Self-efficacy Belief and Perception Among Pre-service Bachelor of Education (B.Ed.) Primary Final Year Students in Teaching Primary Science After Graduating From Paro College of Education

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Abstract

Study was carried out, to find out the competency of the Pre-service B.Ed. primary final year students to teach primary science curriculum in school after graduation. For this study the sample size considered was about 110 final year students. Data was collected through interview and questionnaire. The data collected were analysed using a statistical package for the social sciences. The result showed that, students who have taken science in higher secondary schools are more prepared and competent to teach primary science in schools when compared to students studying arts and commerce. The result also indicated that, more time be given for this particular module while teaching in college, so that students get enough of first-hand experience to do all the prescribed activities. The finding also shows that different branch of science was given different weightage by the module tutors when they delivered the module.

Keyword: *Self-efficacy, Pre-service; competency; Primary Science; curriculum; first-hand experience; prescribed activities.*

Introduction

SCI201 (Primary Science) is one of the compulsory modules in B.Ed. primary program at Paro College of Education. It is offered to B.Ed. primary students during year II, semester II. The module carries 12 credit taught for 4 hours per week for 15 weeks. The teaching strategies includes lectures, field work, discussion and laboratory experiences. This module includes basic scientific principles which are applicable in day-to-day life and different forms of laboratory experiences and is contextualized and aligned to the primary school science curriculum that is taught in the schools across Bhutan. This module covers diverse topics from three branches of science viz. life science, material science and physical science. Many activities are integrated to make the teaching learner centered, interactive, fun and meaningful. The module also gears towards encouraging creativity and building up talent to create conducive learning environment for science.

This module is instituted as one of the important modules for the B.Ed. primary students. The main aim in offering this module is to equip student teachers with scientific concepts and skills to develop scientific attitudes. The module is delivered in a way that basic application of various teaching and learning principles are met, and proper assessment and its role in teaching and learning and teaching methods are well taught.

Though primary science module was taught for decade in college, the primary science curriculum in school was reviewed recently. Therefore, it was necessary to carry out this study to find out how well the B.Ed. primary students are prepared to teach the primary science curriculum in primary schools once they graduate from the college. So, the main idea behind carrying out this study was to find better insight into the preparation of B.Ed. primary student teachers with regard to handling primary science in school. The study also aims at evaluating the effectiveness of SCI201 module to prepare our student teachers in teaching primary science in school.

The result of the study will help identify the effective and ineffective components in primary science module content and teaching strategies and recognize the opportunities and threats to the implementation of this module. The results of the study will be used for reviewing of the module and to improve the teaching for better learning of the future learners.

Literature Review

Teachers' confidence in their own teaching abilities is known as self-efficacy. Teachers with high self-efficacy beliefs possess more beneficial characteristics than those with lower self-efficacy beliefs, making high self-efficacy a desirable trait for teachers (Allinder, 1994; Bandura, 1977). Efficacy beliefs determine individuals' initiation of behaviors, effort level and time spent in the face of obstacles, recovery from failures, and persistence in overcoming difficult situations. Bandura (2006) further states that, "perceived self-efficacy is a judgment of capability to execute a given type of performances; outcome expectations are judgment about the outcomes that are likely to flow from such performances" (p. 309). Further Tschannen-Moran and Hoy (2001) defined teacher efficacy as a teacher's "judgment of his or her capabilities to bring about desired outcomes of student engagement and learning, even among those students who may be difficult or unmotivated" (p.783). Thus, information affecting teaching efficacy is valuable knowledge for instructional design decisions in pre-service teacher education program. Individuals' self-efficacy beliefs are constructed from four sources of information: enactive mastery experience, vicarious experience, verbal persuasion, and physiological and affective state (Bandura, 1997). In teacher education,

actual teaching experiences are the most powerful mastery experiences that convince teachers about their teaching ability (Tschannen-Moran, Hoy, & Hoy, 1998).

Allinder (1994), states that teachers with high teaching efficacy beliefs had a tendency to implement diverse methods in their instruction. Furthermore, the higher the teachers' teaching self-efficacy is, the more confidence they have in their instruction. These successful and direct teaching experiences also influence pre-service teachers and novice teachers in their efficacy development (Housego, 1992; Woolfolk & Hoy, 1990; Lee, 2002). It can be described as "a belief about one's own capability to organize and complete a course of action required to accomplish a specific task" (Eggen & Kauchak, 2007). As can be understood from the definition, self-efficacy "is concerned with judgments of what one can do with whatever skills they possess" (Bandura, 1986). It consists of two components, efficacy expectations, which are related to belief in personal capacity to affect behavior, and outcome expectations, which is a belief that the behavior will result in a particular outcome (Albion, 1999). Several research studies indicate that depending on these sources of judgments, individuals have negative or positive ideas about a behavior before they undertake it and these ideas affect their course of action (Bandura, 1986; Albion, 2001).

Recent studies on self-beliefs and perceived values has indicated that these parameters play an important role in affecting individual's behaviour and performance. For teachers, their self-beliefs about teaching and their valuing of learning are likely to influence the way they teach and the way they perceive their students' learning abilities (Wang, 2000; Yeung et al., 2012)

Teachers' efficacy is very important as programs for teacher preparation around the world attempt to address shortages of qualified, competent teachers. It is further stated that in the field of science education, monitoring and reacting to the issue of efficacy seems to be one way in which programs for teacher preparation are evaluating the structure of the programs. Study also suggest that two types of beliefs seemed relevant, belief that student learning can be influenced by effective teaching (outcome expectancy beliefs) and confidence or belief in one's own teaching ability (Çakiroglu & Boone, 2005).

Study shows in recent years there has been concern expressed about the state of science teaching in many primary and preschool (elementary and kindergarten) classrooms, and the poor science background knowledge of many teachers (Appleton, 2007). Many pre-service primary teachers have low self-efficacy for science teaching (Palmer, Dixon, & Archer, 2015). The teachers' lack of confidence to teach science has been largely attributed to their

poor background knowledge on content and scientific practical skills. When asked science teachers, "What kind of activities do you perform in science laboratories?" to which they received answers such as demonstration experiments, group work, and rotational experiments (Gott & Duggan, 1995; Pekmez, 2000). Many studies have shown that science teachers are not aware of the fact that various experiments they perform should have different objectives. Laboratories should not only aim to reinforce theoretical knowledge, but also allow students to discover knowledge on their own (Nott & Hodson, 1992; Wilkinson & Ward, 1997; Wellington, 1997).

Besides offering scientific knowledge, laboratory classes also contribute to improving student skills including, scientific thinking, observation, creative thinking, interpretation of events, data collection and analysis, and problem solving (Ausubel, 1968).

Methodology

Sample size

For this study the sample comprised of pre-service primary teachers enrolled in a four year B.Ed. primary program. All participants were final year students. Out of 130 final year students enrolled in the course, only110 volunteered to participate in this study. So, the sample size was 110. All of the participants have taken SCI201 as one of the compulsory modules in their second year.

Survey Tool Design

The researchers developed a questionnaire targeted at answering the research questions. The questionnaires mainly composed of Likert scales, 1(strongly disagree) being the lowest and 4-strongly agree and 5not applicable. *Likert scale* is the most widely used approach to scaling responses in survey research to measure attitude, opinions and perceptions. The questionnaire also had a provision of space for extra information. A pre-test was done to evaluate the effectives of the questionnaire with regard to language and measure.

Survey Administration

The study was conducted in two phases. During the first phase, the questionnaires were distributed among the B.Ed. pry final year students. Each respondents survey response was allocated a code to maintain the confidentiality. The questions were mainly focused on the student teacher's professional disposition on content & pedagogy and practical/laboratory skills. The questionnaire also comprised of some items on the primary science contents and lecturer's professional disposition on the delivery of the contents.

During the second phase, focus group interview and an individual interview were conducted to triangulate the data, fine tune and to get an in-depth information. Two representatives from the four sections were asked to volunteer, although there were not two representatives but there were at least one from each section. The focus group discussion was conducted for an hour or so using the semi structured question which focused on the student teacher's professional disposition on content & pedagogy and laboratory skills. One to one interview was also conducted with few student teachers.

Result Analysis

The study made use of statistical package for the social sciences (SPSS) to compute the results and generate analysis. To analyse the data, at first the factor analysis was done for all the items belonging to the Part C and Part D of questionnaire as these items directly pertains to the participants' self - efficacy belief and their preparedness to handle and teach primary science. Before analyzing any data, factor analysis was carried out. Factor analysis is widely used statistical technique in the social sciences. It attempts to identify underlying factors that explain the pattern of correlations within a set of observed variables and reduce the complexity in a set of data. The items which were loaded under different factor were put together and theme was generated based on the commonalities of the items. From the two broad sections of questions, several themes were generated based on item-wise factor loadings. Items which have factor loadings of < 0.40 or items which loaded on two or more factors were omitted. The themes that emerged after the factor analysis on Self-Efficacy Belief and Perception Among Pre-service B. Ed Primary (Pry) Final Year Students were on the students' competency in teaching the contents and use of teaching methods. The other themes that emerged were on their practical skills, laboratory safety, preparation of reagents, preservation techniques, improvisation, use of equipment and providing first aids during emergencies.

Result and discussions

The result and discussion are presented theme wise as follows;

Teaching of primary science contents

One of the themes considered after factor analysis was teaching of primary science contents in schools by the graduates of B.Ed. primary from PCE. The result shows that students with science background are more confident and well prepared to teach primary science curriculum in primary school when compared to commerce and arts background students (Fig.1.1). This clearly shows the self-efficacy beliefs in terms of enactive mastery experience and vicarious experience, since graduates with science background have more experience in learning science contents than the other graduates without science background.

PCE offers B.Ed. primary course to all the graduates of class 12 with pass certificates. Therefore, students joining the said course come with diverse background like arts, commerce and science background.

Use of different teaching methods (Pedagogy)

Question were asked to the students, on how well they are prepared to teach primary science using different teaching skills and strategies. How prepared are they in handling scientific apparatus and conducting fair testing experiment?

The result shows more than 65 percent of the B.Ed. primary students are confident in handling the primary science classes on their own in terms of handling and conducting fair testing experiment, using various kinds of skills and strategies (Fig.2.1). This shows that the module tutors are able to impart right kind of skills and strategies to the students in terms of teaching primary science in schools by the B.Ed. primary graduates. This result also shows the self-efficacy of lectures with regard to verbal persuasion one of the important sources to achieve self-efficacy. Result also shows that, number of fair testing experiment was conducted, and students were confident in conducting scientific fair testing experiment on their own. Moreover, students were given ample of firsthand experience in handling and caring of the scientific apparatus, result shows that students are confident and well aware on handling of the apparatus.

Professional disposition on practical skills

In terms of conducting primary science practical, the result clearly shows that B.Ed. primary students are well equipped with basic skills in designing and setting up an experiment (Fig.3.1). The result also shows that they are pretty good in handling the equipment and to write the problem statement correctly. When it comes to preserving the biological dead specimen in the laboratory students are not that confident. This might be because the students are not given the practical skills of preserving the specimen on their own, though they are briefed theoretically how to preserve the dead plant and animal specimens. So, it indicates that tutor need to focus more on giving student firsthand experience in handling and preserving the dead biological specimens. This result proves that lecturer lacks the self-efficacy of enactive mastery experience in-terms of teaching the students with regard to preserving the dead biological specimens to students.

Laboratory safety & first aids

When it comes to basic safety issues and providing simple first aid in emergency, in the laboratory maximum of the students are confident and competent in providing simple first aid in need. Students are also well aware about the safety issue in the laboratory (Fig. 4.2). This shows that students are well taught in terms of laboratory safety issues. They know that laboratory safety is of top priority when comes to conducting practical in laboratory. As per the result analysis, the tutors also taught the students about importance of laboratory safety and to provide simple first aid in emergency. Self-efficacy of lecturers in terms of preparing students about laboratory safety and first aids is clearly very high, having lots of mastery experience, vicarious experience and even good at verbal persuasion.

Preparation of reagents & mounting slides, preservation techniques

More than 60% of the students were of the opinion that they can easily prepare common laboratory reagents like dilute acids, some bases, can identify chemicals correctly and can mount specimen on slides comfortably (Fig.5.1). Students are very well aware of taking correct precautions during the mounting of slides and preparing any reagents. The result clearly shows that students were given enough of practice in terms of simple specimen mounting on slide, common reagent preparation with all the necessary precautions. This shows that the lecturers are lacking mastery experience and vicarious experience in terms of slide preparation and preservation techniques.

Operation and use of equipment

Questions were asked on whether students are confident in using and operating simple scientific equipment like compound microscope, screw gauze, Vernier calipers, etc. As per the result it shows that more than 70% of the students are confident in operating and using the simple scientific equipment (Fig.6.1). This shows that students were given ample of hands on experience in handling and operating the simple scientific equipment. It also shows that giving students to explore on their own plays an important part in learning and teaching science. Self-efficacy of lecturers are clearly reflected in this result. It shows that lecturers are having some mastery experience and vicarious experience in using and handling some simple scientific equipment.

Improvisation of apparatus and laboratory design

The result clearly shows that students are confident to improvise some simple laboratory equipment in need (Fig.7.1). It might be because students were asked to improvise simple

equipment like beakers, funnel, test tube holder, etc. Result also shows that students were given enough of practice in designing model chemistry laboratory for schools and colleges with all the safety facilities like fume hood, exhaust and enough ventilation. This result shows that lecturers have good experience in improvising some simple laboratory apparatus and have good experience of model laboratory designs having all the modern ambient in it.

Discussion on focus group (FG) interview

Few students volunteered for focus group interview, and they were asked varieties of questions based on content, style of delivery, lecturer competencies, student's preparedness and some general questions.

With regard to content, they felt that, some aspects of science were covered more and some aspect of science was taught less depending on the competencies and preparedness of the lecturers. This clearly shows some physiological and affective state of the lecturers, which has huge impact on overall delivery of the module. Students felt that some content of science was taught more, as most of respondent remembered the life science contents more than physical processes or materials and their properties and some content were never taught or overlooked. Students felt that all the three branches of science must be given equal importance and uniform coverage by the lecturers.

In terms of delivery of lesson, students felt that it depends on the lecturer how prepared are they for that particular class. Some lecturer taught the concept based on first-hand experience and some just give lecture with no demonstration, which had indirect impact on students learning. Students felt that three tutors coming and teaching three aspect of science was not good for the students since, different tutors focused on teaching differently.

When students were asked about how prepared are they to teach primary science in the school, some expressed that they were prepared enough since they got opportunity to teach primary science during their teaching practice. But many expressed that they are not prepared enough with regard to carrying out the activities and handling some of the practical classes.

In general, students felt that the timing allotted for the SCI201 (Primary Science) module was not enough, few of them suggested to make two primary science modules or to stretch the module for two semesters teaching. They would like to see that whole module is taught by single lecturer rather than shared by different lecturers. Beside this, students also aspect that lecturers to be well prepared and use some humour in class to make class lively and interesting. Students

also shared during the FG discussion that they need more hands on practices beside theory classes.

Conclusion

The general finding of this research shows that, students who have studied science during class twelve are more prepared and confident to teach primary science in schools after their graduation compared to students who have studied commerce and arts in class twelve. The findings also show that, students are well prepared to teach primary science in primary school after graduation by the respective module tutors. But when group of students were interviewed, they expressed that, the number of hours allocated for teaching of primary science module in the college was less and felt that they could be given more number of hours so that they get to learn more in-depth about three branches of science along with more hands on experience. The study also shows that students are given less practice on how to preserve the biological specimens, so there is need to give the students more of first-hand experience in biological specimens. Students expressed that there was some problem in delivering the module when taught by different module tutors for instance some tutor focuses more on theory part and some more on practicum.

Therefore, it is recommended to have a uniform understanding among different module tutors before teaching primary science module so that such problems can be addressed. It was also found that some tutor focus more on material science when compared to physical and life science. Therefore, it was found preparedness of students to teach primary science in school is dependent on module tutors assigned to teach the module in the college. It is therefore recommended that, module tutor with sound knowledge in all three sciences be assigned to teach this module. Moreover, it would be good that all the primary science module tutors sit and discuss the way forward to teach the module for different sections of students. It is further recommended that students with science background be identified and informed to ministry of education and be given to teach primary science in the school as far as possible so that primary students will enjoy learning science.

Figures

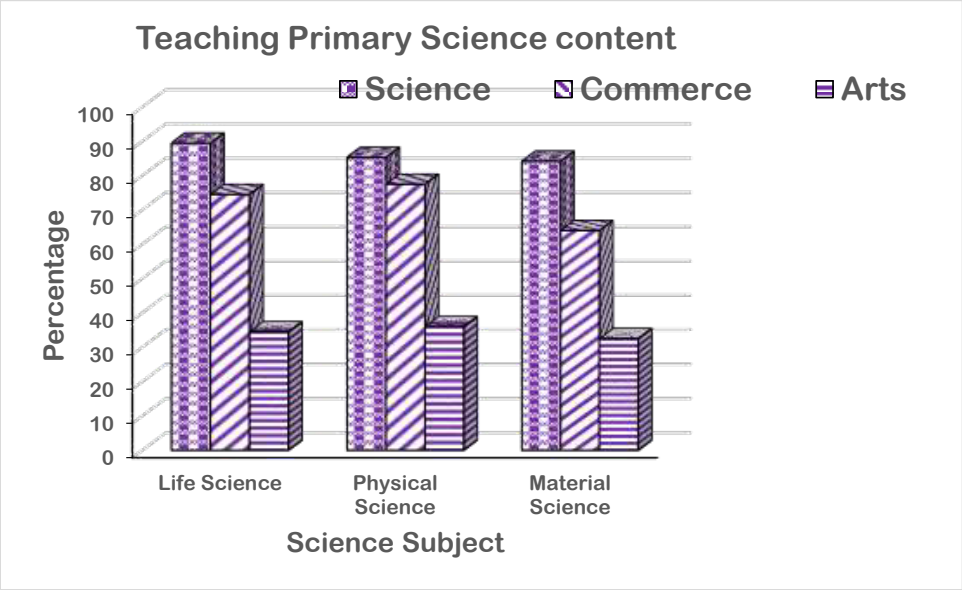

Figure 1.1 Stream wise competency in teaching primary science.

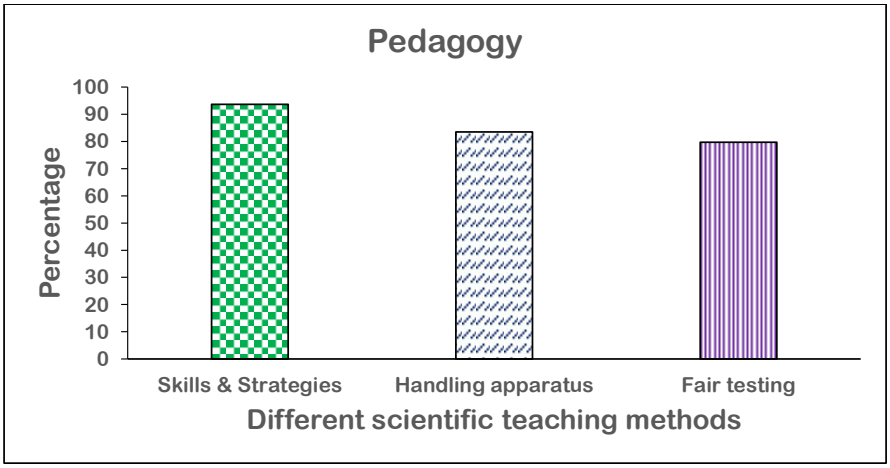

Figure 2.1 Use of various strategies to teach science subject.

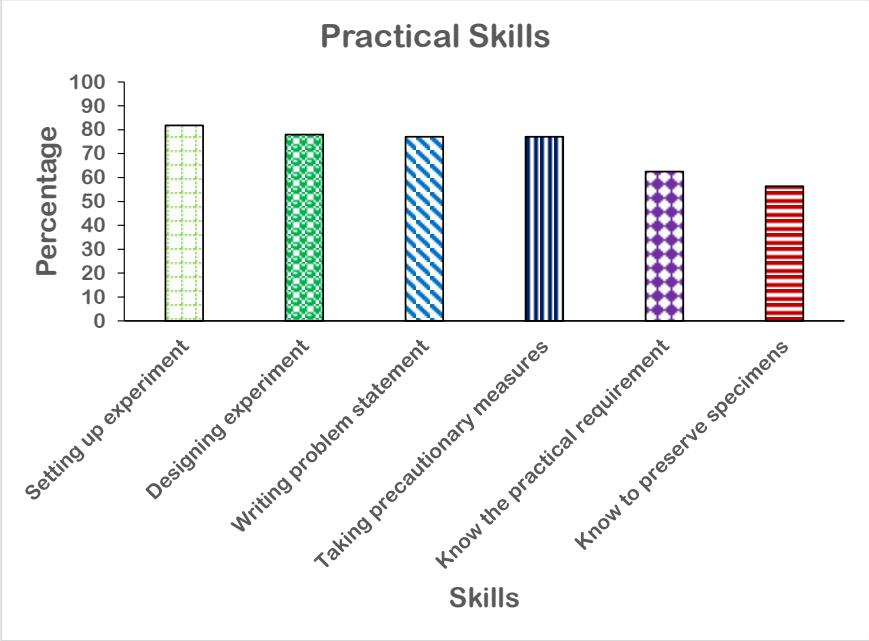

Figure 3.1 Different practical skill

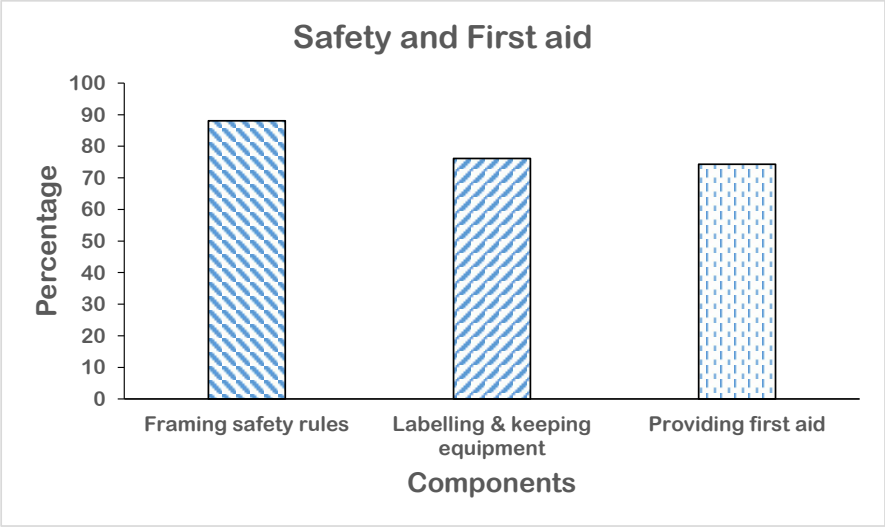

Figure 4.1 Laboratory safety and first aid.

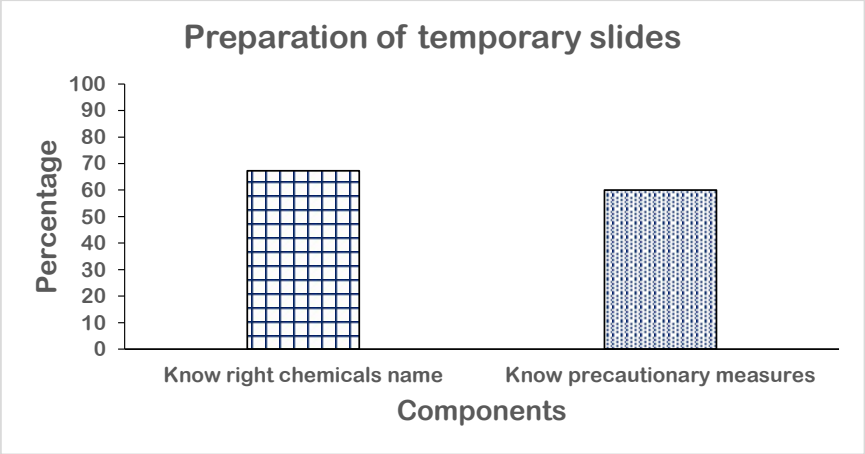

Figure 5.1. Preparation reagents and temporary slides.

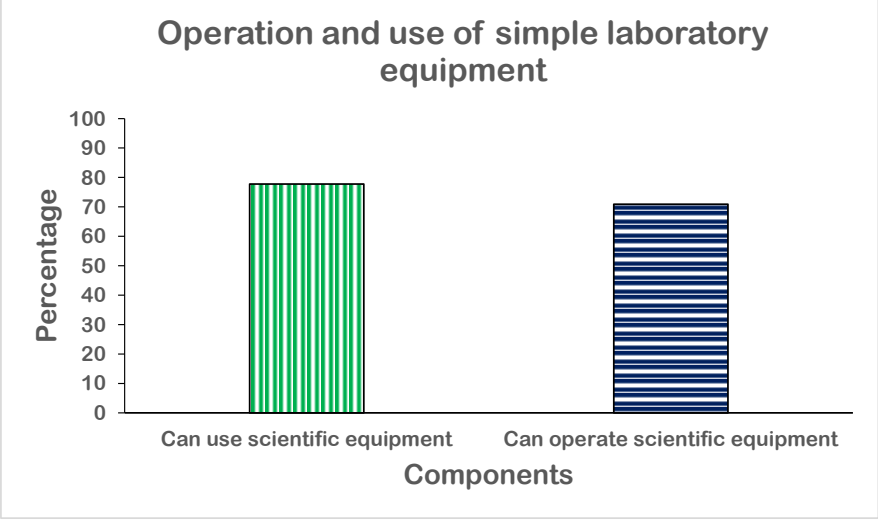

Figure 6.1. Use & operate scientific equipment.

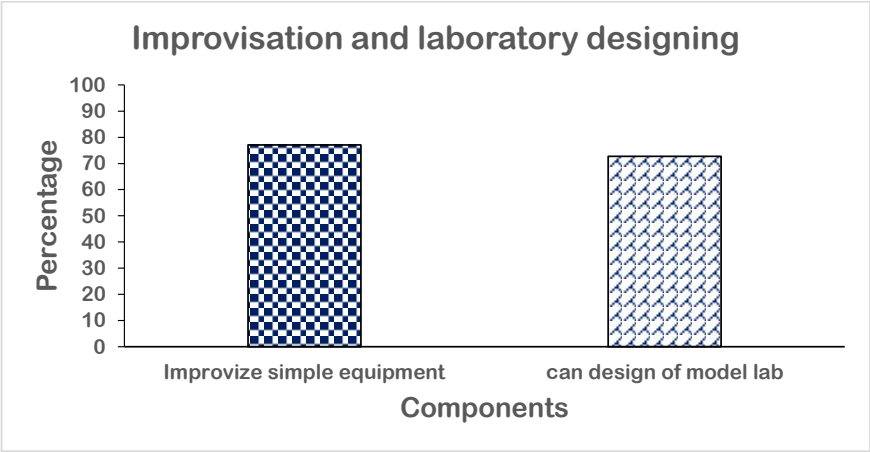

Figure 7.1 Improvising lab equipment and lab designing.

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