

Digital Interactive Collaboration in Mathematical Practices of Management System

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Abstract

Recent trends of mathematics education using the open and distance mode was more effective recent and useful. The theoretical framework was the full of the paradigm shift of the recent mode and relevant of the system. I have taught in the Operations Research in the online education and make the effective idea of the education. The pedagogy of the education in the methodology, groups of students in the schools. The different mode of student was the mode of mathematics in the Game theory, Markov chains, Queuing theory, Dynamic programming, Transportation and Assessment programs. Inventory and Replacement model and Forecasting model are the beautiful aspect in the methods. The online methods were the better for the books. The online methods were the virtual classroom, online conceptual elaboration and technology integrated pedagogy in open and distance learning (ODL). It is suggested that LMS like Moodle is more effective in teaching and learning mathematics education using open and distance mode for higher education in Nepal.

Keywords: *technological motivation, module, collaborative learning*

Introduction

The development of technology has challenged traditional classroom based teaching as the normal mode of instruction. Technology enhanced has been seen s both an innovative new approach to teaching (Benson & Voller, 1997;Benson,2006).Technology enhancing has been linked to learner autonomy because of the possibility to enhance both any time learning and distance learning.

The open and distance education system adopts a flexible approach in respect of content selection, pace and place of the body in an ever updating manifestation of modern communication technology. The distance mode allows the educational system to be open and flexible, which is the most important characteristics of this system (Manjulika and Reddy, 1996).The new policy of Tribhuvan University(TU) also emphasized the role of the open and distance educational system in the higher education in the Masters' of Education (M Ed). Moreover, the policy of TU has to run all the program of the university in the dual mode, face to face and open and distance mode.

Online education was the more seen as users friendly and easy to manage and technically easy. It adapts a flexible modular design and one can choose and apply among thousands of available extensions for their version of Moodle (Unal & Unal, 2011).

Moodle is a course management system which enables delivery of online education. Moodle allows instructors to plan and designate activities for the students. Moodle is a dream tool for teachers, integrating wide range of resources and assessment strategies and is powerful in content creation (Ahmed Yousif, 2012). Thus the online mode was the better mode of education and full of education.

Department of Education runs the masters' programmed of Faculty of Education through open and distance learning (ODL) mode since 2015 in Tribhuvan University (TU). Most of the regions of our country are behind the access of internet. Online based learning needs regular contact to the teacher and students lying in the remote area. Attraction towards job is the major problem for the serious issues of unemployment in Nepal. Under these circumstances, teachers are necessary to aware towards the technology to shift their pedagogical practices and addressing the need of the new trends. It is necessary to make motivation towards the paradigm shift of traditional pedagogy and improving the learners' autonomy to foster them for effective teaching learning process using open and distance mode.

Open and distance education (ODE) often seeks to widen access. This implies a more heterogeneous student body. The wider the range of sources from which an ODE provider recruits, the more likely that some aspects of its curriculum are in accessible to some learners. There are so many unanswered questions in this system. The objective of the study was to explore the benefit and practices of open and distance learning mode through ODEC. This was more challenging and opportunities to establish as the alternative and effective institution of TU rather than face to face mode.

Methodology

In this study, I use the participatory action research approach. I used instruments for collecting data from interviewing participants, observing their behaviors and examining relevant documents that relate to the phenomenon understudy. As to my duties, I used the reflections of experts, reflections of students to verify the data given by teachers. Data triangulation was used for the more reliable and valid output. Methodological triangulation of my study indicates the efficiency and sufficiency of methods. I observed the behaviors change of the students in using the online educational mode.

Participants of this study consist of 13 students, who admit to the department of education from the mathematics. The Operations Research (OR) in the fourth semester in the mathematics education and make the education better for the education in 2078. Pedagogical course and pure mathematical course were chosen for the study. The students who involve in the education were the real user of the study.

Online observation schedule, focused group discussion (FGD) and interview schedule with students and experts were the instruments of this study. Data was collected within 16 weeks for each of the subjects. In accordance with the evaluation of the past activities, next lesson plans were improved and implemented again by researcher. This process was continuing until the final examination held.

The collected information were analyzed with the help of themes of the study. Themes were developed with the help of the theory described in the theoretical framework of this study. Online observational records and students' activities were analyzed by triangulating with the data from interview. Observational data collected using moodle platform and weekly based records. The data obtained from interview schedule will be analyzed descriptively.

Results

Thematic analysis was used to analyze the data. Data triangulation was used to make validity of the findings. Theoretical literature helps to generate the themes of the findings. Findings of this study has presented with the help of the following themes.

Practice for Learner Autonomy

The term autonomy has become prominent over the past thirty years with the shift in theory and teaching praxis of second language acquisition towards learner centered approaches. There are no clear simplistic definitions of autonomy due to its social, psychological, political and pedagogical aspects. Learner automation is the beauty of learner management system (LMS). Flexibility of time space and self-directed learning were used as the learner autonomy in this research.

In my current context my students have already shown a psychological capacity and proactive autonomy by continuing study 'in a world which they themselves have partially created'. As a practitioner, I developed reactive autonomy by facilitating situations where learners can learn autonomously and organize their resources autonomously to reach their goals' (Little wood, 1999, p.75). Learners' were free to learn and flexible for any time learning. Learning materials were in Moodle. They can read and operate using online mode freely.

Students felt enjoyable and happy to learn mathematics through the open and distance mode. Let us see the some feelings of my students during the interview.

Open and distance learning in very useful and interesting for professional development. It is the best opportunity for the people who are beyond the access of university mathematics education. This system is milestone for job holders. Place, time and online contact system increase the self-learning environment and materials as well. (S2)

Getting Job is very expensive in Nepal. Self-employment is very difficult. This education supported to the education them for the development of new and skilled educators. Such types of manpower increase the need and importance of mathematics education. These types of pedagogy empower the learners' autonomy.

Online education is more useful for self- practice and free study if we use pedagogy in pure mathematical contents as well. We are attempting to integrate pedagogy and technology with mathematical content knowledge at master level. (S1)

Office hour is not necessary to learn mathematics at higher level. Students can make their meaning freely. Therefore, students are very happy with the distance mode of instruction. These types of pedagogy increase the learners' autonomy. Pedagogy must be embedding in the mathematical content. There must be the place for learning with feedback system.

I can recall that the class will be the better way of education. The game theory was the best one for the education. The group of education and the work of it was the better for their jobs. The education was the better for the payment. All the system were the open and holds in the system. (S5)

Reflection and impact of face to face mode has seen in the open and distance mode of learning. Students felt uneasy to operate online mathematics learning at the beginning and easily operate time after. They felt excitement to learn and motivated toward the online mode. Student felt more interesting in pure mathematical contents rather than theoretical and pedagogical courses. Game theories were the better for the education in Master level.

Teaching video is very useful for mathematics learning individually. Self-effort becomes meaningful if we can imbed the technical pedagogical content knowledge efficiently. The documents were the useful to understand the tools and the documents of the chapter in the Assignment problem and the problem of Transportation useful to the model used in the Dynamical problem. (S7)

Repetition is necessary for mathematics learning at higher level. Teachers' teaching video was more helpful for the online students. This is useful for reading mathematics and to fins the relation and connection between the mathematical contents. Learner's autonomy is the beauty of online and flexible learning in mathematics education in Nepal. Use of pedagogy is necessary for online education. Online teachers were interested to make online mathematics education more operationalized and based on practice.

Students' did not felt the mood of the education in the online education. Moodle provided students' learning and teaching mathematics. It is just a means for learning. Students use the contents, discussion forum, blue button, group short message service and other for their collaboration their ideas. In the class time, students feel the romantic environment and good for the works.

Mathematics Education held in provides the days orientations for beginning of the semester. Student's reflections indicated that it was necessary to extend up to one week. They focused about the teaching videos and reading book on the text book. Video helped them to initialize the term and book help in the reading the book. This increases their potentiality and empowering to them. These types of activities promotes to the pupils' autonomy.

Students like to read easily as soon as possible. The key points and short notes were demanded by them for online learning. Video conferencing helped to increase our autonomy to learn at any time and any way. Students have to involve in almost every household work and at office as well. Time management is a bit difficult for female students. Assessment written examination was held at the time of contact session. It was very beneficial to the students for final preparation and practice.

Engagement, Assessment and Mathematical Creativity

All students are afraid from the assessment and examination. Moodle helps to make conditioning about assessment. It promotes the all-round development of the students. Students feel about the continuous process of evaluation. It was found that only the thirty percentages of students were able to submit their assignment on time at the initial cycle. It increases to the twenty percentages. Let us see the statement of a student.

I am very afraid from exam, but in this system I am happy with the final exam. I am feeling proud. We have additional knowledge than face to face mode. We are enjoyable learning using the dynamic and figurative presentation in Moodle. It will be better if online final examination held from open and distance mode in future. Otherwise, it will be better, if we are able to face final examination through the constituent campus of TU. (S4)

Students felt the document in the education subjects. All the documents are the important in the field of mathematics education. Open and distance education, all the books and the mathematical indentations in the school. It will be better for the equipment in the field of education. The education has the better for the useful and better for the final use and the practical format.

...(.)online assignment and assessment is difficult to manage and technically risk for teachers as well. First of all, our mind must be dynamic and turn towards the new trends and tendency of the western world. We are attempting semester system but, we are not fully functional as semester system (.). Moreover, we measure the students' mathematical cognitive skills. We must attempt to increase the student potentialities and their creativity in online learning. (S9)

Students were very interested and enjoy with the use of quiz, lesson-video and figurative expressions that I use in my online mathematics classes. Students more engage in operating the dynamic and figurative presentation of pure mathematical representations. I have used self-evaluation tests in the contact session. Questions were developed by students and evaluate their copy by themselves. It was first use to assessment evaluation techniques. Students felt more autonomous to assessment and they got the knowledge about the style of writing and deepness of their writing. Teachers can use to be change the new assessment system using technology for online education. The documents did the operations research and their different contents in the field.

Students feel difficulties to come at Kathmandu for their final examination. They argued to conduct their final examination either from online mode or from constituent campus of TU. The

research work passed in the field of education and better for the education. All the documents had left the five value in the education.

I feel, self-assessment and evaluation technique is very interesting and effective. Internal assessment examinations were more beneficial for the formation of the final examination and have a new experience. (S3)

The outcomes of online learning depend upon the level of engagement of the students. Moodle was a new learning management system for the students. Thus they feel difficult at first, and then they feel easy to read and write.

The documents has the open and distance in the field of education in Operations Research. It has the different parts like dynamic programming and different parts of the education. The problems of the linear programming and other techniques are the useful. (S8)

The program of the operations research make wide and becomes the documents. I have the used in the research work. Mathematical creativity the major ways in the research work. Content is the basic matter for the research work. Dynamic programming and other matter were the better for the used documents.

Students were unable to manage the time table for the online study and practice. At first, they were enjoying to operating the moodle platform. They feel enjoyment rather than mathematics learning. I would like to present the access and engagements of students in learning mathematics in moodle.

Digital Interaction and Increasing Potentiality

The integration of digital technology confronts teachers, educators and researchers with many questions. What is the potential of technological for learning and teaching, and which factors are decisive in making it work in the mathematics classroom? The crucial factors for the success of digital technology in mathematics education include the design of the digital tool and corresponding tasks exploiting the tool's pedagogical potential, the role of the teacher and the educational context.

At the first phase, we are able to the interactive document. The documents are the useful and better for the use and implication. Technical collaboration and the online education in the education are the better for educate. Face book and other documents are the use of the important parts. (S7)

The documents are the useful and fantastic and the use of the documents. The documents were the better for the use and implications. Technical collaboration and other documents were used in the field. Field of the documents has the presents in the used in the documents. Especially, the documents had covered of the fantastic and used in the field. More documents are the useful and move to the educations.

I can improve teachers' competency by the self-practice for the digital competency and empowering technological pedagogical integration with mathematical content knowledge. (T1)

Open and distance mathematics education helps to foster students' competency and fulfill the need of the teachers of twenty first century. Not only moodle but also the other digital tools can use to make online education more interactive and effective. Digital technology reduces the difficulty level of a discipline. Difficult contents of mathematics can teach or learn differently. It opens the door of multiple idea of mathematical solution in formal education informally. But the teachers' competency depends upon the use of practice. At the beginning of the classes, teachers had very low online participation. After the compulsion of the operation at moodle, the competency skill automatically increases.

Content and pedagogy are not separated. Both of them must be imbed by using the appropriate pedagogy. If we imbed them then we can find the position and the impact of pedagogy in mathematics education. (.).Build the capacity with the package of the pedagogical use in mathematics education. (S2)

Linking the pedagogy with mathematical contents is the beauty of the online education. We were separated them as different disciplines. The mathematics becomes difficult than it has. Moodle is software that is very easy to use and quickly to manage but, the competency of teachers is necessary.

Moodle helps for teachers, competency for online mathematics teaching and learning. Student engagement is necessary for the improvement in mathematics education. Students were enjoying in learning higher mathematics and felt easy to learn mathematics when we can embedding the content with an appropriate pedagogy and feedback.

Digitalization of Mathematical Knowledge

Twenty first century is also called the time of digital age. Every students and teachers uses the technical tools in everyday life. They are very interested to operate them. The technical equipment was not used in the classroom practice efficiently. Pedagogical use of digitalization of higher mathematical content is difficult to presents for online learning. Integration of technology tools and techniques is the key to make online learning efficient and effective. It is time consuming and need highly technological knowledge (Neupane, 2018a).

Digitalization of exiting curriculum is necessary for the open and distance mathematics education. Mathematical contents must be brick down into small piece of contents so that students can understand it easily. Even in the theorem of pure mathematics, it will betted to make a bit easy then now. We must attempt to blend the ICT integration in mathematics education. (T1)

Digitalization of mathematics curriculum is necessary for the online education. We are practicing in the holistic curriculum system. There is no proper position of students' autonomy in the

curriculum and other resources. Online education is different than the face to face learning system. In face to face learning, students can raise question for unknown matters, but for the online students it would be difficult. It reduces the opportunities to learn. Thus we must split the mathematical content into small pieces for online education.

Resources and Collaboration

Teachers develop three specific roles and qualities like facilitator, counselor and resource person (Voller,1997, p.102).In this research, as a resource person, tutors provided the direction and advice on strategies and resources in and out of the classroom. I have taken the learning platform, Moodle that learner and teacher autonomy are interrelated to each other. In this study, we have taken moodle as a tool combined with relevant pedagogy to promote autonomy for online mathematics education.

From the observation of the online practices, only forty percentages of students are actively participated in moodle software before the first cycle (orientation to first contact session). After the contact session, the involvement of students increased by thirty percentage. They were unfamiliar to operate moodle at first. Later on they were enjoying opening moodle and ready to learn mathematics.

Resources are the means for fostering students learning capacity and increasing their autonomy. Moodle is a suitable learning environment that promotes the students' autonomy. Students feel open to learning and teacher has teaching freely. Let us see some students' reflections.

I found different additional resources in moodle. It will more beneficial for us. Up to first contact session, we were not familiar with each other. We share our ideas after the period. Very little practice of video conferencing and interaction between the students because we all are busy in job. (S3)

Students' collaboration was a beauty of moodle environment. But our students and teachers were not so practice and sufficient skills for smooth operation. First of all they were just open and play to learn Moodle rather than efficient use of it for online learning. After the first contact session, they were started to collaborate some mathematical ideas and sharing the information. They all are busy in their job. They have only off hours' time for reading. They were used their knowledge and attempt for learning mathematics carefully. They leave their classes as well because of their tile limitations.

Discussion

Students were very happy to learning with online mode. On the whole, students have a positive view towards moodle. They had the problems to handle the online classes at time because they were involved in teaching their classes at school level. More than fifty percentages of students were involved in job.

Hanafi (2004) and Paris (2004) states that students have a positive attitude towards online learning. Further, in a study by Zoranand Rozman (2010), their respondents commented that moodle was helpful, useful, time-saving, and above all that it had a positive influence on their learning. Drennean, Kennedy and Pisarski (2005) argued that a high positive perception was related to high satisfaction towards online learning. Melton(2006) highlighted the usability of

moodle which may contribute to the positive perceptions. From these references, students were very excited and motivated to learn from online mode. Students said that:

“...it has dual benefit mode for us, getting job and the opportunities for learning in the context of developing countries like Nepal...”.

They have no efficiency of technical knowledge for online class at the beginning. Thus, we have to provide the sufficient workshop for operating the moodle and other techniques supporting to online mathematics learning.

Students who have a positive attitude towards learning will easily accepted e-learning (Research Institute of Bangkok University,2002) platform. Major problems were the technical support to operating the online mathematical classes and integration of technology tools and techniques for online mathematical collaboration. Students have the language problems in both pure and pedagogical paper. In pedagogical paper like the Operation Research, they have very difficult to understand the language of the reference book of western writers. In the pure mathematics, they have the problems of pronunciations and understanding techniques. There is very difficult to providing the concepts of pure mathematical knowledge through online classes. Because there were no expressions and other activities like face to face classes. All the students and experts keep their argument towards these difficulties of mathematics repeatedly.

According to Neupane (2018b) teachers' satisfaction is one of the major components to be effective use of technological tools in mathematics education. Contrarily, other teachers express their satisfaction on the training, workshop and seminars but they emphasize that it helps them in improving their technological knowledge and not integrating with pedagogical knowledge in using the tools to teach online mathematics education. Computer collaboration is the major activities of online learning.

Open and distance in education was the research work in the work. The students has are used as the respondent of the research which is limited. It will be better if we study the online education in the different universities of Nepal. Practice of technological integration in online mathematics learning is rapidly improving and students' perception and engagement is increasing. Teachers' quality and their effort were highly appreciative. The curriculum modulation for online education felt more important.

Conclusion

This study gives preliminary data about the practice and teacher-students' reflections towards learning management system, moodle. Perception of Masters of Education students toward smoodle is very positive. Limited time and inefficient resources were the major problem to study the online mathematics education in Nepal. Lack of curriculum modulation of mathematics education, online tutors and learners face different difficulties. Both the agents were attempted to improve the quality of education with the help of open and distance education from the open and distance mode. Technological integration in mathematics education for online education is improving and motivated to transfer the training and

workshop about online pedagogy. Pure mathematical courses are more effective than the pedagogical courses. The frequency level of computer collaboration is necessary to rise.

The open and flexible learning will includes the students who left their classes because of their poverty and necessary to holding job within country or out of country. The facilities of credit transfer between both face to face mode and open and distance mode is necessary. The unavailability of network facilities, time management of students, inefficient use of online pedagogy, lack of incentives were the major problems and challenges for the future for open and distance teaching learning.

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