characterises teachers' described teaching related to the nine elements, as well as what enables and otherwise characterises teachers' teaching.



Results



We found four themes:

- *Dare to let go*, "dare to not know", find answers together with the students, being unpretentious and daring to trust oneself.
- *Strong leadership*: the teacher's own strong leadership/mandate or that the school leadership actively supports, but also that the teacher has a soulmate, a colleague who supports and collaborates.
- *Need for contacts*, contacts outside the school. very different actors, entrepreneurial skills as fundamental, local businesses could contribute to schoolwork, including being a future employer for students, a dividing line can thus be discerned in terms of whether teaching for authentic learning should involve private companies or not.
- *View on teaching in the subject*. the strong desire to include all students, provides explanations through experiences with multiple senses, listen to students and start from their questions and interests, students must "understand life.", an "unconventional culture", teachers who do not think like others, highlight their difference from other colleagues or many of the teachers who are newly graduated.

We also present results about how the teachers' descriptions of their teaching relate to the nine guiding elements presented in Herrington & Oliver (2000) and Herrington et al. (2010)

- Provide access to expert performances, that was less apparent in the interviews. The teachers communicated and collaborated with the expert, but students more seldom get to work with people outside of school.

Discussion

- All teachers consider the authentic project and approach to be central in teaching, with the curriculum being somewhat squeezed in.
- Often feeling alone in their role and their approach to teaching. Colleagues may express scepticism, concerns about losing control, or believe that the approach is demanding.
- Newly graduated teachers may find it challenging to embrace authentic teaching.
- What did not seem to be fully enabled was students' opportunity to truly collaborate with actors outside of school.
- When students did not interact with different actors and interest groups in their concrete work, when they were not challenged in discussions by actors outside of school, they may have difficulty fully grasping the complexity and challenges of the tasks they are working on.
- The tasks, activities, and examples risk remaining school assignments with an authentic touch rather than authentic work.



