Problem-Based Learning and Conceptual Understanding of College Female Students in Physics

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ABSTRACT

In this changing world, peoples are often challenged with problems that require the use of scientific information so that they are able to make informed decisions. However, the study of physics is entangled with many problems including the belief that it is a male domain and the way it is presented to students. The purpose of this study therefore, was to explore the role of Problem Based Learning (PBL) by applying five step problem solving strategy in enhancing conceptual understanding of female students. The study was conducted in Bonga College of teacher education, Ethiopia. To achieve the goal of the study, pedagogical experiment was applied. Data were collected using conceptual understanding inventory test and questionnaire. There was a mean difference between comparison and experimental groups. The difference was statistically significant with large effect size. Students in the experimental group shows good motivation towards the strategy. Based on the findings, it was suggested to apply the five step problem solving strategy at college and tertiary level. Because, this strategy was helpful for students to scrutinize the connection between theory and practice, improves their motivation to learn, and eradicates rote memorization. It also helps to understand concepts and principles central to physics.

Keywords: conceptual approach, problem solving strategy, motivation, physics education

INTRODUCTION

Science helps an individual to survive in an increasingly changing scientific and technological world. That is, peoples need to apply scientific thinking in all parts of their lives. This days, our lives are becoming increasingly complex, we are often challenged with problems that require thinking about and use of scientific information so that we are able to make informed decisions. Particularly, the International Union for Pure and Applied Physics on the general assembly held at USA underlined the importance of physics as the one that contributes to the technological infrastructure and provides trained personnel needed to take advantage of scientific advances and discoveries (IUPAP, 1999). Physics also plays an important role in the education of chemists, engineers and as well as practitioners of other physical and biomedical sciences. That is physics extends and enhances our understanding of other disciplines.

Physics is one of the fields that advance the economic development of one nation, as it plays a crucial role in driving innovation and development of new technologies. For instance in UK, Physics-based businesses contribute 8.5% of the UK's economic output and employ dozens of people (IOP, 2013). It is also believed to power the UK's economy in the future, from agro-tech to business services to offshore wind power, which are built on the innovative application of physics and the skills of physics-trained people.

Regardless of such impressive importance, physics as a field of study is not given emphasis and many students show low interest to study physic in Ethiopia (Semela, 2010; Shishigu, Bashu, Tesfaw, & Gadisa, 2017). It is not unusual to observe, low enrolment rate in physics at college and university level. Also applicants who are assigned

Contribution of this paper to the literature

- It explores the role of five step problem solving strategy in improving female students' conceptual understanding.
- It finds out that female students' conceptual understanding was improved through the five step problem solving strategy.
- It discloses that female students' motivation towards the five step problem solving strategy was positive.

to the physics department are low achievers. Study shows that, one of the reason for this low enrollment in University were lack of job opportunity outside the teaching profession (Semela, 2010). In college of teacher education such as the site of this research project (Bonga college of teacher education), all graduates are trained to be a teacher. However, still enrolment rate in mathematics and natural science stream is still low as compared to other streams. The problem of low interest to study physics is not only common in Ethiopia, it is a global scenario. For instance, there is a decline in enrollment and graduation rates in physics at all levels in USA, UK, Germany, and the Netherlands (Osborne, 2003).

A number of factors have been identified to shore up the low interest to study science in general and physics in particular. These include introducing new physics curricula (Lawrenz, Wood, Kirchhoff, Kim, & Eisenkraft, 2009; Shishigu et al., 2017), strengthening pedagogical knowledge of teachers (Nigussie, 2014; Semela, 2010), adequate instructional materials (Wotengo, 2014). However, the issue is still a debate among science educators. Students only notice the surface features of problem situations. This reliance on surface features leads students to end up with wrong conclusions. Another piece of evidence pointing to student use of inappropriate problem solving skills is that several studies have found that students in introductory physics courses who get the correct answers often do not understand the physics concepts on which the problems are based (Lawrenz et al., 2009). Therefore the current study contributed by investigating the role of the five step problem solving strategy in enhancing conceptual understanding of physics among college female student.

Problem solving is one of the primary goals of physics courses. Problem solving strategy addresses some of the key points for students (Gök & Sılay, 2010). In particular, it provides a systematic approach such as examining a problem before blindly calculating and to checking their answers later. Problem solving can have different meanings in different situations (Hsu, Brewe, Foster, & Harper, 2004). Polya defined problem solving as a search for some action appropriate to attain an aim (Polya, 1962). Whereas, Rief defined it as a task which requires one to formulate a sequence of actions leading from some initial situation to some specified goal (Reif, 1995). Both definitions reflect similar process which is moving toward a goal. Hence, solving a problem is finding a way out of a difficulty. In the process of solving problem, the basic components include the initial state (givens), a desired end state (goal/required), and means to get from the initial state to the end state/operations (Ormrod, 2012). Due to its complement with the goal of this study, problem solving in this study was taken as defined by Rief.

Within physics education, efforts have been made to develop different types of problems that include some characteristics of ill-structured problems such as context-rich problems(Heller, Keith, & Anderson, 1992), ranking tasks(O'Kuma, Maloney, & Hieggelke, 2000), problem posing(Mestre, 2002), project-oriented design problems (Brown & Heywood, 2005), model-eliciting activities(Diefes-Dux, Moore, Zawojewski, Imbrie, & Follman, 2004; Lesh & Doerr, 2003), four problem solving step(Polya, 1957), five step problem solving strategy (Docktor, 2009; Docktor & Heller, 2009). Specifically, physics problems are often solved by using several algebraic procedures in succession (Ormrod, 2012). That is problem solving methods includes both step-by-step algorithms and general frameworks or heuristics (Docktor, 2009). Most of the strategies indicated above have not been tested for evidence of validity, but the five step problem solving strategy has been tested and validated by researchers in University of Minnesota (Docktor & Heller, 2009),

Even though Problem Based Learning (PBL) is new (Tan, 2003), it is based on ideas that have a long history and have been supported by many researchers such as (Dewey, 1910; Gijbels, Dochy, Bossche, & Segers, 2005; Piaget, 1954; Polya, 1962). The idea that learning is fostered when students have the opportunity to formulate and achieve their own learning goals is mentioned by Dewey (1910).

PBL approaches appear to be promising in addressing real-world challenges, higher-order thinking skills, communication skills, problem-solving skills and independent learning (Tan, 2003). Though, the approach and structure of PBL method may differ, the general goals tend to be similar. PBL begins with the assumption that learning is an active, integrated and constructive process. Using this premises this study contributed by applying the five step problem solving strategy.

To compromise the problem of low motivation and conceptual understanding of college female students, a five step problem solving strategy adapted from (Docktor, 2009; Docktor & Heller, 2009) was used. Similar strategies were used in the doctoral dissertations of Jennifer Blue (1997) and Tom Foster (2000) at the University of Minnesota.

They have used problem solving strategy on four criteria with different interpretations. All strategies emanate from the framework of Polya (1962) and Rief (1995) steps in the problem-solving process.

The five step problem solving strategy is a kind of problem based learning (PBL) which help students to reason through the problem and use their existing knowledge in order to solve problems. The five strategic steps are: useful description of the problem, Physics approach, specific application of physics, Mathematical procedures and Logical progression of the concept. Useful description is students' skill in organizing information from the problem statement into an appropriate and useful representation that summarizes essential information symbolically (Docktor, 2009). The description is useful if it guides further steps in the solution process. A problem description includes restarting known and unknown information, assigning appropriate symbols for quantities, stating a goal or target quantity, visualization, stating qualitative expectations, an abstracted physics diagram, drawing a graph, a coordinate system and choosing a system (Docktor & Heller, 2009).

Physics approach is the learners' skills in selecting appropriate physics concepts and principles to use in solving the problem (Docktor & Heller, 2009). The term concept is defined to be a general physics idea such as the basic concept of physics being taught. The term principle on the other hand is to mean a fundamental physics rules or laws used to describe objects and their interaction, such as the law of vector addition and multiplication (Hsu et al., 2004). Specific application of physics is learner's skill in applying the physics concepts and principles from their selected approach to the specific condition in the problem. A specific application of physics could include a statement of definitions, relation between the defined quantities, initial condition and assumptions or constrains in the problems (Docktor, 2009; Docktor & Heller, 2009).

Mathematical procedures are the learner's skills to follow appropriate and correct mathematical rules and procedures during the process. This correspond to carrying out the plan or the plan implementation process of (Polya, 1957). The term mathematical procedures refers to technique's that are employed to solve the target quantities from specific equation of physics, such as isolate and reduce strategies from algebra substitution, use of quadratic formulas or matrix operation (Docktor & Heller, 2009; Foster, 2000). The term mathematical rules refer to confection of the mathematics such as appropriate use of parentheses, square root and trigonometric identities. To be clear, symbolic/diagrammatic answer prior to numerical calculations are considered as appropriate mathematical procedures, which force students' to have mind map about the problem and its solution. Logical progression on the other hand refers to student's skills at communicating reasoning, staying focused toward the goal and evaluating the solution for consistency (Docktor, 2009). It helps to check whether the entire solution is clear and correct, focused and logically organized. Thus, the term logical means that the solution is coherent.

PROBLEM STATEMENT

Problem solving has become important cognitive activities in teaching and learning physics. Many researchers argued that the traditional way of teaching and learning cannot truly reveal what the students learnt and knew (Ganyaupfu, 2013; Hasheesh, Al-Mostaf, & Obeidat, 2011; Selçuk, 2010; Shishigu et al., 2017).

Though the instructional method of teaching physics in Bonga College of Teacher Education is well organized to help students in all direction, still female students are underrepresented. Thus, it needs the attention of science educators and policy makers to create mechanism that improves students' performance in physics, especially those of females. To that effect, the following research questions were developed and addressed:

- o Will female students in the experimental condition show significant improvement on their conceptual understanding after the treatment?
- o What is the effect of the five step problem solving strategy on college female students motivation?

RESEARCH METHODOLOGY

To achieve the goal of the study, a pedagogical experiment with non-equivalent comparative groups was used, because the theoretical perspective most often associated with cause and effect relationship is an experimental study(Bogdan & Biklen, 2003; Cohen, Manion, & Morrison, 2007; Creswell, 2014). It is not possible to conduct true experiment on human beings; as a result this study was a non-equivalent pre-test, post-test control group design. Hence, intact classes were used instead of randomly composed samples. There where one experimental group and one comparison group. Permission was obtained from Bonga College of Teacher Education as to set experimental and comparison groups.

Before the execution of the treatment, a similar test to that of the post-test was administered to both the experimental and comparison group (pre-test). The study was conducted over a period of 16 weeks starting at the beginning of the first semester of the academic year in September 2016. This comprises one full semester according to the academic calendar of the college. A total of 64 students were participated in the study. Students were at their

Table 1. Group difference on the pre-test

Variable	Groups	N	M	SD	t	df	p
Conceptual inventory test	E	32	29.84	15.55	.023	62	.981
	C	32	29.75	16.52			

first year and registered in mathematics and natural science stream. The experimental and comparison groups comprises 32 students each. Diagrammatically, the design of the study is shown in **Appendix 1**.

In **Appendix 1**, three different colors were used to show the difference of concepts being shown. The first row contain "x" in the treatment condition and the second row is empty. That means the treatment is not given for the second group. The pre-test and post-tests are the same for both groups. This is to infer the effect of the treatment under similar conditions except the treatment.

Experimental Procedure

After the pre-test has been completed, the five step problem solving strategy was introduced for experimental group. During this presentation, the problem solving strategy was explicitly described and demonstrated using sample of problems from basic natural science module (BNS101) and one of the researcher who works in the selected college explicitly explained the strategy to students as a course instructor. Thereafter, they applied the problem solving strategy in the classroom when solving sample problems. Students were required to apply the problem solving strategy not only when working on their own but also during group work to internalize the strategy. Students were given the opportunity to practice using the five step problem solving strategies for particular topics. Students then actively engaged, contributed to the construction of solutions during each lesson of the course.

To create homogeneity, the same instructor was assigned by dealing with stream officers to give the course for both the experimental and comparison groups. For each sub topic, a problem was given to students in order to increase their exposure to problems. The researchers did not provide solution for these problems to either groups in order to prevent rote learning of model solutions and to provide opportunities for practice of the five step problem solving strategy.

Data Collection Instruments

The data collection instrument used in this study were: pre-test, post-test and questionnaire. The pre-test and post-test were constructed based on basic natural science (BNS101) course outline and table of specification which comprise 10 items each. The pre-test and post-test have internal consistency reliability of 0.78 and 0.87 respectively. The course basic natural science (BNS101) was given for 1st year students in first semester at college level. It comprises physics, chemistry and biology. Particularly, this study is conducted on the physics part. Topics covered in the study includes physical quantities and measurements, motion and force, energy, electric current and magnetism. In order to ensure uniformity, the pre-test and post-test were set and marked by researchers and taken as part of course assessment to minimize extra work load on students. The consent of college administration and students involved was obtained and consensus has been reached beforehand.

METHOD OF DATA ANALYSIS

The analysis of data was carried out using parametric and non-parametric statistical tests; t-test, Chi square and Analysis of Covariance (ANCOVA). The post-test was subjected to ANCOVA using pre-test scores as covariates. ANCOVA was used to statistically control the pre-test sensitization, which affects the post-test result. All statistical tests were computed using IBM SPSS Statistics for Windows, Version 20.0.

A p-value of less than 0.05 was considered to be statistically significant. After the statistical analysis, qualitative evaluation of post-test has been employed to examine the conceptual understanding of each problem.

RESULTS AND DISCUSSION

Group Difference on the Pre-Test

Conceptual inventory test was administered as a pre-test at the beginning of the study for the purpose of determining whether or not there was a statistically significant difference between the groups. Examining the independent samples t-test; the result shows no statistically significant difference between the groups ($t_{(62)}= 0.23$, $p>0.05$). **Table 1** shows the score averages obtained by the groups from the pre-test of conceptual inventory and the t-test.

Table 2. Pre-test and post-test comparison within groups for conceptual inventory

Observation	Group	Paired difference					
		N	Mean difference	SD	t	df	p
Posttest-pretest	E	32	33.65	20.55	-9.261	31	.000
	C	32	13.12	20.29	-3.659	31	.001

Table 3. Adjusted and unadjusted means and variability for conceptual inventory using pre-test as a covariate

Group	N	Unadjusted		Adjusted	
		M	SD	M	SE
E	32	63.5	13.25	63.5	2.68
C	32	42.87	17.02	42.88	2.68

The researchers controlled all the possible confounding variables such as time difference, the effect of the teacher and topics to be covered. Thus, it is evident to deduce the effect of the treatment. The post-test result shows that the two groups increased dramatically and the escalation made by the experimental group is much better; 63.5 mean score for experimental group and 42.87 mean score for comparison groups. **Table 2** shows the deviation within each group.

As shown in **Table 2**, the move from pre-test to post-test made by both groups was statistically significant at *p= 0.05* level. The mean score of students in the experimental group on the post-test (63.5) was greater than their score on the pre-test (29.84). The experimental group scored above the minimum base line for passing. The cutoff point is 50% (TGE, 1994). For comparison groups, the mean score on the post-test was (42.87) while the mean score on the pre-test was (29.75). A paired sample t-test shows that the difference for both the experimental group ($t_{(31)} = -9.261$, $p < 0.05$, $d = 2.33$) and comparison group ($t_{(31)} = -3.659$, $p < 0.05$, $d = 0.78$) was statistically significant on the inventory tests. This difference, according to (Cohen, 1988) is much larger than typical for experimental group and small for comparison group. This shows that both groups increased in a statistically significant extent. But, the experimental group made 20.53% improvement than the comparison group. This difference was statistically significant, see **Table 4**.

## Post-Test Comparison between Groups for Conceptual Inventory

In this part of analysis, ANCOVA was used to statistically control the effect of the pre-test. ANCOVA typically provides a way of statistically controlling for the effects of continuous variables that the researcher is concerned and which are not the focal point or independent variable(s) in the study (Leech, Barrett, & Morgan, 2005). Thus, the pre-test is called covariate or control variable. Covariates are variables that may cause to draw incorrect inferences about the dependent variable. Accordingly, the result of the study indicated that after controlling for pre-test effect, there was a significant difference between experimental and comparison groups in conceptual inventory ($F_{(1, 61)} = 29.382$, $p < 0.05$). **Table 3** presents the means and standard deviations for experimental and control groups on conceptual inventory before and after controlling for the effect of the pre-test.

As it can be seen from **Table 3**, there was a difference between experimental and comparison groups. Standard error (SE) indicates the deviation of adjusted sample mean from the unadjusted mean. Results indicated that after statistically controlling the effect of the pre-test, the mean score of experimental group (63.5) was higher than the mean score of comparison group (42.88) on conceptual inventory test. This difference was statistically significant, see **Table 4**.

The analysis of covariance presented in **Table 4** shows the existence of significance difference between experimental and comparison groups in conceptual understanding ($F_{(1, 61)} = 29.382$, $p < 0.05$, $\eta^2 = 0.325$). The effect size eta-squared, is interpreted as small, medium and large effects if it possesses the values 0.01, 0.06 and 0.14, respectively (Stevens, 2009). Thus, the effect size is large. The partial eta square value (η^2) shows that the use of five step problem solving strategy by the experimental group in contrast to the comparison group explains 32.5% of the variability in the conceptual inventory post-test scores independently from the pre-test variable. So, it is evident to deduce that the intervention made in this study enhanced the conceptual understanding of students. Generally, the result of this study shows that five step problem solving strategy could be more effective on conceptual understanding than the conventional teaching method.

Table 4. Results of ANCOVA for conceptual inventory test

Source	df	Mean square	F	p	η^2
Pre-test	1	321.296	1.389	.243	.022
Group	1	6797.414	29.382	.000	.325
Error	61	231.348			
Total	64				
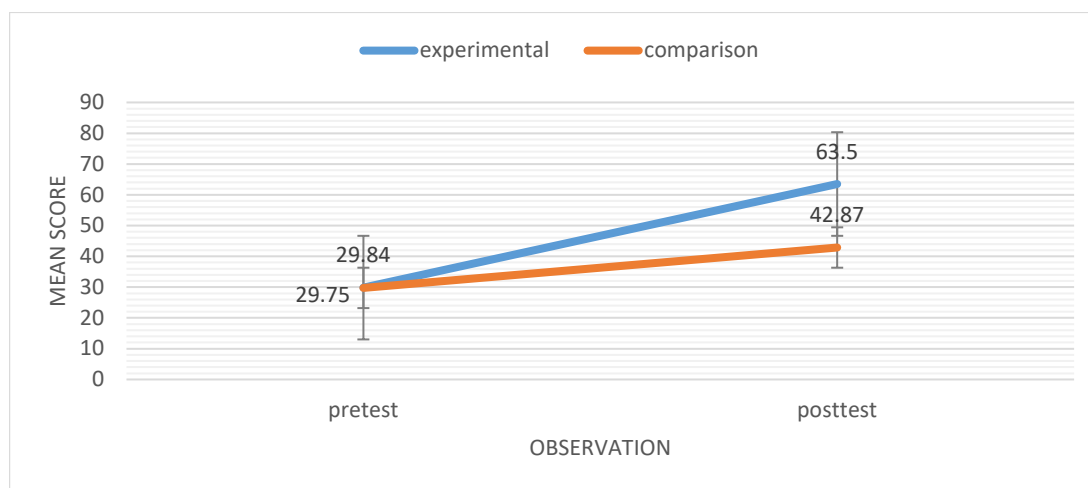
Figure 1. The effect of the treatment on students' conceptual understanding

Figure 2 shows the pre-test and post-test scores of students in both experimental and comparison groups. As it can be seen, the increase made by the experimental group was higher than that of the comparison group and this increase was significant at $\alpha = 0.05$ level.

The result of this study is in line with the study of (Gök & Sılay, 2010). Which shows the effectiveness of problem solving strategy steps in cooperative groups on physics achievements of students. This effectiveness was obtained due to effective and systematic organization of problem solving strategies, and applying these strategies in a plan (Gök & Sılay, 2010). The study conducted by (Yasin, Halim, & Ishar, 2012) also found similar results. They found that the implementation of problem solving strategies has successfully increased students' achievement in physics. Generally, the findings of this study are supported by other research findings such as (Kaptan & Korkmaz, 2002), (Rojas, 2010) and (Ehrlich, 2002).

In this study, qualitative evidence on the five step problem solving strategy has also been addressed. Student's solutions to selected problems from post-test have been discussed in detail to explore the treatment group's conceptual understanding. Two questions were selected for detailed analysis of student solutions. The two equations represent problems for which the scores of the two group's differed substantiality as well as problem for the scores were similar. For each of these two questions, solution maps were constructed. The maps were developed as follows. For particular problems, each student's solution was classified according to the five step strategy. For each steps the percentage of students choosing that route was indicated for treatment and comparison groups separately. Different trends amongst the solutions of the two groups become visible on the solution maps. The different trends were interpreted as conceptual understanding (conceptual approach) and algebraic approach among the treatment group and comparison group.

The term "conceptual approach "will be used in further discussions to mean the useful descriptions or physics approaches that were explicitly described in the problem, while the term "algebraic approach" was used to refer to solution which rely only on algebra when useful description or physics approach where not explicitly elaborated. The increase in conceptual approach and algebraic approach was statistically checked by chi-square analysis. Chi-square analysis was performed with each student's five step problem solving strategy classified as either conceptual or algebraic. Solution was analyzed according to their approach to the problem depending on the given correct solution map. Among the experimental group, 76.66% of the students used conceptual approach and 23.34% of them used algebraic approach.

The analysis shows a significant difference in problem solving approach($\chi^2 = 22.318$, *df =1, N= 64, p<0.05)*. This indicates that the treatment group made significantly more use of conceptual approach. More experimental group students were able to apply physics principles (conceptual approach), whereas the comparison group students tended to apply formulae. The comparison group students showed the tendency to apply formulae without useful

description which lead them to rote memorization. The solution map confirmed that the experimental group students developed better conceptual understanding through the five step problem solving strategy.

Students' Motivation

Questionnaire was used to determine students' motivation toward the five step problem solving strategy. For clarity, the finding were divided in to two sections. The first section deal with positive aspect of motivation of the students about the strategy while the second section deal with negative aspect of motivation of the students about the strategy.

The result of the study revealed positive motivation towards the five step problem solving strategy amongst the treatment group students. When asked whether they were motivated to apply the strategy, 95% answered yes, while the rest 5% were unsure. The entire student respond that they would keep on using this strategy. Students contend that using the strategy help to shift the focus from formula to understanding of physics concept, when asked for an opinion on the problem solving strategy. Of the total experimental group students, 73% reported that the strategy has helped them to increase their problem solving skills which again help them to understand the basic concept being asked and to relate to physical phenomenon. However, 27% reported that it was a waste of time.

Regarding the negative response, researchers have tried to further investigate the situation. Clearly, there is some concern for time spent on writing down the step of the strategy. All those drawings and data take a lot of time and students do not want to expend too much time. But, the benefit is immense. Since visual representations are a powerful tool that help to make the unseen seen and the complex simple(Quilli & Thomas, 2015). That is why the majority of experimental group students discern positively and their performance improved.

CONCLUSIONS AND RECOMMENDATIONS

Students learn a lot of concepts in a given course, and they drill that knowledge so that they pass exams in the college. But, they rarely understand the concept in such a way that they can apply the knowledge in the real world. Instructors must make sure that students understood the concepts, principles, and theories central to the disciplines of physics. A person possessing these understanding can be able to think scientifically and apply the knowledge and skills of science when confronting with both individual and societal problems (Cochran-Smith, Feiman-Nemser, & McIntyre, 2008).

From students' perspective, physics is considered as one of the hardest subjects in schools and females are underrepresented. However, this study shows that female students can succeed if given continuous motivation and effective execution of the five step problem solving strategy. Hence the strategy allows students to grasp physics in a better and effective way.

Within the scope of this study, it was aimed to investigate the effect of the five step problem solving strategy upon conceptual understanding of college female students. Accordingly, students in the experimental group were given applications enabling the use of five step problem solving strategy in the process of solving physics problems, whereas students in the comparison group were allowed to proceed as usual. After completing the experimentation in 16 weeks, the conceptual inventory test was administered. Data analyses showed that the use of five step problem solving strategy had positive effects upon the conceptual understanding of female students.

As a result of the intervention made in this study, it was found that the experimental group outperformed the comparison group counter parts in terms of solving physics problems in different direction. The comparison group in other case was observed in relying on memorizing formulas and ordinary computations which leads them to have low conceptual understanding of basic concepts. Based on the aforementioned discussion and the findings of the study, the following conclusions were drawn:

o The conceptual understanding of both the experimental and comparison groups have increased in a significant extent. The experimental group made a 20.53% improvement than the comparison group. Students in the experimental group also shows good motivation towards the strategy.

o The partial eta square value (η^2) shows that the use of five step problem solving strategy by the experimental group explains 32.5% of the variability in the conceptual inventory post-test scores independently from the covariate variable (pre-test variable).

o The treatment group made significantly more use of conceptual approach. Experimental group students were able to apply physics principles (conceptual approach), whereas the comparison group students showed the tendency to apply formulae without useful description which lead them to rote memorization. The solution map developed in this study confirmed that the experimental group students developed better conceptual understanding through the five step problem solving strategy.

o The five step problem solving strategy allows instructors to identify students' difficulties in order to provide timely and effective coaching.

o The five step problem solving strategy were helpful for students to scrutinize the connection between theory and practice, improve their motivation to learn, and eradication of rote memorization. It also helps to understand concepts, principles and theories vital to physics.

o For future researchers it is highly recommended to conduct similar research in different contexts and dimension to create recognition of the use of the five step problem solving strategy. Since the results of a few studies are insufficient to decide about the maximum use of the strategy, additional studies should be conducted in different topics of physics or science to explore strength and weakness of the strategy.

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APPENDIX 1

Design of the Study
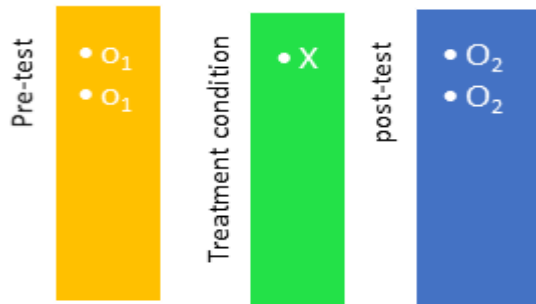
APPENDIX 2

Sample Problems Given to Apply the Five Problem Solving Strategy

<u>Instruction</u>: **Show all necessary steps and give out solutions and interpret the solution**

1. The force of 10N each is acting at a point. One force acts in the east direction and the other 60^0 north of east. Find the resultant force?

2. A stone is launched vertically upwards from ground level with initial velocity 30m/s. Assume the acceleration is $10m/s^2$.

   a) Find the time taken for the stone to return to the ground?

   b) Find the velocity with which it hit the ground?

3. If 1 kg of mass rests on the surface of the earth. What is the weight of the body

4. A body is thrown at an angle of $\theta=45^0$ form the horizontal surface with initial velocity of 60 m/s. the range of the body is _____ m. (Sin 90^0 =1 and g= $10m/s^2$)

5. An object is moving with constant velocity of 30 m/s along straight line. What would be the average velocity of the object?

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