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Use of ICT in Classrooms in Nepal

A study of Student-Centered Learning using ICT

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Abstract— The study was conducted to learn about the potential benefits of ICT intervention in classrooms in Nepal. We found that teachers and students were both motivated to use technology (the Edcrayon app) in class for teaching and learning purposes due to the novelty of the concept in Nepal. The study finds that improvements in student achievement scores were statistically significant for grade 8 but it was not statistically significant for grade 5. Though we received mixed result in the quantitative analysis, it is palpable from the qualitative analysis that use of ICT in education has a big scope as it engages and motivates students to use it for learning at their own time and pace. Teachers and students were motivated to continue using it in subject areas that they feel would be best served by the use of ICT. Additionally, we also found that teachers feel motivated when provided with a variety of teaching resources. We recommend a large-scale study for a longer duration to measure the correlation between effective use of ICT and student performance.

Keywords—*ICT; Five Step Lesson Plan; Edcrayon Application; Student Motivation; Teacher Motivation; Student Engagement; Student-Centered Learning*

I. CHAPTER 1: INTRODUCTION

A. Problem Statement and Research Aim

The government of Nepal wants to see traditional teaching reformed and introduce student-centered teaching and ICT for learning in public schools of Nepal. Since student-centered teaching has been associated with enhanced student learning and achievement, this study aims to provide that empirical data to aid teachers to adopt and use student-centered teaching practices in schools. This study aims to find out if introducing ICT in classrooms based on student centric approach and Five Step Lesson Plan will improve student achievement. Another aim of the study is to see if provision of teaching resources to teachers will improve teachers' motivation as studies link high teacher motivation to improved student achievement. Along with teacher motivation we also want to see if student motivation and student engagement can be observed upon introducing ICT based on student centric approach in classrooms.

With the wave of ICT in education all over the globe in an attempt to integrate technology into the classroom, it is only natural that the Government of Nepal has also envisioned bringing the benefits of ICT in education in Nepal's classrooms. ICT in education in a developing country like Nepal can have its benefits if it is introduced in classes/schools along with student centric teaching so that it can improve student learning and student achievements. There is very little empirical research to demonstrate the effectiveness of student-centered teaching and the use of ICT in classes/schools for learning in Nepal to provide tested

examples for teachers to adopt and use student-centered teaching along with the use of ICT in classes/schools to aid student-centered teaching. In this study, we are using tablets (ICT) to deploy the Five Step Lesson Plan that employs student-centered pedagogy, provide media educational resources (teaching and learning material) and tools (formative assessment). Also, research suggests that in developing countries, teacher motivation is low and one of the reasons for it is lack of educational resources. It has been seen that teachers with high motivation have a direct relationship to the student learning outcomes.

B. Research Questions

- 1) Will there be a difference in scores of students who are taught in a traditional method versus scores of students who are taught in an ICT rich, student-centered, Five Step Lesson Planning method?
- 2) Will students be motivated to use ICT for learning?
- 3) Will there be student engagement when using ICT for learning?
- 4) Does provision of educational resources motivate teachers?

C. Hypothesis

The study hypothesizes that H (null): Introduction of ICT based on student-centered teaching approach will not improve student achievement scores, i.e. the mean scores of the post-test scores of the control group and the test groups will not be different.

D. Organization of the Study

The study is organized into six chapters. Chapter 1 presents an introduction to this study and the context in which it was carried out, the statement of the problem, purpose of the study, the research questions and the hypothesis. The review of literature on topics regarding student centric teaching, ICT, its integration in teaching and learning, motivation and engagement is contained in Chapter 2. In Chapter 3 the methodology of the study is described. Presentation of the study findings forms the basis of Chapter 4. Chapter 5 deals with discussion of findings. In Chapter 6, the conclusions and recommendations are presented and suggestions are made for what can be done in future research.

II. CHAPTER 2: LITERATURE REVIEW

E. Traditional teaching vs. Student-centered teaching

The traditional teaching prevalent in the public schools in Nepal is the age-old teacher dominated teaching learning interaction [1]. This kind of teaching is teacher centric in which the teacher is acknowledged to be the source of

knowledge and students are perceived to be passive recipients of knowledge [2]. Scrivener describes traditional teaching as a jug and mug analogy with knowledge being poured from one receptacle into an empty one [3]. Traditional teaching lays its foundations on the notion that if a student silently, passively listens to the teacher lecturing, then the knowledge transfer should happen. Traditional teaching rests total control of teaching and learning on the teacher [4]. Student-centered teaching is a modern teaching methodology in which the teacher's role is to help learning take place [4]. In student centric approach to teaching and learning, students are more actively involved in their own learning. The control is shifted from the teachers and the responsibility of learning lies on students. In a student-centered classroom, students learn by constructing their own learning. Students are encouraged to reflect on their own learning, share insights with peers, and apply new learning to real life, authentic experiences [5].

Five Step Lesson Planning used by Teach for America and Teach for Nepal, is very much a student-centered teaching learning approach as it allows the students to be actively involved in their own learning, independently and critically creating meaning for themselves. Also, the teachers take the role of guides and mentors aiding students to access, interpret, organize and transfer knowledge. This puts the needs of the learners i.e. students, at the heart of lesson planning. Introducing new concepts and skills, guiding students towards learning objectives and allowing them to master it independently is the core of student-centered teaching. For this study we use the Five Step Lesson Planning pedagogy for student-centered teaching.

F. Information and Communication Technology

ICT has become one of the most essential building blocks of our society. There is growing demand for the integration of ICT for learning. But ICT is not just related to computer related activities as widely thought. According to UNESCO ICT, can be regarded as a coming together of "Informatics Technology" with other related communication technology [6]. Various ICT products for education are teleconferencing, audio video broadcasts and lessons, email, CD ROMs etc. [7]

ICT in education has been seen as a means to access to quality education and while a debate ranges from ICT in education having a positive impact [8], to no significant impact [9], a study in India carried out by Banerjee et al. [10] does show a positive impact of computer assisted learning on mathematics scores. For the purpose of this study, tablets with software to support Five Step Lesson Planning and Formative Assessments and resource materials for teachers and students will be used as the ICT component.

G. Motivation

Motivation is the attribute that moves us to do or not to do something. Motivation is broadly classified as intrinsic or

extrinsic [11]. Deci et al. defines intrinsic motivation, as something that energizes and sustains activities while extrinsic motivation is largely reliant on reinforcement contingencies like reward [12]. Thus, educators have considered intrinsic motivation more desirable resulting in better learning outcomes than in extrinsic motivation. Motivation is assessed using self-report measures or rating scales [13]. Such instruments usually include questions under several subscales, such as interest, attributions, self-perception and self-efficacy, for challenge, curiosity, mastery orientation, persistence, and enjoyment of learning. Other researchers use behavioral indicators of motivation. Turner constructed a behavioral measure that included aspects to effective strategy use, persistence, and volitional acts [14]. For this study the Intrinsic Motivation Inventory (IMI) is used to measure motivation amongst the students.

III. CHAPTER 3: METHODOLOGY

H. Setting and Participants

For the study grades 5 and 8 were chosen based on mutual decision between the principal of St. Xavier's School and us. The principal also wanted to see the outcomes of using ICT in these two different age groups one pre-teen and the other who had just entered their teens. In grade 5, the study provided contents for Mathematics and in grade 8, contents were provided for Science. In grade 5 the classes were mostly taken in the respective classes while for grade 8, the classes were taken in the conference room, where along with the student devices; there was also a large monitor on which the videos and interactive exercises could be displayed.

I. Sample

Grades 5 and 8 students from St. Xaviers School were chosen as sample for test. Even though it is a convenient sampling, the students who were assigned the different sections were done in a random manner. Thus the students were all randomly distributed in the different sections. In grade 5, the total participants were 84 students in the test group, out of which 51 were boys and 33 were girls, and 95 students in the control group, out of which 60 were boys and 35 were girls. In grade 8, the total participants were 36 students in the control group, out of which 19 were boys and 17 were girls, and 78 students in the test group, out of which 49 were boys and 29, were girls. Pretest and posttest were scores collected from all the students and the motivation and student engagement questionnaires were collected from only the students in the test groups in both grades 5 and 8.

J. Study Design

The overall study includes surveys, questionnaires, observation, data collection, and a field lab setting to measure between control and test study results. The first research question can be answered using quantitative methods and statistics with an experimental setup in which two sets of similar students will be taught similar skills but in two

different approaches, viz. Traditional method and student-centered method with ICT. The second research questions are answered in a quantitative and qualitative manner to understand the extent to which the experimental approach helped students to be motivated to use ICT for learning. The third research question is answered qualitatively with the help of classroom observations and the student interview. For the purpose of answering the fourth research question, interviews and classroom observations were carried out to understand and observe teacher motivation, if any.

K. Instruments

The study uses the Intrinsic Motivation Inventory (IMI), which is a multidimensional device, used to assess participant’s subjective experience related to an activity in an experiment. This instrument measures participants’ interest/enjoyment, perceived competence, effort, value/usefulness, felt pleasure and tension, and perceived choice during the experimental intervention. The sub-scale that measures the interest and enjoyment is the self-report measure of intrinsic motivation. As a result the questions in this sub-scale have more items in it than the other sub-scales.

The study also uses interviews with the students to better understand student engagement in classroom. For the interview of teachers and students to understand their motivation, the indicators used are taken from the IMI questionnaire. Part of the teacher interview questions was taken from DFID paper on teacher motivation by Bennel [15]. Observation of classrooms is also carried while using ICT with student-centered methodology for teaching and learning so as to observe the observable traits of motivation and student engagement in the classroom.

The android app Edcrayon used in the study consist of the Five Step Lesson Plan construct that is used in our technology. The app is designed to include the skills to be taught and is supplemented by content, activities, discussion materials, and assessments. Another feature of the app is the use of Formative Assessment tools (Canvass and Color cards) to help the teachers and students in the learning process. The color cards contained three colors: red, yellow and green. The red color card would mean that the students are not able to understand what is being taught and would require help while the yellow color card would mean that the student has understood the easier things but found it difficult to understand the harder concepts and the green color cards meant that the students have understood the harder concepts also. With the canvass, the idea is that if the teacher asks a question in the classroom like “what is the keyword you have learned till now?” or “what is the correct answer out of these options?” then the students can scribble the keyword or the answer for the question posed. This would help the teachers get immediate feedback for the things being taught in the classroom either during the lesson or after the lesson has been

taught. Along with these features the app contains reference materials students can use to do assignments with the help of external resources.

IV. CHAPTER 4: STUDY FINDINGS

L. Findings

To answer our first research question with regards to the student achievement scores, a pre-test and post-test was carried out in both the grades 5 and 8. The control groups in both the grades were sections A and B and the test groups were sections C and D. The test questions for the pre and post-test were selected from a Creative Commons website, www.ck12.com, that provides free and open source educational materials for students and teachers.

The pre-test was carried out in order to find out if either of the control or the test group were similar to each other in terms of their achievement scores. The post-test was conducted after the study was over to see if the intervention, ICT with educational resources for student centric teaching. From the pre-test, it was seen that both the classes were similar. Grade 5 control group had a mean score on the test of 1.55 and the test group had a mean score of 1.63. In grade 8, the control group had a mean score of 4.84 and the test group had a mean score of 4.08.

After the study was completed, the effect size of the student achievement scores was calculated to see what kind of an effect the intervention of ICT with student centric approach had.

When the effect size was calculated for grade 5, it was seen that the effect *r* (Pearson correlation coefficient) was 0.12792. The effect size is smaller than 0.2, which is considered to be a small effect size.

For grade 8, it was seen that the effect *r* (Pearson correlation coefficient) was 0.49798. The effect size is greater than 0.3, which is considered to be a medium effect size. This is a pretty encouraging sign. Also, the effect size is statistically significant at 0.01.

TABLE I. GRADE 5 CORRELATIONS TEST

Correlations (Variables: Independent – Use of ICT, Dependent – Post-test scores)			
		Control Test	Post-test Score
Control Test	Pearson Correlation	1	.128
	Sig. (2-tailed)		.094
	N	171	171
Post-test Score	Pearson Correlation	.128	1
	Sig. (2-tailed)	.094	
	N	171	171

TABLE II. GRADE 8 CORRELATIONS TEST

Correlations (Variables: Independent – Use of ICT, Dependent – Post-test scores)			
		Control Test	Post-test Score
Control Test	Pearson Correlation	1	.498*
	Sig. (2-tailed)		.000
	N	99	99
Post-test Score	Pearson Correlation	.498*	1
	Sig. (2-tailed)	.000	
	N	99	99

* Correlation is significant at 0.01 (2-tailed)

For further testing the statistical significance of the post-test scores and to test the hypothesis, we ran a two-tailed independent t-test to see if the intervention would result in higher scores for the test group as compared to the control group.

TABLE III. GRADE 5 GROUP STATISTICS

	Group	N	Mean	Std. Deviation	Std. Error Mean
Post-test Score	Test	82	5.8293	2.82758	.31225
	Control	89	5.0674	3.07408	.32585

TABLE IV. GRADE 5 INDEPENDENT SAMPLE TEST

Post-test Score	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of Difference	
								Lower	Upper
Equal variances assumed	1.039	.309	1.682	169	.094	.76185	.45286	-1.3214	1.65585
Equal variances not assumed			1.688	169	.093	.76185	.45131	-1.2908	1.65279

According to Levene's Test for equality of variances, since .309 is larger than our significance level of .05 so we assume the equal variances. The significance for the t-statistic is .094, which is larger than the level of significance .05, and hence we accept the null hypothesis that the mean post-test score between the test and the control groups for grade 5 is not significantly different.

TABLE V. GRADE 8 GROUP STATISTICS

	Group	N	Mean	Std. Deviation	Std. Error Mean
Post-test Score	Test	66	8.9848	3.67316	.45213
	Control	33	5.3939	2.46145	.42848

TABLE VI. GRADE 8 INDEPENDENT SAMPLE TEST

Post-test Score	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of Difference	
								Lower	Upper
Equal variances assumed	9.356	.003	5.069	97	.000	3.59091	.70839	2.18496	4.99686
Equal variances not assumed			5.765	88.759	.000	3.59091	.62291	2.35314	4.82867

According to Levene's Test for equality of variances, since .003 is smaller than our significance level of .05 so we assume the variances are not equal. The significance for the t-statistic is .000, which is smaller than the level of significance .05, and hence we reject the null hypothesis that the mean post-test score between the test and the control groups for grade 8 is not significantly different. Thus we accept the alternate hypothesis and hence conclude that the intervention was statistically significant.

To further understand the student's motivation levels in classroom while using ICT with student centric approach for learning, we ran a correlations test between the independent variable, having a device to work with in the classroom and dependent variables, interest, competence, choice and pressure, the different components of the Internal Motivation Inventory (IMI) questionnaire.

TABLE VII. GRADE 5 CORRELATIONS TABLE

Correlations (Variables: Independent – Device(D), Dependent – Interest(Y1), Competence(Y2), Choice (Y3), Pressure(Y4))						
		D	Y1	Y2	Y3	Y4
D	Pearson Correlation	1	-.024	-.054	-.075	-.161
	Sig. (2-tailed)		.832	.634	.507	.153
	N	80	80	80	80	80
Y1	Pearson Correlation	-.024	1	.691**	.360**	.003
	Sig. (2-tailed)	.832		.000	.001	.976
	N	80	80	80	80	80
Y2	Pearson Correlation	-.054	.691**	1	.290**	.203
	Sig. (2-tailed)	.634	.000		.009	.072
	N	80	80	80	80	80
Y3	Pearson Correlation	-.075	.360**	.290**	1	.069
	Sig. (2-tailed)	.507	.001	.009		.540
	N	80	80	80	80	80
Y4	Pearson Correlation	-.161	.003	.203	.069	1
	Sig. (2-tailed)	.153	.976	.072	.540	
	N	80	80	80	80	80

From the results in Table VII, it can be seen the correlation between having a device and other variables is negative in every case for grade 5. There is a statistically significant positive correlation between having interest in using ICT and feeling that they are competent in using it, 0.691, and feeling that they have a choice in doing so, 0.360. There is statistical significance (at 0.01 level) for the positive correlation, 0.290, between feeling they are competent in using the device and the app and the feeling that they have a choice in doing so.

TABLE VIII. GRADE 8 CORRELATIONS TABLE

Correlations (Variables: Independent – Device(D), Dependent – Interest(Y1), Competence(Y2), Choice (Y3), Pressure(Y4))						
		D	Y1	Y2	Y3	Y4
D	Pearson Correlation	1	.118	.163	-.129	.064
	Sig. (2-tailed)		.345	.192	.302	.612
	N	66	66	66	66	66
Y1	Pearson Correlation	.118	1	.359**	.275*	-.455*
	Sig. (2-tailed)	.345		.003	.026	.000
	N	66	66	66	66	66
Y2	Pearson Correlation	.163	.359**	1	.071	-.142
	Sig. (2-tailed)	.192	.003		.573	.256
	N	66	66	66	66	66
Y3	Pearson Correlation	-.129	.275*	.071	1	-.229
	Sig. (2-tailed)	.302	.026	.573		.064
	N	66	66	66	66	66
Y4	Pearson Correlation	.064	-.455*	-.142	-.229	1
	Sig. (2-tailed)	.612	.000	.256	.064	
	N	66	66	66	66	66

** Correlation is significant at 0.01 (2-tailed)
* Correlation is significant at 0.05 (2-tailed)

In grade 8, there is a positive correlation between having their own device and the interest in using ICT for their classroom, 0.118 though it is not statistically significant. There is a positive correlation, 0.359, between having interest in using ICT in classroom and feeling they are competent in using it, significant at 0.01 level and there is positive correlation between interest in using ICT and the feeling that they have a choice in doing so, statistically significant at 0.05 level.

M. Observations

During the pilot study at St. Xavier’s School, Jawalakhel, Lalitpur, Nepal, when the initial teacher training was started, the teachers seemed excited and the general feeling was that they wanted to learn something new. The teachers felt that learning to use ICT in classrooms would not only be important for them but also be helpful in improving their own skills in using ICT in classroom and for better classroom management. Another interesting observation was that the teachers also felt they would be able to finish the course quicker with the help of ICT. Both of them also felt that their work load would be considerably reduced with the use of ICT in classrooms as

they believed they would have to speak lesser in classrooms as videos explaining concepts could be played instead of them speaking in class all the time. However, a general cause for worry was that they seemed unsure of how to use ICT during the classes. Despite their anxiety they were excited, nonetheless.

The students seemed just as excited. It was something new for them and during the installation of the software, the Edcrayon app, everyone was excited and it was difficult for us to control the students as some of them who could not follow us were asking their friends for instructions leading to a noisy classroom. It is quite normal in the Nepalese context as students are shy and the majority of them tend to keep things to themselves even when they would rather speak up and ask for help. During the software installation period, the students would request us to make the ICT enabled classes available for other subjects also and would inquire with us if we would be able to provide it for them. This indicated that the students were already itching to have ICTs they use outside of school to be integrated in classrooms for their educational purposes. This was an indication that both teacher and students had positive attitude towards ICT for learning.

After the initial software installation period where we got acquainted to the students, they became friendlier and would be excited to see us arrive for the pilot classes where they could use their smartphones or tablet to learn with the use of ICT. Even when the students were in another teacher’s class, upon seeing us arrive, they would stick their heads out of the door or wave at us from inside the classroom conveying their excitement for the ICT classes.

N. Classroom Observations

During the initial phase of the trial, the students of both grades 5 and 8 showed a lot of enthusiasm and interest in all the test classrooms. The moment the ICT class were to start, they would all be eagerly waiting for us to come to set up the ICT class. In Grade 5 test classes, the students would wave at us from inside the classroom while we would stand outside the classroom waiting for the ongoing class to end. Once the ICT class would start, the students followed the teacher's instructions to arrange themselves in groups of two or three as quickly as possible, however with a lot of noise. Once the students sat in their groups and settled down, they followed the teacher's instructions to look up the studying content on their devices and seemed to be visibly excited to learn using ICT. Since, there was one tablet per group, it was usually the owner of the device who would be controlling the device and other students would want to use it too. Sometimes this caused an initial period of unsettling and result in the students talking a lot, with the teacher having a hard time trying to control the class. But once the class settled down, the students were attentive to the teacher. When the teacher asked students to read out from the lessons available on the devices, many of the students raised their hands to volunteer to read it out loud demonstrating initiation to participate in class. When teacher asked the students to follow what she was teaching on the tablet, all the students followed as per instructions. Along with following what was being taught with the help of the tablet, students were also able to follow what the teacher was doing on the blackboard. This demonstrated their attention and concentration in the classroom. From the general observation

it was evident that the students were much more quicker to get used to the app and were much more comfortable using their devices for the learning activities. The students were quick to try out all the different aspects of the app and figure out how to use them by trial and error or by asking their friends. When the teacher asked during and at the end of the class to show the color cards to demonstrate how much they have understood the class, the students would be excited to do so but would look around at their friends to see which color cards they were putting up.

In Grade 8, the students were also visibly excited. After the software had been installed, the students were very attentive to the teacher. When the students were asked to follow the teacher on the board, the students were very attentive and once the teacher asked the students to look up a video in their devices concerning a real life example of light in underwater creatures, the students seemed very excited and were quickly onto their devices to watch the video. Most of the students were able to easily navigate to the content but some of them had problems and at times there were distractions due to some students asking around other students to help them out. Apart from that, most of the time the classroom was attentive to what was being taught.

After the first class, the test classes were well behaved, especially in grade 5 as they would comply with the teacher's directions. The students in Grade 5 did some classroom activity as assigned by the teacher. Upon the teacher's asking, the students also watched some videos for reference to do their class activity in Mathematics. When some students were not able to find the appropriate content as directed by the teacher, the students helped each other find the right content to view.

Grade 8C students were still mischievous in the class but the classroom environment was better than the previous occasion. The students were more comfortable using the Edcrayon app and there were fewer distractions compared to the previous class. Due to pressure of having to finish the course in time for the district level examinations, the teacher used a more traditional approach in the remaining sessions, using the ICT resources sparingly. However, the teacher did assign students to look up videos and read up some extra learning resources at home.

From the classroom observations, it showed that the students displayed intrinsic motivation to use ICT in the classroom. They showed a lot of interest in using ICT, they enjoyed the class sessions and were having a lot of fun watching the videos and reading supplemental lessons. Their excitement level was very high also. There were visible signs of engagement also. The students tried to focus on the class even when there was some distraction going around them in the initial phase of the study. If some students were causing distractions, their friends would ask them to quiet down so that they could concentrate. Every time the teacher asked them to read something from the tablet, all the hands would go up wanting to get involved. And the most important thing was that the students continued wanting to use ICT in classroom. On a more lighter note, some of the students came up to us while they were lined up to go home and asked us to request the principal to allow ICT continuation for upcoming

academic year too.

O. Teacher Interview

For the purpose of understanding the teacher motivation to use ICT with student centric teaching formal interviews were conducted. To maintain their anonymity, Teacher I (grade 5 Math teacher) and Teacher II (grade 8 Science teacher) will be used instead of their names.

One of the goals of Teacher I before the study began was that there will be less reliance on books and Teacher II wanted to finish the remaining of the course faster with the help of ICT in the classroom. Since Edcrayon facilitated media contents of sorts, Teacher I was very satisfied with the product. Similarly, Teacher II did find that the goal was achieved as she found the classes progressed much faster with the help of ICT as videos and animations helped clarify concepts to the students with much ease.

In terms of being confident to use ICT in classrooms Teacher I did not feel very confident in the beginning of the study but started feeling more confident as the study progressed. However, she mentioned that there were major monitoring issues because she wouldn't know if the students were following her on their own devices. Though she said the monitoring issues were also present when students used books only, the tablets presented a different challenge as students could play games in it and Teacher II mirrored these feelings and felt nervous without our assistance.

Both teachers felt that the contents present in the app were useful and that the students were very interested in using it because of the extra learning materials in the app. Teacher II also felt that the contents were very useful to supplement what was already present in the textbooks. With respect to finding the product interesting both teachers admitted that they found it very interesting to use because of its usefulness and novelty while they both felt the need for more training to be able to use it independently and confidently. However, both the teachers had reservations about having difficulty in monitoring students.

With respect to enjoying the product both the teachers enjoyed using it since it was a very new concept for them. Also, since it helped them in explaining concepts easily with the help of videos and animations. However, Teacher I found it exhausting at times since students found it hard to follow her but said that with time this problem would subside as both teachers and students get accustomed to using the app. Teacher II had doubts about how to merge ICT with traditional teaching and also if the teaching goals would in fact be met. Despite enjoying using the app to teach, both teachers did feel some anxiety while using it though it did not deter them from continuing to use it. The teachers also felt that the use of ICT in classrooms would improve student performance while improving teaching effectiveness. Even though Teacher I found it a hindrance in the beginning of the study, she found that the use of ICT would be very helpful in teaching due to supplemental videos and animations to help students understand concepts better.

Overall, the teachers showed interest and enthusiasm in wanting to use ICT in classroom for their teaching activities and strongly felt that this could enhance the students learning and also their own teaching. They had a positive attitude towards this and it could be seen during the classroom observations how they would supplement each new concept they taught with the relevant videos we had provided them. Even though the teachers would not know where to look for the videos, they would ask us to locate it for them. And just like the students the teachers also wanted to continue using ICT in the classrooms demonstrating that their motivational aspirations for ICT.

P. Student Group Interview

Grade 5 and grade 8 students were interviewed to understand how motivated they were to use ICT for their learning in the classrooms. The interviews were conducted in a group setting and as can be predicted, the grade 5 students were much more enthusiastic during the interview than were the grade 8 students. The general feedback we got from the students of both the grades were largely positive with some concerns raised by the students. The interview results are grouped together and if something interesting was mentioned by any set of students, then they have been mentioned separately.

On being asked if the students found ICT in classroom interesting the students screamed “yes” in unison and cited that it helped in their learning. They also found the concept very new and interesting. They showed enthusiasm that they could learn faster than when the same concept was explained by the teacher. Some of the grade 5 students even went to the length of asking some of their neighborhood friends to download the app and use it for their learning at home. The students also found it enjoyable because there were pictures and videos to explain the concepts and commented that they could gain knowledge with the use of ICT in classrooms. A student from grade 8 mentioned that ICT in classrooms was interesting because it was far better than having to listen to the teacher all the time and the class agreed in unison.

They also found it very enthusiastic to use ICT to learn when they responded to our query with a resounding “yes”. They said that their enthusiasm stemmed from the fact that using ICT in classrooms was a modern concept that should have been already been implemented in their classes and it was something that even their parents endorsed.

When inquired if the use of ICT provided them autonomy in terms of how they learned they said that even if they did not understand the concept when the teacher taught them, they could go home and watch the videos, which helped them understand the concept. They also commented that they could re-watch the videos while they could not do the same with the teachers. Watching the videos was also more useful to them than reading text to grasp the concept.

Upon inquiry if using ICT was related to learning they answered affirmatively stating that it was and that using ICT will be very good in learning science since most of the concepts could be better explained with interactive materials

and videos rather than just the teacher explaining it to them which could be difficult to understand. The students then asked us if we could develop more content for them in other subjects also.

There seemed to be enough motivation in the students to continue using ICT and from this study it can be concluded that the students showed a lot of motivation to use ICT for learning. Even the students who did not have their own devices mentioned that if there was a projector in the classroom and if the videos could be played in the classroom, that would be something they would really appreciate since they saw how much it helped their fellow students, who had devices of their own, to watch the videos to understand the new concepts.

There were also a few changes the students wanted in the app. They wished for a feature that would allow them to have their own photos instead of application avatars. They also demanded further features like the ability to chat regarding the lesson being taught in class, a feature to ask questions to teachers and to get answers to their queries. They also wanted games from which they could learn concepts. Similarly, they also requested for a game-based system. For example, one of the students commented that upon completion of certain activities, they should be able to unlock and replace their default avatar with a comic superhero avatar.

V. CHAPTER 5: DISCUSSIONS

Q. Discussions on Findings, Observations and Interviews

The intervention of using ICT in the classroom with student centric approach was statistically significant at 0.05 to improve the student’s scores in grade 8 but not in grade 5. The low effect size in grade 5 accounts for a small improvement seen. However, the improvement in grade 8 was much more and the effect size was also a moderate one. From this we might make an argument that use of ICT could be better suited to higher classes than the lower ones. However, more studies are required to confirm that. Similarly, the lower effect size in grade 5 might also be a consequence of several students sharing a device.

This gives us much needed evidence regarding the use of ICT in classrooms in Nepal too. Even though the effect size in grade 8 was a moderate one, it could be due to the short period of the study and also because the use of ICT in classrooms was abandoned in both the grades due to lack of time for the teachers to finish the syllabus. Due to this fact, it would not be safe to assume that the student achievement scores were also due to a student centric approach since this approach was not used for the entirety of the study period. However, the teachers did ask the students to look up the videos at home even when the use of ICT in classrooms was discontinued during the end of the study period.

We also have to see that there was a significant difference in the effect sizes of achievement scores of students of grade 5, low effect size, and grade 8 students, moderate effect size. The teachers and students also seemed very enthusiastic to use ICT in their teaching and learning process. The students felt that it was about time ICT was integrated into their learning in the classrooms while the teachers felt that they would be able

to achieve more by integrating ICT into their teaching and also that they felt it would be nice to learn relevant technologies for the classroom. The students in grade 5 did not have as many devices as their counterparts in grade 8. Due to this there could be a negative correlation between having devices to work with in the classroom and their interest in using ICT in the classrooms. The correlations test for grade 8 students did show a positive correlation, however it was not statistically significant. For grade 5 students, there is a statistically significant positive correlation between having interest in using ICT and feeling that they are competent in using it, 0.691, and feeling that they have a choice in doing so, 0.360. Thus it seems critical that students should feel competent enough to use ICT for their learning and also feel that they it is their choice to do so rather than it being forced upon them. There is statistical significance (at 0.01 level) for the positive correlation, 0.290, between feeling they are competent in using the device and the app and the feeling that they have a choice in doing so. In grade 8, there is a positive correlation between having their own device and the interest in using ICT for their classroom, 0.118 though it is not statistically significant. This could be largely attributed to many students having their individual devices. There is a positive correlation, 0.359, between having interest in using ICT in classroom and feeling they are competent in using it, significant at 0.01 level and there is positive correlation between interest in using ICT and the feeling that they have a choice in doing so, statistically significant at 0.05 level. Hence not only for grade 5 students but also for grade 8 students, it is very important that they feel competent in using ICT for learning and for that to be their choice out of their own volition.

VI. CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

R. Conclusion

The achievement scores of students in the test group compared to the control group were statistically significant for grade 8 but not for grade 5. The effect size for grade 5 was small but the effect size for the intervention in grade 8 is moderate and gives us much needed hope for use of ICT in classroom settings. The teachers and students both demonstrated the interest and will to use ICT for teaching and learning in the future citing that they felt ICT could be very helpful to teach and learn new concepts. The idea is novel and the teachers feel it can aid in their teaching and students feel that it can help them study at their own pace and time. Along with that the students were very engaged in the classroom with the use of ICT for learning. From the qualitative analysis, both the teachers and students demonstrated that they were highly motivated to use ICT in the classrooms for the teaching and learning process and would like to continue using it in the future, too.

S. Recommendations

The study was carried out for a period of roughly two weeks towards the end of the academic session and the teachers were rushed at that time to complete the syllabus on time. For this reason an entirely student-centric approach was not used in all the classes during the end period of the study. Towards the end of the study, the use of ICT in the classroom was stopped and the students were taught in the traditional

method. However, the teachers told the students that if there are supplemental videos in the Edcrayon app, then they could look them up. Therefore it would be highly recommended for this study to be carried out sometime in the early to mid academic year when the teachers are not pressed for time to finish their syllabus. This would allow the teachers to stick to the student centric methods as it does take some time and visible results for the teachers to have faith in the system. Also, the study duration could be longer, desirably a few months long so that both the teachers and students can get better accustomed to using ICT in classroom, which would provide us a richer qualitative feedback. We could also get a better sense of student motivation and engagement in the classroom since the initial spike of interest and excitement in using a new concept would also disappear and we could derive a better understanding of student motivation to use ICT and their engagement in classroom. Also, student achievement scores data could have been collected on numerous occasions to see how the use of student centric ICT is aiding in students achievement scores. We could then also see if with time, the student achievement scores get better or not. Also, if the study could be carried out in different schools at the same time, then we could also see if we could get similar results in all the schools or not. This would provide us a stronger result to base our decisions on regarding the use of ICT in classrooms. Additionally, conducting another test after certain period of time to study retention difference with and without the use of ICT might be very helpful.

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