

## Good Teaching - Learning Practices Application Of Learning Principles In Physiology Education

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**Abstract:** Evidence based medicine is essential for providing optimal health care. However, evidence based educational practice is lacking in health professions education including Physiology education. There is an existing body of learning theories such as Adult learning theory, Theory of constructivism, Theory of reflective practice and Experiential learning theory which can inform teaching- learning practices. The key learning principles emerging from these theories and their application in Physiology education are: Build on prior knowledge and skills by assessing prior experience and building new knowledge on it; Provide safe non-threatening environment for optimal learning to occur; Encourage active participation of the learner in the learning process; Provide relevant content and problem centred approach for the learner to value learning; Providing opportunities and support to learners for self-directed learning will make them lifelong learners; Timely and constructive feedback with reflections enhances learning; Address different learning styles by using a variety of Method. Teachers in Physiology and other disciplines can use the learning principles to inform their teaching-learning practices and enhance student learning.

**Key words:** evidence based educational practice, learning theories, learning principles, application in physiology education

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**Introduction:** To provide best patient care it is essential that patient management is based on best available evidence<sup>1</sup>. Evidence based medicine (EBM) or Evidence based practice is what health profession is striving towards currently to provide optimum health care<sup>2</sup>. One of the ways to achieve this would be to follow Evidence based educational practices for our medical students. However, in health professions education, including teaching and learning of Physiology, evidence based educational practice is lacking<sup>3</sup>.

As health professional teachers it would be helpful to have guidelines to follow when faced with difficult situations<sup>3</sup>. There is a need today to use the existing body of theory and principles to inform teaching and learning practices in health professions education. This “informing” can improve and empower teachers in preparing to teach and be facilitators of student learning.

The purpose of this communication is to provide a brief review of four of the learning theories and the learning principles emerging from them. This will be followed by a discussion

on the applicability of these learning principles to Physiology education.

**Theories of Learning<sup>3,4</sup>:** (Table 1): Adult learning theory: Malcolm Knowles introduced the term andragogy, for adult learners which are based on five assumptions about adult learning: Adults are independent and self-directed, have experience, value learning which they can practice, interested in problem centred approach and motivated to learn by internal drives.

**Theory of Constructivism:** This considers learning to be based on prior experience, teachers as facilitators and learners to be engaged actively in the learning process. The learning here is active rather than passive.

**Theory of Reflective practice:** Schon described this theory of learning on the following assumptions: “Reflection in action” and “Reflection on action” to inform learning practices. “Reflection in action” is the ability to reflect as a continuous on-going process even as one is doing the action (eg patient management) and make modifications based on reflection. “Reflection on action” is to reflect

after the task is over and learn from it. It is believed that maximal learning happens with reflective practice.

Experiential learning theory: elaborates that learning relies on previous experience and knowledge is created through transformation of experience. Kolbs learning cycle which has been popularly used for application in classroom teaching is based on this theory.

**Table 1: Learning theories**

LEARNING THEORY	DESCRIPTION
Adult learning	Learners are independent self- directed learners Learners have prior experience Learners value learning which can be practiced Learners are interested in problem centered approach Learners have intrinsic motivation
Constructivism	Learning based on prior experience Teachers are facilitators Active engagement of learner in learning process
Reflective Practice	Reflection in action and Reflection on action to inform learning practices
Experiential learning	Learning relies on previous experience Knowledge is created through transformation of experience

**Learning Principles Emerging from the Learning Theories and its Application in Physiology Education:** (Table 2) Typically Physiology teaching- learning is done for undergraduate medical and allied health students as well as postgraduates in Physiology and other specialities. The bulk of the teaching is however, reserved for the undergraduate health professionals who are traditionally taught Physiology through lectures, tutorials and practical class. Some teachers may be using

other innovative Method to enhance learning in Physiology.

The learning principles that emerge from the theories and their application in Physiology education are described below. Reflection on ones’ best experiences with learning will show that in these experiences the teacher had incorporated one or more of the learning principles.

**Principle 1. Build on prior knowledge and skills:**

The learner brings some prior learning / experiences in the class. Learners’ previous knowledge and skills are critical to the current learning and should be incorporated in the learning process. As a teacher to facilitate learning one must first assess prior knowledge; followed by discussion of the responses for clarification; then build upon the knowledge which the learner already has adding new learning on to it; and then check for understanding to ensure new learning has occurred.

Some of the strategies for assessing prior knowledge are: Know, Want, Learn (KWL) strategy<sup>4</sup>: Before the session, the students write on a hand out what they already Know about the topic and what they Want to learn about it. After the class /session the students again write on the hand-out what they did Learn.

Conducting a pre-session quiz on the topic. Audience Response System can be used if the classroom has the provision for it. Alternatively, a show of hands or showing number cards can be used. Participants could write their comments/thoughts on statement or questions about the topic. If it is a practical class the learner could be asked to demonstrate the skill to be learnt.

**Principle 2. Provide a safe non-threatening environment.:**

Provide a comfortable, safe, non-threatening environment yet challenging to the learner for optimal learning to occur. The key feature here is to create an environment of respect for the learner.

Some of the ways in which it could be done in a classroom is to be courteous and patient with the students. Listen to their viewpoints and questions. Encourage them to ask questions to the teacher as well as answer questions asked by the teacher. Do not pull them up in front of their peers. If correction is required call them in private and give constructive feedback to them. Design and introduce group activities in the class.

Some of the specific Method that can be used are: Think- Pair-share: Throw a question to the class. Ask each student to first think about it. Encourage them to write down their thoughts. Then ask them to discuss it with the person sitting next to them. If it is a lecture class with a large group of students asks for few pairs to respond. If it is a tutorial with a small group of students ask each pair to respond. The whole activity takes about 2 minutes. It gives confidence to the learner as they are sharing their thoughts with a peer and the response to the whole class is not their individual response but that of the shared one with their peer.

Confusion technique: At the end of the class, ask the students to write one point /concept taught which is not clear to them on a piece of paper. Ask them to fold the paper twice. Then ask them to keep on passing the paper for a minute / till you ring the bell. Then ask a few students to read the question from the paper which they are holding. The teacher can clarify the issue/unclear point. The student feels comfortable in reading out because it is not his/her paper and the student whose paper is being read has his/her question answered without coming into the limelight. The teacher can handle it in a variety of ways. Many teachers prefer to collect all the papers and then identify difficult areas for learning and start the next class clarifying those concepts.

Call students by their names<sup>3,4</sup>: If it is a tutorial class learn all the names. However, if it is a lecture class with large number of students, ideal would be to learn all the names but may be difficult for most teachers. So try and learn as many as possible. Group quiz: Students can

be divided in smaller groups and a quiz can be conducted with a small prize for the winning group.

**Principle 3. Active participation:** Active participation of the learner in the educational process contributes to learning. The challenge before the teacher is to actively engage the mind of the learner with the content being discussed. One has to be very good and updated in content knowledge of the topic being taught, presenting ones' ideas in a logical flow and sequence and clarifying concepts. There are some specific strategies which can be used to encourage active participation of the learner in the learning process.

Think-Pair-Share and Confusion technique described above. Encourage sharing of experiences and questioning. Introduce Crossword puzzle and Interactive quizzes in the class.

Note taking guide<sup>4</sup>: This consists of key concepts of the topic, space for key points to be noted down followed by one to two short answer questions which promote higher order thinking.

Essence: at the end of the class or in the middle of the class, ask the students to share the key message/concept. This is different from summarizing.

Summary: can ask students to summarize at the end of the class.

If it is a tutorial, the students take turns to be the scribe for the discussion. The tutorial group can also formulate their own learning goals with the help of the teacher.

If it is a practical class invite the students to participate in the demonstration of the skills.

**Principle 4 . Relevant content and Problem centred approach.**

Relevant content applicable to their practice will make learners value the learning and problem centred approach will enhance the learning process. Learners will value learning

which is relevant and has practical applications. Some of the things which teachers can do are:

Develop Specific Learning Objectives which address relevant content<sup>4</sup>. Case Based Learning: For example a case of hyperthyroidism could be used to discuss the physiological basis of signs and symptoms followed by functions and mechanism of action of thyroid hormone in a Physiology class.

In a Physiology practical class for examination of Cardiovascular system the discussion could be started with a clinical case of a patient with murmur followed by demonstration and discussion of heart sounds.

Early clinical exposure<sup>5</sup>: This means exposing the first year medical students to the patient/clinical case. However, the discussion is on the basic science concepts and not on diagnosis and management. The purpose of the clinical case is to provide relevance and context to; and importance of learning basic science concepts.

For example, during Physiology class on thyroid gland, the students could be taken to the hospital to see a patient with goitre followed by discussion of physiology of thyroid gland. Alternatively the patient could be brought to the classroom instead of a hospital visit after taking informed consent from the patient.

However in both situations the discussion should be focussed on the physiology of thyroid gland.

Community Based Learning: Globally the move is towards community based learning where the community is involved in students learning. This could be done by getting the students do small projects in the community in groups. For example they could screen for hypothyroidism in a small area, present their finding followed by a debriefing by the teacher on Physiology of thyroid gland.

**Principle 5. Self Directed Learning<sup>3,4</sup>:** Opportunities and support should be provided to the learner for self-directed learning. The students of today will be doctors of tomorrow. Providing self-directed learning skills to the

students is crucial to enable them to be lifelong learners, an important attribute of a competent doctor. Self-directed learning deepens learning and makes it long lasting<sup>3,4</sup>.

The teacher can encourage the students to be self-directed learners by helping them formulate their own learning objectives and identifying how they will reach it. The students can also be encouraged for independent study. Eg. Ask questions in class which the students have to go and find out. Alternatively give them assignments which require higher order thinking.

However, in order to inculcate self-directed learning skills in the students it is mandatory to provide them with appropriate learning resources such as references, journal articles, books, hand-outs, self-learning modules etc<sup>4</sup>.

**Principle 6. Feedback and Reflections<sup>4</sup>:** It is important to give constructive, timely feedback to the students on their learning and encourage them to reflect to enhance learning. This leads to “successful learning and mastery of content and skills”<sup>4</sup>.

Some of the Method that can be used in a classroom are: Ask questions to check understanding (could use the Think- Pair- Share or Quiz or crossword puzzle) followed by discussion of the response/answer, clarify misunderstandings and give the correct answer.

Give a case in advance to prepare followed by a debriefing session with the whole class. Encourage reflections. Students could keep journals and teachers can give feedback on it. However this is quite challenging as the art and skills of reflection need to be learnt first.

**Principle 7. Address different learning styles.** All learners do not learn the same way. Students have different learning styles. There are instruments such as the VARK (Visual, Auditory, Reading/Writing, and Kinaesthetic) questionnaires to find out the different learning styles<sup>6</sup>. However, as a teacher one must use a variety of Method to address the different

learning styles of the students to maximize learning. These Method include role play, case studies, questioning, using varying technology such as media, video etc. and games<sup>3,4</sup>. For example an online game has been used to teach

blood grouping to the first year medical students<sup>7</sup>. This game is available at <http://www.nobelprize.org/educational/medicine/bloodtypinggame/>

**Table 2: Learning principles and their application in teaching- learning**

LEARNING PRINCIPLES	DESCRIPTION	KEY FEATURE	APPLICATION IN TEACHING - LEARNING
Build on prior knowledge	Learners' previous knowledge and skills are critical to the current learning and should be incorporated in the learning process.	Use prior experience	Assess prior knowledge Discussion of response for clarification Build upon it adding new learning Check for understanding
Safe non threatening environment	Provide a comfortable, safe, non-threatening environment yet challenging to the learner for optimal learning to occur	Respect the students	Think-Pair-Share Encourage questioning Call students by names Provide small group activities Confusion technique Group quiz
Active participation	Active participation of the learner in the educational process contributes to learning	Actively engage the mind of the learner with the content	Crossword puzzle Quiz Essence Note taking guide Scribe Formulate learning goals
Relevant content and Problem centered approach	Relevant content applicable to their practice will make learners value the learning and problem centred approach will enhance the learning process.	Provide learning that is relevant and has practical application	Develop relevant specific learning objectives Case based learning Early clinical exposure Community based learning
Self directed learning	Providing opportunities and support to the learner for self-directed learning enables them to be lifelong learners,	Provide learning resources	Formulate own learning objectives Independent study Assignments
Feedback and Reflection	Leads to effective learning	Constructive and Timely	Ask question to check understanding, followed by discussion of the response, clarify misunderstandings and give the correct answer Journals for reflections
Address different learning styles	All learners do not learn the same way	Use variety of teaching-learning Method	Role play Questioning Games Varying technology

**Conclusion:** Learning principles inform educational practices. Many teachers may already be using some / all of the strategies. The way forward is for the teacher in Physiology and other disciplines in medical education to use them/ continue using them to become facilitators of learning and enhance student learning.

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