



USING VIRTUAL LEARNING ENVIRONMENT IN SUPPORTING THE TEACHING OF ACTION RESEARCH TO ENHANCE THE LEARNING ACHIEVEMENT AND LEARNING PARTICIPATION OF BHUTANESE UNDERGRADUATE STUDENTS

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ABSTRACT

This study explored the use of Virtual Learning Environment (VLE) in supporting the teaching of action research to enhance the learning achievement and learning participation of undergraduate students in Bhutan. Although the use of VLE is becoming increasingly important at the university level in Bhutan, only a limited number of studies have been focused in this field. The study pursued a quantitative approach, adopting a quasi-experimental study with an experimental pretest-posttest control group design. A sample of 68 B. Ed second year students were selected to participate in the study by clustered random sampling. The participants were further divided into two groups, namely control and experimental group. Each group had 34 participants. The experimental group received VLE aided instructions while the control group received instructions through traditional lecture method. Instruments such as achievement tests and questionnaires were used to collect the quantitative data. After performing satisfactory validity and reliability checks, the quantitative data assembled from achievement tests and questionnaires were analyzed and interpreted using inferential statistics t-test with $p < 0.05$ level of significance, mean, standard deviation and descriptive statistics frequency. The posttest achievements scores of experimental and control groups had increased by 16.2 and 8.41 respectively. Students in the experimental group were highly involved in active learning participation while they were taught with the support of VLE. The findings emphasizes that teaching action research module with the support of VLE enhances the students' learning achievement as well as learning participation.

Keywords: Learning Achievement, Learning Participation, Virtual Learning Environment, Action Research, Undergraduate Students, Traditional Lecture Method, Module.

1. Introduction

Action research has become very important in the world today. The main goals of action research is to determine ways to enhance the lives of children (Mills, 2011) and also to enhance the lives of those professionals who work within the educational system (Hine, 2013). It provides practitioners with new knowledge and understanding about how to improve educational practices or resolve significant problems in classrooms and schools (Mills, 2011; Stringer, 2008). Similarly, McCallister (2008) claims that action research is of overriding importance



in the field of education because in education there is always room for improvement when it comes to teaching and educating others. Action research is gaining its importance in Bhutan as well. Maxwell (2003) confirms that there is a growing interest in action research in Bhutan. “Prior to becoming part of the University, the role of academics had been to teach yet the University's Charter identified research as one of its key functions and this called for some action” (Maxwell & Choden, 2012, p. 187) therefore, action research was introduced as a compulsory module (subject) at the two colleges of education under Royal University of Bhutan.

Considering its immense importance, teaching of action research module can be highly effective if students are taught this module through the virtual learning environment (VLE) as Khlaisang and Mingsiritham (2016) has found out that the use of VLE in higher education has continually expanded because it helps in enhancing students' capacities via attractive technology and challenging tools appropriate for the digital generation. According to Nwabude (2012) VLE is a set of teaching and learning tools designed to enhance a student's learning experience by including computers and the internet in the learning process. Similarly Chou and Liu (2005) contends that VLE is a computer based environment that has a relatively open system, allowing interactions and knowledge sharing with other participants and instructions, thereby providing access to a wide range of resources. Alves, Miranda, and Morais (2016) asserts that VLE has become increasingly important within the context of higher education, mainly due to the tools which compose them and to the support they give to students, teachers and institutions. Similarly, Chakraborty and Nafukho (2015) claims that online learning environment like VLE has become an indispensable part of modern educational systems that stimulates innovative approaches to teaching and learning. VLE improves the educational interaction between the teachers and the students with the aid of digital resources that endeavors to enhance the learning achievement of the students (Sneha & Nagaraja, 2013). Numerous researches, in varied approaches, have been done to assess the effectiveness of VLE and many have proven to be effective. Majority of students ranked VLE as being more effective and desirable compared to the conventional lecture hall in delivering information (Goldberg & McKhann, 2000). VLE develops students' independent learning and thereby encourages students' motivation to learn (Barker & Gossman, 2013).

However, in Bhutan, VLE is fairly a new concept. The status of ICT-integrated pedagogy, including VLE, in higher education in Bhutan, is at its infancy and affected by lack of adequate resources as well as training in ICT-integrated pedagogy (Choeda et al, 2016). VLE is significantly associated with the provision of: Lecture notes, bulletin board, on-line assessment and other tools like chat and video summaries (Lange, Suwarty and Mavondo, 2010) however, in Bhutan, VLE has been confined to the usage of very few features like sharing of work plans, module descriptors and uploading assignments (Choeda et al, 2016). Therefore, this study has also initiated the integration of more features of VLE like online quiz, online discussion and guidance, online assessment and feedback, collaborative blogs, bulletin board, chat and video sharing, with a purpose to assess the effectiveness of VLE in enhancing the learning achievement and learning participation of the students.



2. Objectives of the study

- 1 To assess the learning achievement of undergraduate students using VLE in teaching action research module
- 2 To find out learning participation of undergraduate students using VLE in teaching action research module

3. Materials and methods

3.1 Research Design

The study pursued a quantitative approach, adopting a quasi-experimental study which aims at assessing the effectiveness of using VLE while teaching action research module in enhancing the learning achievement and learning participation of the students.

3.2 Sampling:

The researcher adopted cluster random sampling to select 68 students out of 120 students i.e. 2 sections out of the 4 sections of B. Ed 2nd year students. A section consisted of 34 students each. One section of B. Ed 2nd year students (experimental group) was taught using VLE and another section (control group) was taught through traditional lecture method.

3.3 Research Instrument:

Learning Achievement test: The quantitative data adhering to the first objective of this study was collected by conducting achievement tests to the participants. The pre-test and post-test of 30 multiple choice questions were developed from the eight topics. The pre-test and post-test were administered to assess and compare the achievement level in the experimental and control group before and after the treatment was given. The pre-test was administered in the beginning of the study and later was used to compare with the posttest administered at the end of the experiment.

Learning Participation Test: Researcher developed 20 items using five point Likert scale. It was administered after the treatment to find out students' participation level while learning action research module with the support of VLE.

Lesson plan: A total of eight lesson plans for two hours each were used. Four lesson plans of two hours each were used for control group using the traditional lecture method and four lesson plans of two hours each were used for experimental group that adopted VLE in assisting the teaching and learning program.

3.4 Research Procedures:

After performing satisfactory validity and reliability checks, a pre-test was conducted for both the treatment and non-treatment groups. The treatment group was taught with the support of VLE while the non-treatment group was taught through the traditional lecture method. In the treatment group, varied features of VLE like online quiz, online discussion and guidance, online assessment and feedback, collaborative blogs, bulletin board, chat and video sharing were improvised. At the end of the treatment, a posttest was conducted for both the groups. However, the questionnaire was administrated only to the treatment group in order to study the level of participation after they were taught with the support of VLE.



3.5 Data Analysis

3.5.1 Achievement Test

A comparative statistical analysis using paired sample t-test was done within the group i.e. analysis of pretest and posttest of experimental group as well as control group. The comparison between pretests and posttests score of the two groups was done by conducting independent t-test to assess and compare the learning achievement of second year students in action research after using VLE and the traditional lecture method. The Inferential statistics t-test with $P < 0.05$ level of significance, mean and standard deviation were used to conclude the results.

3.5.2 Questionnaire:

The data analysis of student's participation questionnaire was done by tabulating standard deviation and mean from all the 20 items in the questionnaire. The questionnaires were filled up at the end of the treatment by the experimental group. The total average mean and standard deviation was also computed and presented through a graphical presentation.

4. Results and Discussions

The first objective of this study was to examine and compare the learning achievement of the students between traditional lecture group and VLE classroom. The second objective was to find out the learning participation level of students in the VLE group. The result analysis were done based on achievement test scores and questionnaires on learning participation.

4.1 Analysis of Achievement Test

To examine and compare students' learning achievement among control and experimental groups, pretest and posttest with same questions were administered in both the groups at the beginning and at the end of the study. The questions consisted of 30 multiple-choice questions and each question carried 1 mark. Pretest was administered at the beginning of the study, before any treatment was given, in order to assess whether the learning ability and background knowledge of the students in both the groups were similar or not. Posttest was administered, at the end, in order to assess the differences in the learning achievement after the treatment. A comparative statistical analysis was done using paired t-test within the group (i.e. analysis of pretest and posttest of both the groups within itself). The comparison of pretest and posttest scores between experimental and control group was done by using independent t-test (i.e. analysis of pretest and posttest between the groups). The comparisons were done based on mean, standard deviation and inferential statistics t-test with $P < 0.05$ level of significance.



4.1.1 Comparison of pretest and posttest result within the group (Paired sample t-test).

Table 1. Comparison of Pretest and Posttest within the group (Paired sample t-test).

Group	Test	Mean	Mean difference	Standard deviation	Sig. (2 tailed)
Control	Pretest	6.38	14.79 – 6.38 = 8.41	1.95	0.00
	Posttest	14.79		2.07	
Experimental	Pretest	6.74	22.94 – 6.74 = 16.2	1.97	0.00
	Posttest	22.94		1.01	

*Significance level: $P < 0.05$ -significant

The comparison of pretest and posttest within the group was done by comparing mean, standard deviation and significance level P-value. From the table 1 it is apparent that the mean of the pretest and the posttest scores of control group were 6.38 and 14.79 respectively. The mean of the pretest and posttest scores of experimental group were 6.74 and 22.94 respectively. The mean difference of pretest and posttest of the control group was 8.41 and the mean difference of pretest and posttest of experimental group was 16.2 resulting to the significance value (p) 0.00 which indicated there was statistically significant increase in the students' scores in the posttest when compared to their pretest in both the groups.

4.1.2 Comparison of pretests and posttests result between the groups (Independent sample t-test).

Table 2. Comparison of pretests and posttests between the groups.

Tests	Group	Mean	Mean difference	Standard deviation	Sig. (2 tailed)
Pretest	Control	6.38	6.74 – 6.38 = 0.35	1.95	0.46
	Experimental	6.74		1.97	
Posttest	Control	14.79	22.94 – 14.79 = 8.15	2.07	0.00
	Experimental	22.94		1.01	

Table 2 illustrates the means and the standard deviations of pretests and posttests of both control and experimental groups. The mean difference of pretests of the control and experimental groups was 0.35. From the result given on table 2, it was clear that mean score of experimental group was slightly higher than control group. However, because of the negligible difference (0.35) of mean scores between the groups the calculated significance value (p) was 0.46, which was greater than significant value $P < 0.05$. This indicated that there was no significant difference in the pretest scores between the groups. Hence, researcher concluded that the students in both the groups



have homogenous learning ability. The result was as expected by the researcher as it was mandatory to have equal or similar learning ability in both the groups at the beginning of study.

The mean difference of the posttests between control and experimental group was 8.15. The significance value (p) of the posttests was 0.00, which was lower than the significant value $P < 0.05$. This indicated there was statistically significant difference in the posttest scores between control and experimental group. The result showed that the students in experimental group had significantly higher scores than the students in the control group. The result was as anticipated by the researcher - a better performance from the students who were taught with the support of VLE than the students who were taught through traditional lecture method. Thus proving the first hypothesis which stated that “the learning achievement of experimental group will be better than the control group after using VLE in teaching action research.” The figure 1, below, illustrates the comparison of mean scores of the pretests and the posttests of control and experimental group.

Figure 1. Comparison of pretest and posttest

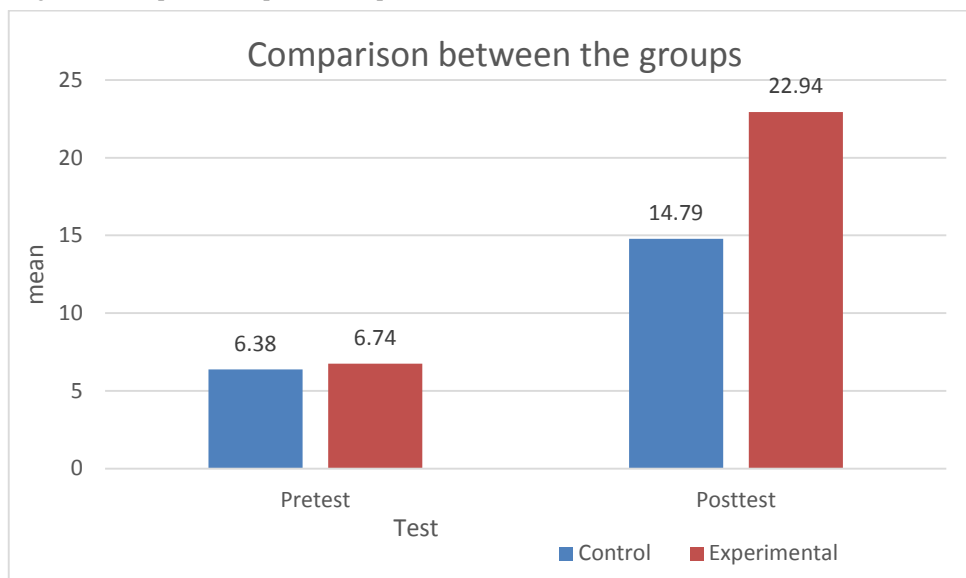


Figure 1 further reveals that the pretest mean of control group was 6.38 and the pretest mean of the experimental group was 6.74. It was noted that they were almost equal and the 2-tailed significance value was 0.46 which indicated that there was no significant difference between the pretest means of the two groups. The posttest mean of the control group was 14.79 and the posttest mean of the experimental group was 22.94. The 2-tailed significance value 0.00 indicated that the mean of the posttest of the experimental group was significantly higher than the mean of the posttest of the control group. The mean difference was 8.15 which showed a huge difference in the learning achievement of students instructed with the support of VLE and the traditional lecture method.

The standard deviation is a statistic that describes the amount of variation in a measured process characteristic. Specifically, it computes how much data are concerted from the mean on average. A smaller standard



deviation means greater consistency, predictability and quality (Wachs, n.d., Dorji, 2017). The standard deviation of the means of pretests were 1.95 and 1.97 in control and experimental group respectively as shown in table 2. Although the standard deviations were slightly different among the groups, because of the negligible difference (0.02) it indicated that the level of variation in scores of both the groups were almost similar. This further indicated that the learning ability of the students were similar in both the groups.

The standard deviation of the means of posttests were 2.07 and 1.01 in control and experimental group respectively as shown in table 2. The standard deviation of the posttests of control group has increased by 0.12 when compared to its pretest. This indicated that the scores of the students in control group were scattered away from the mean, and the traditional lecture method was not that effective in narrowing the gap in students' learning ability. However, the standard deviation of the posttest of the experimental group has decreased by 0.96 when compared to its pretest. This showed that the scores of the students in experimental group were more concentrated around the mean, which further indicated that the learning ability of the students in experimental group were almost same, revealing greater consistency and better quality. The variation of the standard deviations among the groups may have been caused by the types of treatment given. Looking at the result above, integration of VLE in teaching proved to be better than the traditional approach.

The findings of this study was similar to the findings of Barker and Gossman (2013), Choeda, Penjor and Dukpa (2016) and Chou and Liu (2005) who concluded that VLE had a positive effect on students' learning thereby encouraging students' motivation to learn. Similarly, the result also agrees with the conclusions made by Koskela et al (2005) on 'Suitability of a Virtual Learning Environment for Higher Education,' and Merchant et al (2014) on 'Effectiveness of virtual reality-based instructions on students' learning outcomes in K-12 and higher education: A meta-analysis.' Their main purpose was to find out the overall effect as well as the impact of VLE. The common key findings suggested that the VLE was suitable for higher education programs and had positive impact on the learning achievement of the students.

Similar results were inferred from the following researches. Goldberg and McKhann (2000) carried out a research with a main purpose to compare the effectiveness of the conventional lecture hall with that of a VLE for the presentation and dissemination of an introductory neuroscience course. A comparative achievement test between the two groups of students using VLE and Conventional approach indicated that the raw average scores on weekly examinations were 14 percentage higher for students in the VLE compared to the conventional lecture hall setting. Similarly, Wells, De Lange and Fiegerec (2008) carried out research with a purpose to identify the impact of VLE as a study tool replacing old traditional approaches of teaching and learning accounting. The researchers found out that VLE had been a rewarding experience.



4.2 ANALYSIS OF THE QUESTIONNAIRES ON STUDENTS' LEARNING PARTICIPATION

The second objective of the study was to find out whether teaching action research subject with the support of VLE would increase students' learning participation level or not. Hence the researcher administered 20-itemed questionnaire to the students in the experimental group. 5 Likert-type scales were used to assemble the data. Based on the true experiences gained after learning action research with the support of VLE, students were asked to read the statements carefully and check (✓) the statements from 1 to 5. "5 meant strongly agree, 4 meant agree, 3 meant neutral, 2 meant disagree, 1 meant strongly disagree." The structure of the statements was made to the level of B. Ed second year students' standard and the researcher explained the statements before letting the students to check (✓). A total of 34 students from the experimental group participated. The table 3, below, illustrates the result of students' learning participation level while learning action research with the support of VLE. The mean and standard deviation were used to infer the result.

Table 3 illustrates the mean, standard deviation and level of students' learning participation

SI No.	Learners' Participation Level	\bar{x}	S.D	Degree of Participation
1	I love participating in VLE discussion and chat forum	4.88	0.33	Very high
2	I participate more in the class when I am taught with the help of VLE	4.32	0.59	High
3	I like to participate in the online quiz conducted on the VLE	4.71	0.46	Very high
4	The VLE activities involve us in active participation	4.76	0.43	Very high
5	Action Research module becomes more learner centered when taught through VLE	4.35	0.54	High
6	Students who misses few classes can also learn through VLE	4.82	0.39	Very high
7	I enjoy submitting assignments and receiving feedbacks through VLE	4.56	0.56	Very high
8	Use of VLE is easily accessible and efficient	4.76	0.43	Very high
9	VLE helps me to develop interest towards learning Action Research module	4.71	0.46	Very high
10	More information and learning materials can be accessed through VLE	4.79	0.41	Very high
11	I learn more through VLE than regular classroom teaching	4.91	0.29	Very high



SI No.	Learners' Participation Level	\bar{x}	S.D	Degree of Participation
12	I love learning action research module through VLE	4.71	0.46	Very high
13	Learning through VLE prepares me to be successful ICT user	4.62	0.49	Very high
14	Learning through VLE helps me to retain the learned information for longer period of time	4.82	0.39	Very high
15	I have no doubt that with the help of VLE I can score higher marks in Action Research module	4.82	0.39	Very high
16	I never get bored in learning Action Research module when I am taught using VLE	4.62	0.55	Very high
17	All activities were carried out effectively	4.82	0.39	Very high
18	VLE keeps us updated with the latest information and learning materials	4.94	0.24	Very high
19	It is easier to submit assignments and test answer sheets through VLE than in hard copies	4.76	0.50	Very high
20	VLE can help us become confident learners	4.59	0.50	Very high
	Total	4.71	0.44	Very high

*Remark: 0-1.50= very low participation, 1.51-2.50= Low participation, 2.51-3.50=Moderate participation, 3.51-4.5=High participation, 4.51-5= Very high participation.

Table 3 shows that for all the 20 statements of the learning participation questionnaire, the mean rating was 4.71 out of 5 on a Likert scale. This indicates that the learning participation level of learners while learning action research module with the support of VLE was rated as very high participation. The highest mean of 4.94 was rated by the participants for one statement with its standard deviation of 0.24 and the lowest mean of 4.32 was rated for the statement with its standard deviation of 0.59. Therefore the data analysis indicates that the class experienced high level of learning participation when the VLE was integrated in teaching and learning of action research module. The overall learning participation level of the students with the support of VLE is shown in figure 2 below.



Figure 2. Number of questionnaire statements rated on Likert Scale.

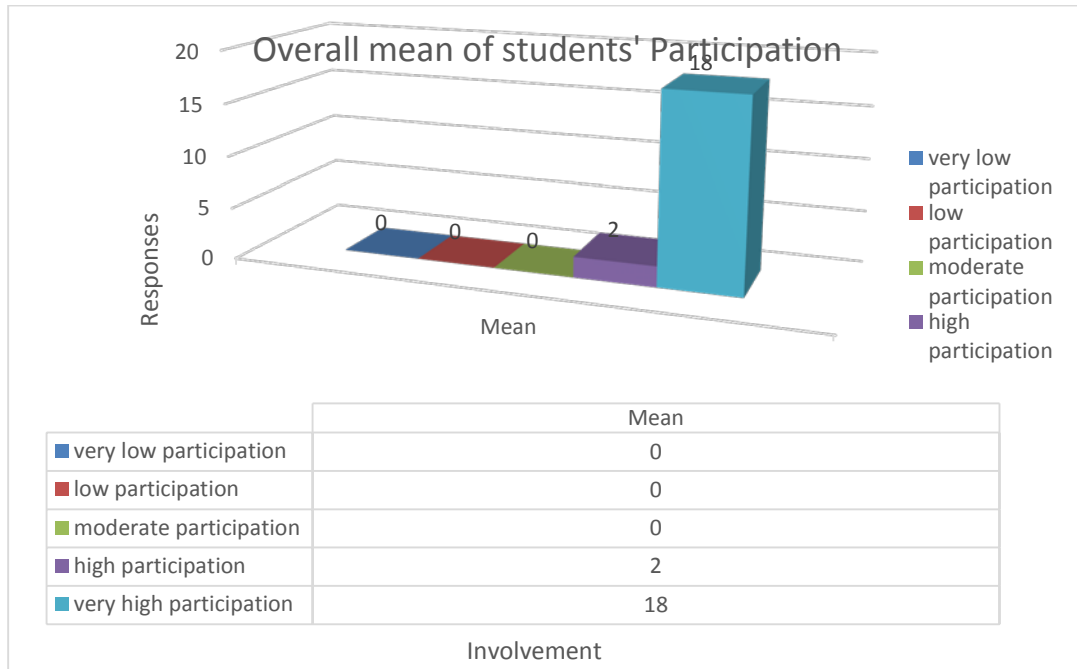


Figure 2 in the above graph shows the overall learning participation level of the students with the use of VLE in teaching and learning action research module. The data represented in the above graph is the mean of the ratings done in the likert scale by the respondents in the questionnaire. The average data analysis showed that the participants responded above 3 on the likert scale for all 20 statements. The graph indicates that on the likert scale for the 20 questionnaires, the participants did not rate “very low participation,” “low participation” and “moderate participation.” 2 of the questionnaire items were rated “high participation” and remaining 18 of the questionnaire items were rated “very high participation.” Therefore, the researcher concluded that when the VLE was used as a supporting tool in teaching and learning of action research module, students exhibited a high level of learning participation. This result proved the second hypothesis that “students taught using VLE will be more involved in learning participation compared to the control group.”

The result supported the findings of Xu, Park and Baek (2011) who conducted a research on digital storytelling through VLE and found out that students were engaged in active participation when they pursued digital storytelling through VLE. VLE is seen as a high motivational factor in digital storytelling. Similarly, Lange, Suwardy and Mavondo (2010) concluded from their findings that VLE which is significantly associated with the provision of: Lecture notes, bulletin board, on-line assessment and other tools (chat and video summaries) had a positive impact on students learning motivation and participation. The VLE provisions of Lange, Suwardy and Mavondo are similar to the researcher’s VLE provisions as the researcher also improvised lecture notes, online quiz, on-line assessment and other tools like online chat forums and video sharing. Both researches had similar working principles and



purposes. Participants in both the cases were undergraduate students and the similar data collection approaches were used. Remarkably both the findings showed similar results. The findings of the researcher stood in line to the findings of Lange, Suwarty and Mavondo (2010) which concluded that VLE involves students in active participation.

The findings were also parallel to Khlaisang and Mingsiritham (2016) and Dutton, Cheon and Park (2004) who concluded from their findings that students' participation in learning escalated when VLE is properly managed and improvised. Also, Chou and Liu (2005) in their research on 'Learning effectiveness in a web-based virtual learning environment: a learner control perspective' observed that students were involved in active participation when they were taught with the support of VLE. They further reported that students in VLE group report higher levels of satisfaction than students in the traditional environment. In fact many researches had similar findings. The overall result from the questionnaire on learning participation showed that the students in the experimental group were actively involved in learning action research module with the support of VLE. The researcher concluded that the participation level of students increases when they are taught with the support of VLE.

5. Conclusion

The learning achievement tests revealed that the students who were taught with the support of VLE outperformed the students who were taught through the traditional lecture method. There was a huge difference in their performance as the average score in the VLE group was higher by 8 marks compared to the control group who was taught without VLE. This revealed that students taught with the support of VLE had better academic achievement compared to the students in the control group. This result was further reinforced by the students' questionnaire which exhibited that students who were taught with the support of VLE were greatly involved in active learning participation. For example, the students had very high level of participation under the two statements "VLE activities involve us in active participation" and "VLE keeps us updated with the latest information and materials" with respective means at 4.76 and 4.94, which showed that students were not only involved in active learning participation but also remained updated with the latest information and learning materials. The questionnaire further revealed that students enjoyed accessing other features of VLE like online quiz, submitting assignments and receiving feedbacks through VLE.

The effectiveness of VLE was further endorsed by an achievement test carried out through a comparative statistical analysis using independent t-test between the groups. The mean difference of the posttests between control and experimental group was 8.15, as shown in table 2. The significance value (p) of the posttests was 0.00, which was lower than the significant value $P < 0.05$ and this indicated that there was statistically significant difference between posttest scores of experimental group and the control group. By looking at the mean difference of posttest scores between the groups as shown in table 2, it was clear that the scores of the students in experimental group were significantly higher than the students in the control group. Therefore, based on the result of means, standard deviations and significant P-values generated by computing paired sample t-test and the independent t-test, a conclusion was



made that teaching with the support VLE was more effective in enhancing the learning achievement of students than the traditional lecture method.

Since the study found out that teaching action research module with the support of VLE enhanced learning achievement as well as learning participation of the students, the RUB (Royal University of Bhutan) lecturers are recommended to use VLE in teaching other subjects as well. The features of VLE like online quiz, online discussion, chat forum, announcements, online assessment, sharing videos, uploading learning materials and feedback proved to be very effective in the teaching and learning program. Apparently, the RUB is moving forward in promoting VLE in all the colleges. The researchers recommend RUB to train the Lecturers adhering to the varied features of VLE so that they will be familiar with all the potential features of VLE. Most importantly, there should be free Wi-Fi connection for all the students so that they can have access to VLE throughout the day.

However, due to the limitations of time, the study was conducted with one month of experimental teaching, at one of the teaching colleges only. The results of the study are thus not adequate to be generalized and cannot represent all the undergraduate students at RUB. Thus further researches at different RUB colleges may be carried out for a longer duration so that data will be more relevant and authentic. Moreover the sample size was only limited to two groups of students; the researchers, in the future, can use more groups of students because the increase in the sample size may present more reliable data. Moreover, as the study was conducted at the undergraduate level only, the future researchers can involve post graduates or high school students to improvise VLE and collect varied data that shall provide varied results and options.

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