

Assessment for learning in innovative STEM

Modular presentation

STEM education is by far the most contemporary and rich discipline aiming to prepare learners for the future. It changes rapidly as society changes, while also nurturing historical perspectives. To prepare our youths for the future, STEM education must occupy greater space and play a larger role in school to allow every boy and girl the opportunity to flourish, both for themselves and for society. Understanding, developing and supporting this quest is challenging for schools, teachers and researchers. Developing instruction is key, and bridging educational research and practice gives us greater potential to succeed.

STEM education has been given high priority by governments and education policy makers worldwide for many years as it is seen as crucial to future global economic prosperity and welfare. More recently, ecological sustainability has become an increasing priority. The most important underlying assumption is that countries with dynamic economies tend to be the ones with effective education systems that prioritize STEM education. However, STEM is a contested concept, it is undefined and context-specific, with different driving forces and limitations in different socio-political contexts. Therefore, many education systems face profound challenges in helping students understand how to solve real authentic problems using knowledge gained through STEM disciplines, which is why the importance of including STEM in education cannot be underestimated.

It is well known that embedding assessment for learning assessment into classroom instruction is central to student success; however, this is not as simple as it seems. This course highlights the complexity of embedding assessment for learning in daily practices and provides participants with tools to embed assessment for learning in their daily instructional practices. Furthermore, by combining theory and practice, it provides some suggestions on how to provide affordances for teachers' classroom assessment practices to bridge teaching and learning in STEM education.

MODULE	CONTENT	LEARNING OBJECTIVE	METHODOLOGY
Introduction and course overview	Assessment for learning STEM education Research and practice Acknowledging context by learning from each other's educational systems	To develop and put into practice the understanding of the theory and science behind assessment for learning in STEM.	<ul style="list-style-type: none"> ✓ Workshop ✓ Lectures ✓ Hands on activities ✓ Guest lectures
Five key strategies for formative assessment	Theory and practice. Practice with theory 1. Clarifying, sharing, and understanding learning intentions and success criteria. 2. Engineering effective discussions, tasks, and activities that elicit evidence of learning. 3. Providing feedback that moves learning forward. 4. Activating students as learning resources for one another. 5. Activating students as owners of their learning.	To develop and put into practice the understanding of the theory and science behind assessment for learning in STEM. To develop participants' self-efficacy and assessment literacy to enable embedment of assessment for learning in their teaching practices. To widen participants' repertoire of forming learning activities promoting students' learning in STEM.	<ul style="list-style-type: none"> ✓ Workshop ✓ Lectures ✓ Hands on activities
Engineering effective discussions, tasks, and activities that elicit evidence of learning within the STEM contexts.	Exploration of various theories and practices of STEM education. Hinge questions Concept cartoons	To develop and put into practice the understanding of the theory and science behind assessment for learning in STEM.	<ul style="list-style-type: none"> ✓ Workshop ✓ Peer work ✓ Individual work ✓ Hands on activities

	<p>Practical STEM</p> <p>Validity</p>	<p>To develop participants' self-efficacy and assessment literacy to enable embedment of assessment for learning in their teaching practices.</p> <p>To widen participants' repertoire of forming learning activities promoting students' learning in STEM.</p>	
<p>Clarifying, sharing, and understanding learning intentions and success criteria.</p>	<p>Theory and practice regarding Clarifying, sharing, and understanding learning intentions and success criteria, including worked examples and concept cartoons</p>	<p>To develop participants' understanding of how assessment for learning can be put into practice to elicit evidence of students' comprehension, and how this evidence can be formatively applied together with students in the classroom.</p> <p>To develop participants' understanding on how to phrase, evaluate and implement different pedagogical techniques in the classroom for example hinge questions and feedback, which are essential to the assessment for learning approach in STEM.</p>	<ul style="list-style-type: none"> ✓ Workshop ✓ Peer work ✓ Hands on activities

Peer assessment in STEM	<p>Experiencing different techniques to embed peer assessment.</p> <p>Experience peer assessment from learners' point of view.</p>	To develop participants' understanding on how to phrase, evaluate and implement different pedagogical techniques in the classroom for example hinge questions and feedback, which are essential to the assessment for learning approach in STEM.	<ul style="list-style-type: none"> ✓ Workshop ✓ Peer work ✓ Individual work ✓ Hands on activities
Experiencing and critiquing learning activities	<p>Practical and theoretical STEM</p> <p>Inquiry and direct instruction</p> <p>Educational resources</p>	Building repertoire.	<ul style="list-style-type: none"> ✓ Peer work ✓ Individual work ✓ Hands on activities ✓ Guest lectures ✓ Study visits (school and museum) ✓ Outdoor activities
Exploring and critiquing educational resources including educational technologies	Exploring different digital tools for assessment for learning	To widen participants' repertoire of forming learning activities promoting students' learning in STEM.	<ul style="list-style-type: none"> ✓ Workshop ✓ Peer work ✓ Individual work ✓ Hands on activities
Designing and evaluating learning activities	Designing their own learning module/activity. One theoretical and one practical where assessment for learning is embedded.	To widen participants' repertoire of forming learning activities promoting students' learning in STEM.	<ul style="list-style-type: none"> ✓ Peer work ✓ Individual work

Outdoor and extra mural activities in STEM			<ul style="list-style-type: none"> ✓ Workshop ✓ Hands on activities ✓ Study visits (school and museum) ✓ Outdoor activities
Practical STEM	Indoor and outdoor STEM activities.		<ul style="list-style-type: none"> ✓ Workshop ✓ Hands on activities ✓ Outdoor activities
Supporting students' vocabulary	Importance of language in STEM, supporting second language learning in STEM.		<ul style="list-style-type: none"> ✓ Workshop ✓ Hands on activities ✓ Guest lectures