

The Affective Environment that Encourages Engagement in Science Learning

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The Theme for the 2019 symposium is
Supporting thinking with different age groups.

With a focus on the nexus of cognitive and
affective domain, first I ask the question:

What affective states support thinking?

Research has shown that information process can be *initiated, recalled, selected, disrupted or terminated* by different emotional states (Pekrun et al. 2002).

For example, **negative affective states**, such as anger, anxiety and boredom, can cause task-irrelevant thinking,

while **positive affective states** such as enjoyment and curiosity have negative association with task-irrelevant thinking and help attention flow (Zeidner 1998).

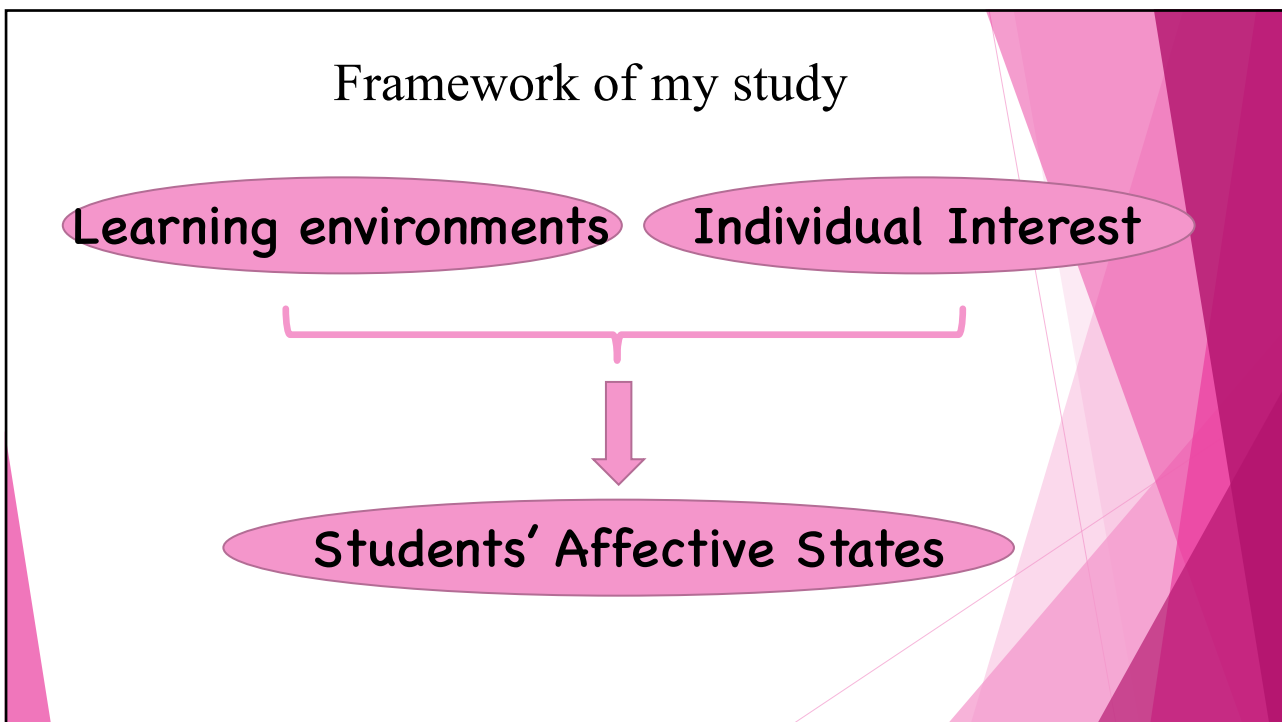
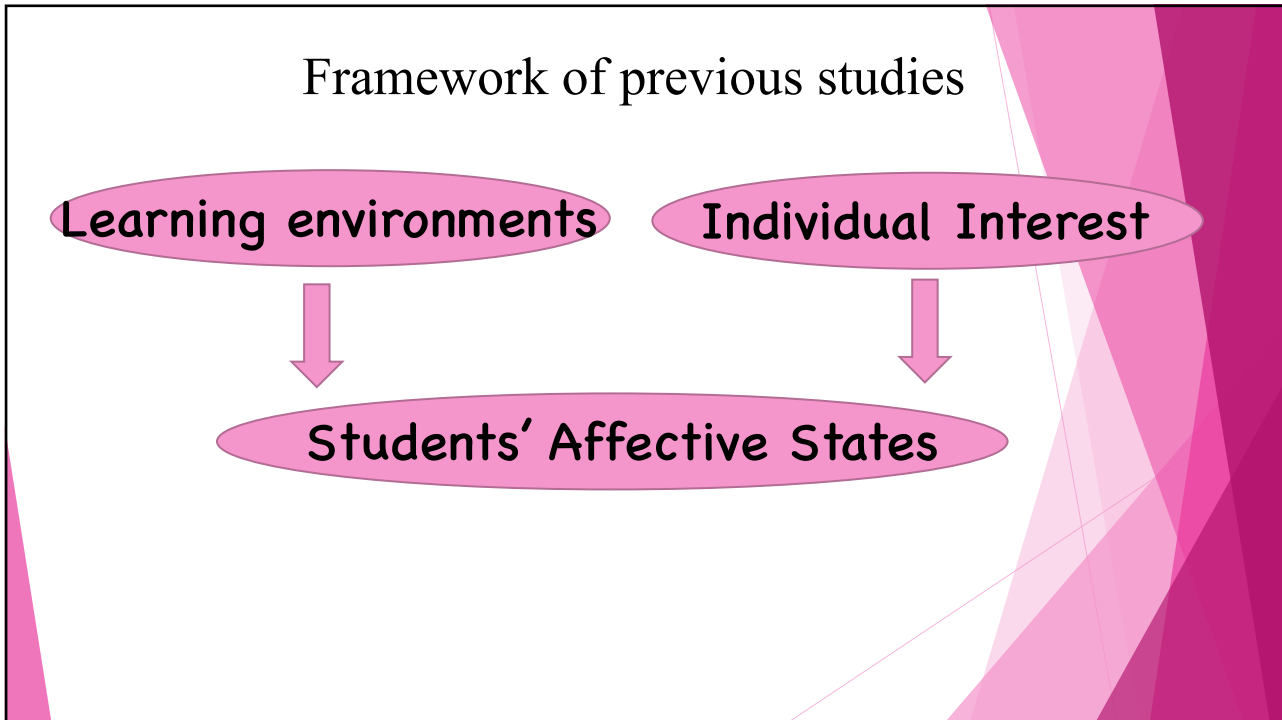
How to arouse positive affective states to support thinking?

Hascher (2010) observed that learners' learning processes 'are evoked by **teacher instruction, partner work, classroom discussions, single learning activities, achievement situations**, etc., and these situations elicit a variety of emotions like *pride, anger, frustration, happiness, and sadness*' (p. 18).

Hascher's observation demonstrates a strong connection between *learning environments* and student *affective states*.

Another factor that contributes to student affective states is **individual interest**.

Hidi and Harackiewicz (2000) found that students with individual interest in a particular topic enjoyed their involvement with the topic to a greater degree.



Research questions:

What types of *interplay* of learners' individual interest and the Learning environments *result in positive* learner affective states?

What types of *interplay* of learners' individual interest and the Learning environments *hinder positive* learner affective states?

Findings are based on *in-depth interview* with 9 pre-service teachers. The interview was about their own science learning experiences at secondary schools.

An example of the interview questions:

Was there a science lesson, which you were interested at the beginning of the lesson, but felt disappointed during the lesson? What do you think made the change?

Six types of interplay were identified

Name of the types	descriptions
P1–Selfsustained	Individual Interest is strong enough to diminish or ignore the negative impact of Learning Environment, leading to positive affective states
P2–Beyond expectation	Strong Learning Environment support exceeds the expectations set by Individual Interest
P3–Resonant	Individual Interest resonates with or is supported by Learning Environments in one way or another
N1–Adversely overpowered	Detrimental or conflicting Learning Environment outweighs Individual Interest that results in negative affective states
N2–Below expectation	Learning Environment does not meet the expectation set by Individual Interest
N3–Irresponsive	Learning Environment does not respond to the requirements set by Individual Interest

P1 - Selfsustained - Individual Interest is strong enough to diminish or ignore the negative impact of Learning Environment, leading to positive affective states

Ruby saw herself as a biology-lover. However, the learning environment for her was not a favourable one. Ruby did not receive much support from peers and she had experienced a personality clash with her science teacher. However, these issues seemed not to have much impact emotionally on her in most learning situations with biology:

"It was something that I liked, so I could stay committed and focused to it"

P2 - Beyond Expectation - Strong Learning Environment support exceeds the expectations set by Individual Interest

Jake recalled a secondary science lesson which involved explosion and gave him a chance to see things that he would not normally see at home. Jake made a comparison between this lesson and primary school science he had experienced. It is evident that this lesson exceeded Jake's expectation about science teaching.

"Coming from primary school where we did science but it was always sort of more like backyard science, ... making volcanoes and stuff. ... In secondary ... I was starting to see things that I wouldn't normally see at home, and it was really fun"

P3 - Resonant - Individual Interest resonates with or is supported by Learning Environments in one way or another

Jessie was particularly interested in the topic of evolution and the way the topic was taught also allowed her to contribute to the classroom debate. Her Individual Interest was supported by the cognitive learning environment, which resulted in an enjoyable situational experience.

Jessie: It was a science lesson and I liked it when we did the evolution stuff. That was interesting.

Interviewer: Was there a debate about it?

Jessie: Yeah especially with the very religious people in the class. I liked that because that's interesting to me.

N1 - Adversely overpowered - Detrimental or conflicting Learning Environment outweighs Individual Interest that results in negative affective states

Interviewer: If we're thinking about secondary school lessons, what's an example of a bad one that you didn't much like?

Emmy: Probably on evolution. I'm a Christian and ... it was mainly the way that the teacher was teaching it, and he wasn't really emphasising it as a theory, he was sort of stating it as fact. I found that very hard. ... That was probably the one I didn't like the most.

N2 - Below Expectation - Learning Environment does not meet the expectation set by Individual Interest

Bella also expressed her disappointment to secondary science teaching while making a comparison between her own expectation of science being fun and magical, and high school teaching where all the fun aspects were taken out of science:

I love watching things, like biology things on National Geographic. And I love finding out about the natural world and I think it's really interesting learning about the universe and all these science things. You didn't get to hear about that in high school. Suddenly "you're old enough so now we take all the fun aspects out of it". And I think I very much grew up believing in magic and wondering how everything came to be and I'm agnostic and I wondered about that. And it [secondary school science] just sort of stripped away all the wonder of it and made it boring.

N3 - Irresponsive- Learning Environment does not respond to the requirements set by Individual Interest

Emma wanted to become a vet and therefore chose chemistry in year 11. She had the willingness to do chemistry well. However, she did not have many productive positive affective experience.

The year 11-12 group that I went through with, we'd help each other out and we were very supportive of one another. The teacher was great, although not great at teaching. ... he was very boring and not very engaging ... He's a friend of mine. ... It was very boring and I used to fall asleep in chemistry classes and he'd throw dusters at me to wake me up. ... Well we'd have a bit of a chuckle.

Some thoughts:

Positive Individual Interest does not always lead to favourable learning experiences.

Dissatisfaction and frustration are often experienced as a result of Individual Interest being ignored.

Questions and Comments?

How feasible is it to address each individual interest with responsive learning environments?

What could be the differences between primary and secondary setting in terms of the impact of these six types of interplay?

(E.g., individual interest may be more developed when the learners enter a secondary school classroom, compared with a primary classroom)

The presentation is based on a research study published in the journal *Research in Science Education* in 2018:

Ma, H. (2018). Influence of the interplay of habitual affective attributes and classroom learning environments on students' situational affective experiences in learning science: The narratives of primary pre-service teachers. *Research in Science Education* . DOI: 10.1007/s11165-018-9800-1



Thank You !