



ADVANCED STUDENT CENTERED AND TEACHING CENTERED METHODS AND THEIR ASSESSMENT



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1. Introduction

Teaching methods are the broader techniques used to help students achieve learning outcomes, while activities are the different ways of implementing these methods. Teaching methods help students: master the content of the course. learn how to apply the content in particular contexts. Learning science develops knowledge, problem solving skills, boosts critical thinking, cultivates a passion for learning, uplifts many disciplines, and holds the key to future and technology. Science also involves a lot of communication with other people and develops patience and perseverance in children. Different teaching methods like lecture method, demonstration method, inductive–deductive method, heuristic method, problem solving method, project method, etc., are used for presentation of the subject matter to the students. Students develop an understanding of why the learning is important and how they will know if they are

successful [1]. The lesson introduction provides a hook to get students thinking about the learning to come. The aim of science education is to develop and sustain the curiosity of young people about the natural world. It seeks to build students' confidence and ability in scientific enquiry and foster a sense of wonder, enthusiasm and interest in science. 'Advanced learning' describes the learning of students who learn at a rate that exceeds that of their peers in one or more content areas. The learning of these children also falls outside the need-spectrum of the majority of their peers. One of the basic motives behind advanced teaching is to motivate students to actively take part in the learning process. When the level of interaction with teachers and peers increases, students gain knowledge that is practical and also, retain more information effectively from a class[2].

2. Methods for teaching science

2.1. Lecture (teacher-centred)

Lecture method: In the lecture method, the teacher presents the learning concepts to the students. Teachers learn different concepts beforehand and explain the concepts in a classroom. The teacher will be actively involved in the lecture method and the students will be passively listening to the lectures. It is a teacher-centered method in which the teacher delivers a lecture on different topics, which makes class monotonous and students a passive learner. Hence, it could be concluded that the Lecture method is not appropriate for teaching at the primary level [3]. As the primary teaching strategy under the teacher-centered approach, direct instruction utilizes passive learning, or the idea that students can learn what they need to through listening and watching very precise instruction. An example of direct (teacher-centered) instruction is when a teacher lectures a class on how a certain class of chemicals function. The advantages of its use include that it is simple, straightforward, and can work with the material in a state-mandated curriculum. The lecture method, also known as the transmissive method, is based on vertical learning, whereby the teacher has all the knowledge – the "know-how" – which they transmit to the students. The students are considered to have everything to learn [4].

2.2. Hands-on activities (student-centred)

Learner-centered teaching methods shift the focus of activity from the teacher to the learners. These methods include: Active learning, in which students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class. There are many ways to incorporate student centered techniques into classroom resources and lessons: Allow for student choice and autonomy, use open-ended questioning techniques, engage in explicit instruction, encourage student collaboration and group projects, and encourage student reflection. Learner-centered teaching methods shift the focus of activity from the teacher to the learners. These methods include: Active learning, in which students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class. Encourage children to take responsibility for planning, setting up and packing up an activity for everyone. Ask a child to lead their favourite game or dance to their favourite song. If the child requires more support or is not comfortable leading an activity, they could share the responsibility with others. Student-centered mindsets view the learner as primary and unique agents of learning, engagement, and connection, as opposed to teacher-centered mindsets which tend to view learners as passive and uniform vessels [5].

2.3. Project Based learning (student-centred)

Project-Based Learning is a "teaching method in which students gain knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging, and complex question, problem, or challenge". Project-based learning is a student-centered pedagogy that involves a dynamic classroom approach in which it is believed that students acquire a deeper knowledge through active exploration of real-world challenges and problems. Teacher-facilitated collaborative approach in which students acquire and apply knowledge and skills to define and solve realistic problems using a process of extended inquiry. Projects are student-centered, following standards, parameters, and milestones clearly identified by the instructor [6]. A teaching method that focuses on creating connections with students' interests and the things they learn in school. The ultimate goal is to make the educational process more meaningful to students. This type of project allows students to learn about different types of technology and how to use them. Creating and producing a podcast is an example of a technology project. Students research the topic, develop the script, record, and then publish the podcast. gives students the opportunity to decide two things: what material they learn and how

they learn it. (This concept is also sometimes referred to as personalized learning.). Seven Essentials for Project-Based Learning are a need to Know, a driving question, student voice and choice, 21st century skills, inquiry and innovation, feedback and Revision and a Publicly Presented Product [7].

2.4. Peer-led team learning (student-centred)

Peer learning is an education method that helps students solidify their knowledge by teaching each other. One student tutoring another in a supervised environment can result in better learning and retention. Peer-Led Team Learning (PLTL) is a model of collaborative learning that supplements large lecture courses, typically in science and mathematics. In PLTL, 8-10 students work together on a packet designed to develop course-relevant problem-solving skills in a study group facilitated by a Peer Leader. PLTL increases student engagement, motivation and performance. Peer learning has several benefits to the workplace, such as developing their communications skills, professional development, teamwork, making onboarding more efficient, and building a stronger company culture [8]. Research shows that educational experiences that are active, social, contextual, engaging, and student-owned lead to deeper learning. The benefits of collaborative learning include: Development of higher-level thinking, oral communication, self-management, and leadership skills [9].

2.5. Flipped learning (student-centred)

In a lecture-centered classroom, the instructor delivers content in class and then sends students home to complete homework. When you deliver informational content outside the classroom and then use class time to facilitate engagement and deeper learning that's a flipped classroom. Flipped classroom is one of the student-centered teaching strategies that has gained popularity in the most recent decade. It is based on the idea of changing the role of the instructor from "sage on the stage" to "guide on the side". Flipped Learning is a student-centered approach that gets teachers asking themselves about the best way to organize their lessons and time with their learners. Provide opportunity for students to gain first exposure prior to class [10]. With the flipped classroom approach, students obtain the initial information independently, at home, often through video content. This enables them to get used to the process of self-study and allows them to learn at their own pace. In all flipped classroom models, the teacher is available

to facilitate discussion, guide learning, and help students problem-solve as they work through a concept. Students are responsible for completing the learning activities by a particular due date[11].

2.6. Differentiation (student-centred)

Teachers who differentiate instruction in academically diverse classrooms seek to provide appropriately challenging learning experiences for all their students. Differentiated instruction is the process of tailoring lessons to meet each student's individual interests, needs, and strengths. Teaching this way gives students choice and flexibility in how they learn, and helps teachers personalize learning. Teachers who differentiate instruction in academically diverse classrooms seek to provide appropriately challenging learning experiences for all their students. The objective of differentiation is to lift the performance of all students, including those who are falling behind and those ahead of year level expectations. Differentiation benefits students across the learning continuum, including students who are highly able and gifted. Differentiating process refers to how students make sense or understand the information, ideas and skills being studied. It reflects student learning styles and preferences. Differentiating process involves: providing varied options at different levels of difficulty or based on differing student interests.[12].

One example is provided textbooks for visual and word learners. Allow auditory learners to listen to audio books. Give kinesthetic learners the opportunity to complete an interactive assignment online. Teacher centered approach is an approach that encourages students to completely focus on their educator, while learner centered approach is an approach where both the educators and the students share an equal focus. In a teacher-directed classroom, the students are more passive. They just receive knowledge from the teacher and don't take a very active role in constructing their own knowledge [13].

3. Assessment in science education

Classroom assessment is an integral part of science instruction. Assessment is the "systematic process of gathering information about what a student knows, is able to do, and is learning to do". The assessment process is an effective tool for communicating the expectations

of the science education system to all concerned with science education. Two sample assessment tasks, one to probe students' understanding of the natural world and another to probe their ability to inquire[14].

Types of Assessment: Diagnostic, Formative, Interim, and Summative. Although the terms assessment and evaluation are often used synonymously, they are in fact distinctive and different. The intent of assessment is to measure effectiveness; evaluation adds a value component to the process. Assessment methods define the nature of the assessor actions and include examine, interview, and test. The examine method is the process of reviewing, inspecting, observing, studying, or analyzing one or more assessment objects [15].

3.1. Diagnostic Assessment in science education

Diagnostic assessment is used to explore students' thinking (to check on prerequisite knowledge) and in particular to detect where students hold alternative conceptions (misconceptions). This assessment is used to collect data on what students already know about the topic. Diagnostic assessments are sets of written questions (multiple choice or short answer) that assess a learner's current knowledge base or current views on a topic/issue to be studied in the course. Diagnostic assessment examples include pre-assessment tests that give you a snapshot of or diagnose knowledge to screen students. Diagnostic assessments are intended to help teachers identify what students know and can do in different domains to support their students' learning. These kinds of assessments may help teachers determine what students understand in order to build on the students' strengths and address their specific needs [16].

3.2. Formative Assessment in science education

Formative assessment is an essential practice for supporting all students, including English language learners (ELLs), in the science classroom. Formative assessment is assessment that takes place during the course of instruction with the goal of improving teaching and learning. Some examples include: (Predict-Explain-Observe): The teacher presents a phenomenon, and students are asked to make a (P) prediction about what will happen, (E) explain why they think that will happen, and then (O) observe what happens. The goal of formative assessment is to monitor student learning to provide ongoing feedback that can be used

by instructors to improve their teaching and by students to improve their learning. This type of assessment can help students realize when they're stuck or confused before the panic of an exam sets in. They may also identify students who are easily grasping concepts and who might be ready for a next-level learning challenge. Five strategies for formative assessment are remind, questioning, sequencing, incentivizing and creating. The goal of formative assessment is to monitor student learning to provide ongoing feedback that can be used by instructors to improve their teaching and by students to improve their learning[17].

3.3. Interim Assessment in science education

Interim assessments are common assessments that are administered to students throughout the school year to monitor growth and achievement according to specific learning goals and academic standards. Interim assessments are sometimes called "benchmark assessments," but there is a slight difference. Benchmark assessments are given periodically, whereas interim assessments don't necessarily follow a schedule. Interim assessment allows educators to do something immensely important: compare data across groups and track trends in learning over time. It may contain hybrid elements of formative and summative assessments, or a summative test of a smaller section of content, like a unit or semester. An example of a benchmark assessment is a weekly spelling test given to all students. This is a benchmark assessment because it can be used to measure how well students are meeting the learning goal of learning how to spell[18].

4. Conclusion

Learner-centered methods have repeatedly been shown to be superior to the traditional teacher-centered approach to instruction, a conclusion that applies whether the assessed outcome is short-term mastery, long-term retention, or depth of understanding of course material, acquisition of critical thinking or creative problem-solving skills, formation of positive attitudes toward the subject being taught, or level of self-confidence in knowledge and skills. The theory of student-centered learning is gaining popularity because students are more likely to be engaged and motivated when actively involved in their education. Second, student-centered instruction is often more effective than traditional, teacher-centered instruction. The main difference between

teacher centered and learner centered approach is that in teacher centered approach, students' focus is completely on the teacher, whereas in learner-centred classroom, both students and educators have equal focus.

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