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CONSTRUCTIVIST TEACHING METHODS: A CASE STUDY OF SECONDARY SCHOOL PHYSICS CLASSROOM

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Abstract:

This paper examined the implementation of constructivist teaching approaches in secondary school physics classroom at Government High School Sokai Mardan (Khyber Pakhtunkhwa Pakistan). Two experienced physics teachers were selected using purposive sampling technique. Semi structured interview was used as a data collection tool. Four themes were emerged from variables i.e. (I) Teaching learning outcomes: learners' problem-solving skills. (II) Elements of teaching practices nurturing student's engagement. (III) Factors influencing teacher's instructional practices. (IV) Teaching is: What teacher has taught without questioning. Two main research questions guided this research study i.e. how core elements of physics instructional practices foster students' engagement? And what are the various variables influencing the teaching activities of Teachers in the classroom in Physics. Thematic analysis was used for semi structured interview. Analysis of teachers reveals that teachers are vulnerable to misinformation, other set and derogatory attitudes about learners, lack of intrinsic encouragement of teachers in adopting creative teaching methods, non-existence of multimedia, laboratory facilities, workload of teachers, non-research-based syllabuses, lack of sufficient teacher preparation, weak administration, Annual syllabus completion pressure, low socio-economic students grasping the concept, lesson planning, weak class control when doing group activities are some of the barriers that impede the effectiveness of constructivist style of teaching. It is strongly recommended for educators, mentors, and the director of the school organization must ensure that unambiguous instruction curriculum methods are utilized consistently throughout the classroom. It was also investigated that student's class size negatively affect teaching practices. Slow learners required more time compare to fast learners. In an overpopulated classroom, learners are unable to catch the attentions of teachers. Therefore, it is recommended that the frequency of the pupil need to be 25 students per class (http:/classsizecountswa.com/about/) to offer better education and the implementation of constructivist based teaching learning conception.

Key Words: Science Education, Constructivist Pedagogy & Physics Classroom

Introduction:

Background of the Study:

Natural science and specifically Physics are crucial part of every country's growth. The existence of high standard quality physics labs in any country reflects their participation in Science and Technology advancement. Understanding the main principle in physics beyond rote memorization is focused on inculcating the theoretical mindset of the pupil, which requires a constructivist learning atmosphere for teaching. There are several learning principles that deal with teaching method research. "Teachers desires to base their practice of teaching on some theory (constructivism) and be able to believe, judge, weigh and justify which teaching paradigm works best in class and why" (Jordan, 2008).

Student's achievements in Physics are closely related to teachers' beliefs about scientific teaching. Teaching is not like one-way traffic or providing some sort of information to the students or it's just memorizing the teacher's knowledge. They should give an appropriate sequence to information by expanding their instructional technique in subject matter based on learner's previous learning experiences. They should identify students ' learning complexities by looking into their prior knowledge where teachers should focus on learner misunderstandings and emptiness of knowledge. Teachers will involve students in the learning practices by introducing any teaching activity to promote their constructive physics behavior. "Different concepts possess their own specific knowledge so teachers should have beliefs' that direct and guide them to use the kind instructional pedagogy relevant to the nature of knowledge" (Matthews, 2014).

Statement of the Problem:

Constructivist physics teaching can be achieved once teachers are trained with contemporary methodologies. Teacher educators are witnessed that the quality of education is solely depend on teacher content as well professional knowledge. This study examined how core element of physics instructional practices fosters students' engagement? There is scarcity of constructivist teaching classroom environment and to sort out this issue research is of utmost importance.

Research Questions:

- How core elements of physics instructional practices foster students' engagement?
- What are various Factors influencing teacher's instructional practices in physics classroom?

Significance of the Study:

This research paper wills assist to mould teacher ways of teaching to student in a physics classroom. The study wills gain physics teacher's perception to align with teaching practices that boost up students critical thinking, innovation, and aspirations of physics knowledge. The study will gain the attention of key stalk holders to revolutionize the significance of learners and learning oriented pedagogies in secondary physics classroom.

Review of Literature:

"Constructivism is a world view of learning that emphasizes the active role of the learner in building their understanding and making sense of the world, in which learners uses their prior understanding and experience to construct their knowledge. Knowledge discovered is more useful to learners than knowledge merely received" (Yilmaz, 2008). "Teacher's pedagogical belief is teachers 'suppositions regarding their own knowledge, student level of learning and even their own role and responsibilities as a teacher" (Bada, 2015)."Teachers have to transform the didactic and autocratic classroom learning into more learner centered, democratic environment that motivate the leaner's to mold and shape their self-based learning and teachers need to acquire and adopt such belief and practices that help to facilitate towards constructivist approach of teaching and learning" (Amineh, 2015).

Pedagogical techniques are the teacher's tools or approach that converts theoretical practices into practical learning of knowledge and information. Pedagogical methods represent two criteria, either positivist in knowledge transfer or constructivist in the creation of knowledge. Didactic approach incorporates the activities of copying, recalling, and memorizing. The students memorize these questions, and the teacher prepares examination paper from that copy paste text. The students rewrite certain questions in review again and teachers assess the intellect of the pupil by giving specific ratings. Students move through the next level without possessing the basic abilities of logical thinking and Meta cognitive skills. These methods make rote learning change. Pedagogical philosophy constructivist approach reinforces learner-based and learning culture values that allow teachers to follow specific instructional practices. "Similarly, learner centered teaching is supported by sophisticated beliefs which create thinking skills and scientific attitude" (Kalpana, 2014). "Teacher knowledge and beliefs impacts their attitude and decision-making skills, so it is crucial to study the problem solving and decision-making environment. The syllabi have been developed in the best interest of constructivism. The syllabi stress learner-based methods of teaching. Keeping the principle of constructivism, that urges that the student should learn through their self-based teacher facilitated activities" (Amineh, 2015).

Constructivist Teachers Search for Enhancing Student's Responses:

Teachers call for initial feedback from the students during the teaching learning process. The initial response from the students may be incorrect, so the initial response should not be regarded as the final answer. Teachers will wait for some time to encourage the students to consider and then offer their response. Teachers will wait for some time to encourage the students to consider and then offer their response. If they still do not react to their own thinking, teachers should use recapitulation to clarify and understand their mistakes and assess their errors. For e.g. a teacher gives an assignment to his students. "One of a student's seems too confound, if his perspectives of resolving a problem was well and good and teacher told the student to revise and explain how he did the issue. As he just starts explaining his point of view slowly and gradually, he pointed out and recognized his mistake" (Redish, 1998).

"Teacher's job is not just 'fixing' the errors for the students. Teachers must elaborate the weak areas of the students through reasoning and mutual discussion of understandings, Students learning occur when they repeat and re organize their thinking regarding a concept. Students learning gets firm when they restate and recapitulate, therefore, Constructivist teachers keep engage students in activities that may causes refutation to their hypotheses and later motivate discussion, if students find the time to re-read a textbook chapter, they get a lot more out of it the second time" (Chin, C. 2006)."The focus of teaching is to help students construct knowledge from their learning experience and encourage student's participation in discussion, teachers should always encourage students to think for answers themselves, at initial hypotheses they might be wrong but can resolve their problem through proper negotiation, thinking and reasoning processes are more crucial for a healthy learning, differences of opinions, ideas and thoughts are the charms of democratic school environment, contradictions will lead students to construct and develop their knowledge" (Black, P., Harrison, 2004). "Students can challenge teachers, if they are internally strong and their internal strength shows, they had perceived some new understandings that led to the point of disagreements, those students, who don't consider teacher to be the sole authority, possess sophisticated beliefs, Meta cognitive approach, analytical and critical thinkers and have high order thoughts"(Berrett, 2012).

Research Methodology:

Sample of the Study:

The study was conducted in Government High School Sokai Mardan. Two experienced teachers were selected as a sample for the required interview. Purposive sampling technique was carried out to outreach the participant and get relevant data.

Data Collection Tools:

As the study was pure qualitative and researchers developed semi-structured interviews to gather the data required to investigate the research problem.

Data Analysis:

"Thematic analysis was carried out for semi structured interview. Qualitative analysis required the development of categories and making comparison and contrasts, teachers' interviews responses were analyzed qualitatively for making comparison and contrast" (Krueger & Casey, 2000). During the study teacher's observations were collected and then the researcher presented and evaluated along with the key topics of his research context.

Qualitative Analysis of Teacher's Interview:

Two secondary-level physics teachers were interviewed to obtain detailed insight into the usage of constructivist methods. Interviews were conducted against pedagogic and instructional practices of physics teachers. "Semi structured interview was employed to make the responses more strengthened; the semi-structured interview design allows the researcher to perceive the thinking of teachers that is difficult to be measured through questionnaire" (Patton, 1980). Four themes emerged upon thematic data analysis and these four themes were then used as framework for organizing the data.

Theme 1: Elements of Teaching Practices Fostering Student's Engagement

Participant articulated that Awareness of students, enthusiasm, emotional commitment, intrinsic inspiration, software, laboratory facilities, adequate teacher preparation, research-based syllabuses, annual syllabus control, lesson planning, pupil instruction, classroom setting, classroom events, smooth parental participation, administrative interference, availability of physical resources, teacher ability how to teach. Free, conducive, and trustful environment, collective work between student and teacher, school support are essential elements that promote problem solving and critical individualities in students.

Theme 2: Factors Affecting Teacher's Instructional Practices

Participants explores that teachers are subject to practice, lack of intrinsic motivation, other static and negative beliefs, emotional relation, lack of technology, classroom equipment, overcrowded classes, lack of sufficient teacher instruction, workload of teachers, obligation to complete the annual syllabus and student performance, weak academic teachers and Professional qualifications, working students, poor annual teachers Evaluation, low cognitive ability of students to grasp the concept, group work control, time constraints in the classroom, selfish teacher mentality, poor pre- and in-service teacher training, low-paid teachers, school discipline issues, unsatisfactory teacher environment, syllabus completion pressure, Burden of enormous strength in classrooms, student assessment problems, respective environment, encouragement of teachers by the heads, overloaded schedule of work are factors that affect teacher practices.

Theme 3: Teaching Learning Outcome: Memorization or Problem Solving

Teacher interview shows their classroom result as problem solving and logical reasoning since students can solve issues on their own and can make rational choices in these dimensions, but certain topics require memorization such as various numerical numbers, their names and certain abstract theorems relevant to the intellectual context of the subject matter. Teacher's show that students should be critical to cope successfully with scientific problems that increase their engagement.

Theme 4: Teaching is: What Teacher has taught Without Questioning

Teachers assume that confronting and demanding habits stimulate the brains of the pupils, and this is achieved often through countering and asking concerns. Mr. Nasrullah said I usually do not offer straight forward responses even though students pose questions. I inquire about their thoughts and ask questions in response and send clues to get them to find the solution in simple terms, they will not learn if the students don't ask. Teacher questions help the students build their own abilities to think objectively. Teachers show that interviewing helps resolve the ambiguities between students. Mr. Aman Ullah claims they ought to be tested, however because they already have any information students may ask. No students are bothering to pose query in our schools for the entire year. Mr. Aman Ullah elaborated that the instructor will provide concerns, so that the students will build their own logical reasoning abilities and strong suspicions.

Findings of the Study:

Significant aspects from teacher interview analysis are as follows

Elements of Teaching Practices Fostering Student's Engagement:

The result of teaching activities that promote student participation provides the following conclusions

- Physics teachers have shared their opinions because teachers with their own personality competencies, enthusiasm, technology, partnerships, inspiration, and instructor self-confidence building is a very significant aspect that will help inspire students. The teacher's role is to guide them, give students some

flexibility, introduction, evaluation, and assignment. The two teachers shared their views as institutional assistance, instructor training, centered instruction, respectful teacher disposition, and good friendship with the guarantees of the teaching-learning process of life. Free and trustful environment, student-teacher collaborative work, educational environment, is the elements that foster student problem-solving traits.

Factors Affecting Teacher's Instructional Practices:

- Analysis shows that teachers knowledge, enthusiasm, certain fixed and negative beliefs, emotional attachment, lack of intrinsic motivation, lack of multimedia, laboratory equipment, overcrowded classes, teacher workload, non-research-based syllabuses, inadequate teacher training , poor administration, annual syllabus pressure and student outcome, Poverty and working pupils, weak education and technical skills, lesson preparation, students ' intellectual skill in understanding the idea, class power of community study.
- A teacher illustrates that inability to teach is overcrowded classrooms, pressure to overcome syllabus, administrative interference, laboratory equipment, and teacher-training.

Teaching Learning Outcome, Memorization or Problem Solving:

- Interview shows their classroom result as problem-solving and logical reasoning as they can address the issue on their own and can make choices about these subjects.
- A teacher analysis shows students need to be critical to deal effectively with scientific problems.

Conclusions:

Teaching Practice Fostering Student's Engagement:

- According to one of the teachers in physics, the elements that foster student engagement, i.e. the teacher's own personality skills, enthusiasm, multimedia, relationship, motivation, and self-confidence building measures are very important factors that help encourage students; the student's maturity level is not enough. This is the teacher's conviction that drives them, allowing students some independence, interpretation, evaluation, and task.
- A teacher concluded that institutional support, teacher methodology, focused teaching, humble teacher attitude, friendly relationship with guarantees that the teaching-learning process exists for the student. Free and trustful environment, student-teacher collaborative work, educational environment, is the elements that foster student problem-solving traits and skills.

Factors Affecting Teacher's Instructional Practices:

- Both teachers make it obvious that teachers have expertise, passion, other set and derogatory values, emotional commitment, lack of intrinsic inspiration, lack of digital, laboratory facilities, overcrowded classrooms, workload on students, lack of adequate teacher instruction, bad administration, Pressure of annual syllabus delivery and student results, deprivation and labor students, low academic and technical skills, student evaluation, student preparation, student intellectual ability to understand the idea, lack of laboratory facilities, class discipline in group study, teachers issue, student history influence teaching activities.

Recommendations of the Study:

Based on conclusion of the study, following recommendations were drawn.

- It was investigated that educational methods were negatively impacted by the class size of students. The large number of students per class as we have in our country has been hard to deal with. Sometimes, because of the huge number of students in class, teacher cannot even give a minute to a single student all. It is therefore recommended that the student strength should be 25 per class to deliver quality education (http://classsizecountswa.com/about/).
- The textbook board of Khyber Pakhtunkhwa has updated textbooks on SSC (Secondary School Certificate) physics. The updated textbooks foster intellectual growth and help the learners build important logical critical thinking skills. Such textbooks require the new instructional resources, comprising of multimedia representations, app-based learning approaches and strategies for problem-solving in the real world. Changes were introduced in the textbooks to eliminate the emphasis on rote learning. It is therefore suggested that physics teachers substitute their conventional teaching and adopt more logical, learning-oriented, and informed sophisticated teaching that converts students ' attitudes to vital, empirical, evaluative, imaginative, and relativistic thinking.
- This work indicates that the aim of teaching learning cycle is to inculcate thinking, vital, logical skills and achieve cognitive abilities in learners is growing increasingly every day. Therefore, it is highly advocated that constructivist teaching model be implemented into secondary physics classrooms to render the learning cycle of teaching more successful.

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