**PHYSICS DEPARTMENT**

**Teaching – Learning Methodology of Physics Department**

**REPORT**

**Name of the practice:** Peer Instruction Teaching Method

**Objective:** Development of research-based teaching methodology which teachers use to evaluate student comprehension, provide ongoing feedback to improve their learning gains is important at all levels of physics instruction. Peer Instruction is one such interactive teaching methodology used for formative assessment. Peer instruction was introduced by Prof. Eric Mazur from Harvard University in the 1990s for the introductory physics courses. As stated by Eric Mazur “the fundamental role of implementing peer instruction in class is to exploit student interaction during lectures and focus student’s attention on underlying concepts”.

**Process:** In the Peer Instruction approach, after a brief presentation by the instructor several multiple choice questions known as concept tests are asked during the class. The concept tests is a conceptual question based on a core concept that is being covered in the course and is usually targeted to address student’s misconceptions. First, the students think individually and are given 2-3 minutes to answer the concept question. After they report their answer, students work in a small group of three or four to discuss their individual answers to the question and to arrive at a consensus on the correct answer. In order to reach consensus, students must explain their own reasoning and problem solving in support of their answer. After the group discussion, students are then asked to individually answer the question a second time. The entire class participates in the discussion led by student explanations of their group’s findings before the instructor answers the question.

**Outcome:** Quantum Mechanics Conceptual Survey (QMCS) developed by Sam McKagan from University of Colorado and NIST, USA is a survey of students’ conceptual understanding of quantum mechanics. It is intended to be used to measure the relative effectiveness of different instructional methods in quantum physics courses.

Also, normalized gain introduced by Hake in 1998 can be calculated to measure the effectiveness of the course in promoting conceptual understanding. Hake defined the average normalized gain as:

$$\left〈g\right〉=\frac{\left〈post\right〉-\left〈pre\right〉}{100-\left〈pre\right〉}$$

Where $\left〈post\right〉$ is the class average grade on the post-instruction test and $\left〈pre\right〉$ is the class average grade on the pre-instruction test. This measure is commonly described as "the amount students learned divided by the amount they could have learned."

In this course QMCS was used to check the learning gain of students and the average normalized learning gain for the quantum mechanics course is, $\left〈g\right〉=0.275$ where the maximum possible gain is 0.68. To measure the effectiveness of Peer Instruction teaching methodology results obtained over several years would have to be compared to the course on quantum mechanics which uses traditional teaching methodology.

**Challenges:**

1. If the multiple choice questions are not graded then all students may not always take these questions seriously and may not put the effort into getting the right answer.
2. If the questions are graded then the weaker students might answer by looking at answers of good students. Also, if the questions are graded then some students might not share their frank opinion to get more marks then their peers.
3. Getting students to study on their own and reflect on what was done in the class.