

# TEACHER KNOWLEDGE- PEDAGOGICAL CONTENT KNOWLEDGE

## LEARNING OUTCOMES:

- State teachers knowledge, and
- Describe PCK - orientation to physics teaching

# TEACHERS' KNOWLEDGE

“To teach is first to understand “  
(Shulman, 1986)

“If the promise of the teaching profession is to achieve, we must attend to the processes by which its knowledge base is developed and transmitted” (Howsam et al. (1976)

# TEACHERS' KNOWLEDGE- STARTING POINT



Generic knowledge about pedagogy, how students learn, teaching approaches, methods of assessment and knowledge of different theories about learning, etc.



Knowledge of the subject matter without consideration about teaching the subject matter. (e.g. Mathematics, Physics, etc.)

# DOMAINS OF TEACHER KNOWLEDGE

Shulman (1986) – 7 categories of knowledge

1. Content knowledge
2. General pedagogical knowledge
3. Pedagogical content knowledge (PCK)
4. Curriculum knowledge
5. Knowledge of learners and their characteristics
6. Knowledge of educational context
7. Knowledge of educational aims, purpose, and values and their philosophical and historical grounds

# 1- CONTENT KNOWLEDGE (SUBJECT MATTER KNOWLEDGE)

➤ The amount and organisation of knowledge essentially in the mind of the teacher.

- ◉ **Substantive structure:**

Knowledge of the major facts, concepts, principles within a field and the relationships among them.

- ◉ **Syntactic structure:**

Knowledge about methods, rules of evidence and proofs in that subject and history of the discipline, how knowledge is being evaluated by the discipline's experts.

**The amount of the degree of substantive & syntactic structures that a teacher knows would certainly influence the delivery of the subject content to the students**

# 1- CONTENT KNOWLEDGE (SUBJECT MATTER KNOWLEDGE)

- Deep content knowledge is a necessary condition for the development of PCK. If a teacher does not understand the nuances(meanings) of a concept, the deep relationships between this particular concept and other concepts, and the ways through which this concept was constructed by the physics community, then translating these meanings into student understanding is impossible.
- Therefore *it is cvery important that future physics teachers are skilled in the content and processes of physics.*

## 2- GENERAL PEDAGOGICAL KNOWLEDGE

**Principle and strategy of classroom management as well as its organization that arises in the delivery of the subject matter.**

- Example: understand how students learn, theories of learning, child psychology, teaching strategies, classroom management, assessment, etc....

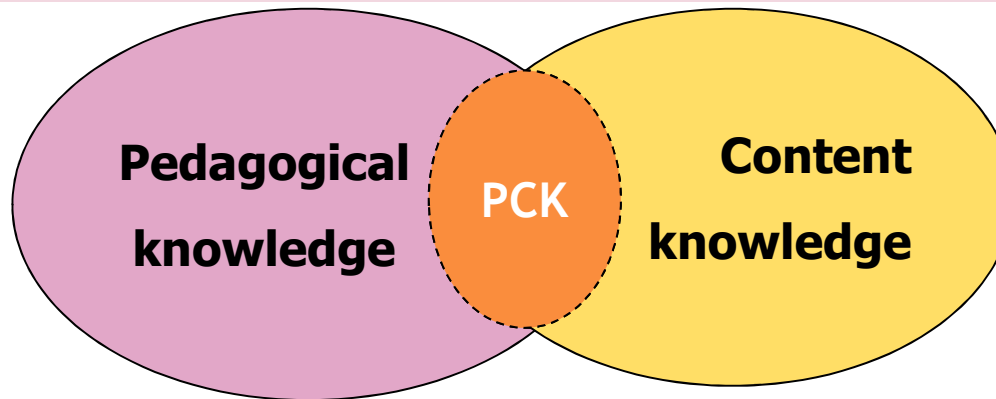
## 2- GENERAL PEDAGOGICAL KNOWLEDGE

Understanding of the processes of learning is crucial for the development of the orientation toward teaching, assessment methods, understanding of the role of student ideas, etc.

For example, the awareness of the complex nature of brain activity should affect how teachers deal with what is widely perceived as “student misconceptions”.

# 3-PEDAGOGICAL CONTENT KNOWLEDGE

- **Knowledge formed through the synthesis of two knowledge bases: content knowledge and pedagogical knowledge - unique mixture of pedagogy and content.**

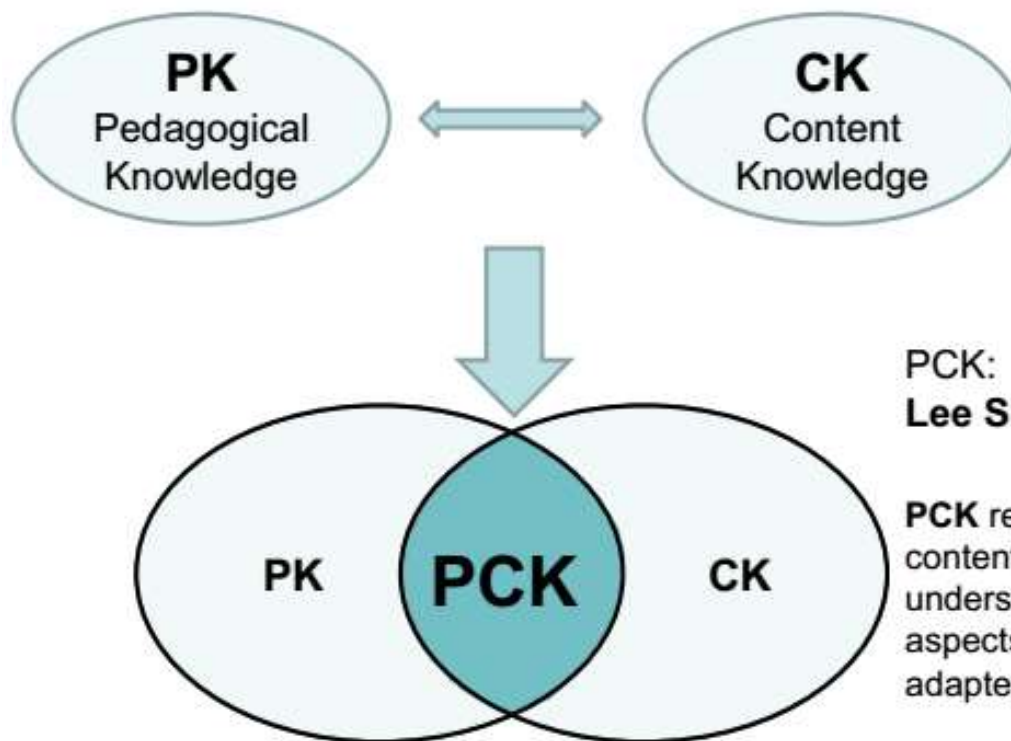


Pedagogical content knowledge (PCK) is an "amalgam" of content and pedagogical knowledge.

PCK includes an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that students of different ages and backgrounds bring with them to the learning of those most frequently taught topics and lessons. (Shulman 1986, 9)

# 3-PEDAGOGICAL CONTENT KNOWLEDGE

**PCK =  
Pedagogical Content Knowledge**



PCK: originally proposed by  
**Lee Shulman** (1986; 1987)

**PCK** represents the blending of content and pedagogy into an understanding of how particular aspects of subject matter are organized, adapted, and represented for instruction.

### 3- PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

- **PCK includes: the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, and demonstration.**
- **At the heart of PCK is the manner in which subject matter is transformed for teaching. This occurs when the teacher interprets the subject matter and finds different ways to represent it and make it accessible to learners. (Mishra & Koehler 2006, 1021)**
- **Pedagogical content knowledge is a teacher's understanding of how to help students understand specific subject matter.**
- **It includes knowledge of how particular subject matter topics, problems, and issues can be organized, represented, and adapted to the diverse interests and abilities of learners, and then presented for instruction.**

### 3- PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

- **Teacher's deep understanding of a subject area she/he must also be able to foster understanding of subject or concepts for students.**
- **Domain of pedagogical content knowledge that was different from both knowledge of the content and general knowledge of teaching (Shulman, 1986).**
- **PCK is a personal construct and each teacher develops their own PCK over the years of teaching.**
- **It includes knowledge of students' difficulties and prior conceptions in the domain, knowledge of domain representations and instructional strategies, and knowledge of domain specific assessment methods**

### 3- PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

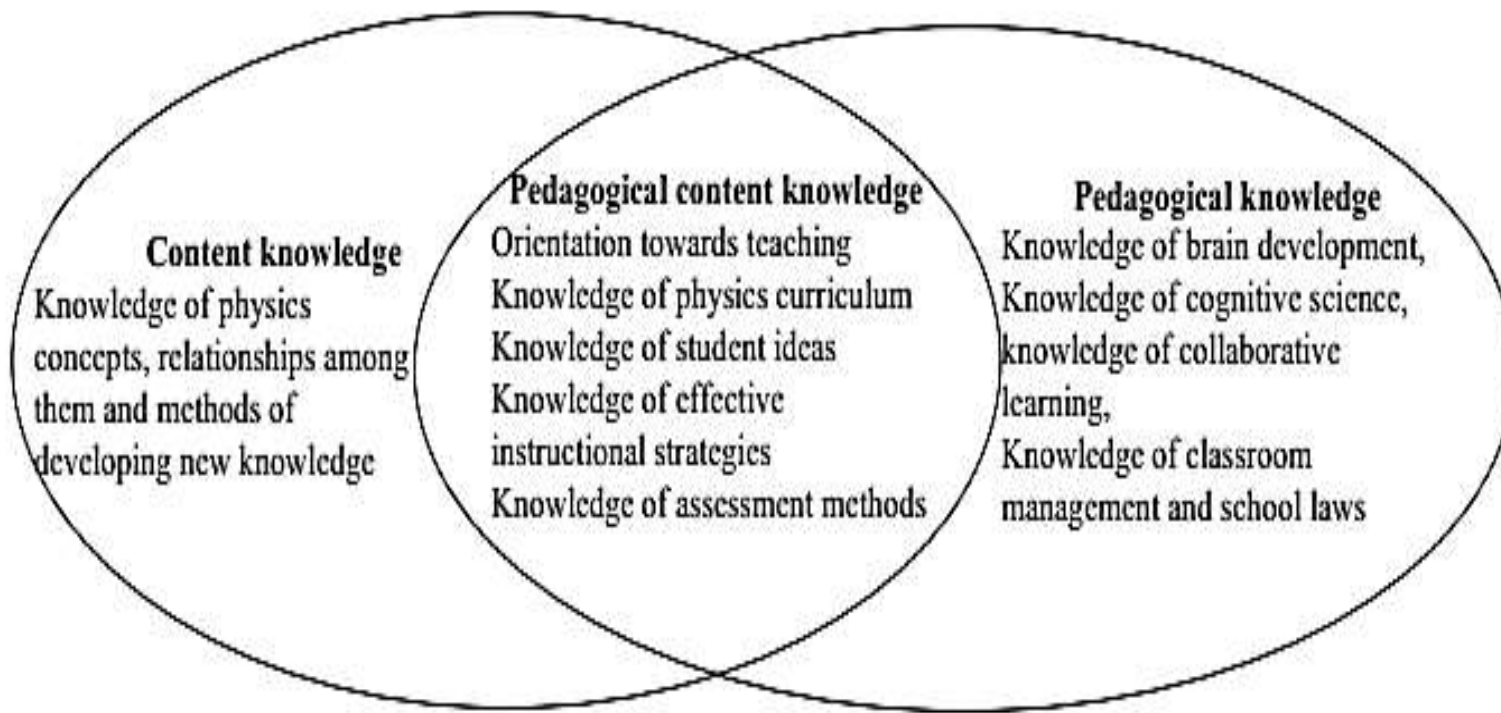


FIG. 1. The Structure of Physics Teacher Knowledge.  
(Etkina, 2010)

## 4-KNOWLEDGE OF CURRICULUM

- ◉ **Curriculum knowledge:**

- Particular grasp of the materials and programmes that serve as ‘tool of the trade’ of teachers.

- ◉ **Aims and Objectives:**

- Need to understand the aims and objectives of the mathematics curriculum - the planned teaching activities are in tandem.

## 5-KNOWLEDGE OF LEARNERS AND THEIR CHARACTERISTICS

- ◉ The needs of learning basic physics concepts
- ◉ Learners difficulties
- ◉ Learners misunderstandings
- ◉ Learners misconceptions

These knowledge involve conceptual and procedural knowledge, conceptual errors and level of understanding.

- ◉ Need to know techniques in evaluating learners' understanding and diagnosing misconception/appropriate learning strategies
- ◉ Need to know students' learning style (imaginative, analytical, practical and dynamic learner)

## 6-KNOWLEDGE OF EDUCATIONAL CONTEXT

- ◉ Knowledge of school, classrooms and all setting where learning takes place ( districts, school, communities and cultures).
- ◉ Grossman (1990) - Contextual knowledge includes knowledge of the area where the teacher teaches like the area's hope to achieve, expectations and limitations.

## 7-KNOWLEDGE OF EDUCATIONAL ENDS, PURPOSES, AND VALUES, AND THEIR PHILOSOPHICAL AND HISTORICAL GROUNDS.

- ◉ Educational ends
- ◉ Purposes of teaching and learning
- ◉ Values
- ◉ Philosophy of teaching physics
- ◉ Historical ground

# SOME DEFINITIONS OF PEDAGOGICAL CONTENT KNOWLEDGE (PCK)

The most regularly taught topics in one's subject area, the most useful forms of representation of those ideas, the most powerful analogies, illustrations, examples, explanations, the ways of representation and formulating the subject that make it comprehensible to others

(Shulman, 1986)

Bridge that a teacher builds to link his or her understanding of the content to that of the students understanding of the same content (Grossman, et al. 1989)

**PCK**



The teachers organise the new knowledge related to the discipline into content that can be easily understood by the students during instructions

(Tamir, 1987)

A unique knowledge to the teacher and is the fundamental knowledge to have in enabling him or her to connect the pedagogical knowledge (how to teach) with the content knowledge (what to teach)

(Pesno, 2002)