# Design and Implementation of Student-Centered Assessment in Blended Learning Classroom

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## Abstract

This paper presents the process of design and implementation of student-centered assessment in e-learning course. The Attitude Towards Thinking and Learning Survey was utilized to measure the extent to which a student is a connected knower or a separate knower. On the average, the respondents are more connected learners; hence, they show higher adaptability to interactive learning environment as hypothesized by Dougiamas and Taylor (2003). Utilizing the result of the attitude towards thinking and learning, appropriate activities were embedded in the design of the e-learning course. Backward curriculum design was the framework on designing the instructional process, where the goals of the course were operationalized in terms of assessment evidences. Mapping of objectives, outcomes, assessment tools and delivery mode (offline or online) was done.

Paired t-test analysis shows that there is a significant difference in the pretest and posttest achievement scores. This implies that students' performance have improved during the implementation of the e-learning course. Constructivist On-Line Learning Environment Survey also suggests that their actual experience in the classroom exceeds their preferred classroom environment in terms of students' reflective thinking, interactivity and peer support.

**Keywords:** Backward Curriculum, Blended Learning, Constructivist, Student-Centered

## Introduction

Teaching is becoming one of the most challenging professions in our society where knowledge is expanding rapidly and much of it is available to students, as well as teachers, at the same time. As new concepts of learning have evolved, teachers are expected to facilitate learning and make it meaningful to individual learners to provide knowledge and skills (Perraton, Robinson, & Creed, 2001).

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The growing emphasis of a paradigm shift in teaching methods in the Philippines is embodied in the student-centered learning approach, in response to the criticisms to the traditional teacher-centered learning methodology (Medina, 2008). A student-centered classroom isn't a place where the students decide what they want to learn and what they want to do, it's a place where the teacher consider the needs of the students, as a group and as individuals, and encourage them to participate in the learning process all the time (Jones, 2007).

To facilitate student-centered learning, many authors suggest the use of media and technology (Wang & Woo, 2007). However, in this type of learning, technologies should shift their role from being conveyors of information to a means for engaging students in thinking. More specifically, technologies should be used to pose problems to students, provide related cases and information resources, a social medium to support learning through collaboration and interaction, and intellectual partners to support learning by reflecting (Jonassen, Peck, & Wilson, 1999). In this way, technologies would no longer become "full" systems (Zucchermaglio, 1994) that do nothing but transmit information to the learners; as well as having tools that can lead students to experience the knowledge construction process (Edelson, Pea, & Gomez, 1996).

The advent of advancing technology has propelled life on the fast lane: trade, social systems, even the arts. The Internet and hi-tech media paraphernalia also made us to be part of the globally competitive world, and nothing could be more apparent in meeting this pressure than in education. With such rampant changes, education should be equipped to deal with, and evolve as well, for the sake of the learner, or he will suffer because he could not cope with life's challenges because he was not prepared properly when he was studying. One way education can meet the growing need to be globally competitive is through the use of online or e-learning (Bantayan, 2007). The use of e-learning can be touted as an alternative delivery of education. It is a type of teaching practice that upholds the concept of "anytime, anywhere" kind of learning (Salgarino, 2000).

The paradigm shift away from teaching to an emphasis on learning has encouraged power to be moved from the teacher to the student (Barr and Tagg, 1995). The teacher–focused or transmission of information formats, such as lecturing, have begun to be increasingly criticized and this has paved the way for a widespread growth of 'student–centered learning' as an alternative approach. However, despite widespread use of the term, one of the issues with student–centered learning is the fact that many institutions or educators claim to be putting student–centered learning into practice, but in reality they are not (Lea et al., 2003).

The main objective of the study was to develop a student-centered e-learning course utilizing the MSU-IIT Online Learning Environment (MOLE), an open source learning management system. Specifically, this research study aimed to:

1. describe the process of development in terms of the (i) attitude of students towards thinking and learning; (ii) learning objectives and outcomes; (iii) assessment tools; (iv) instructional plan; and (v) grading system.
2. compare the difference between the pretest and posttest performance of the students;
3. determine the pattern of students' participation in the e-learning classroom;
4. determine the impact of peer assessment in the improvement of students' outputs;
5. assess the quality of students' outputs; and
6. accumulate the perceptions of the students (i) on their e-learning experience; (ii) on the making of their outputs; and (iii) on the constructivist online learning environment.

Backward Curriculum Design was utilized in developing the e-learning course in gearing towards the student-centered approach in learning. The logic of backward design suggests a planning sequence for curriculum. This sequence has three stages: (1) Identify desired results, (2) Determine acceptable evidence, and (3) Plan learning experiences and instruction (Wiggins & McTighe, 2005).

These stages were followed in such a way that the course was already prepared before its implementation. In using the first stage in this study, goals were considered, established content standards were examined and curriculum expectations were reviewed. In the second stage, the e-learning course was anchored by performance tasks and projects which provided evidence that students were able to use their knowledge in context, hence, a more appropriate means of evoking and assessing enduring understanding. Lastly, with clearly identified results and appropriate evidence of understanding in mind, the instructional activities were then planned and made. These include teaching methods, sequence of lessons, resource materials, and assessment tools.

As to each activity, the design process was grounded in Constructionism which is both a theory of learning and a strategy for education. It builds on the "Constructivist" theory of Jean Piaget, asserting that knowledge is not simply transmitted from teacher to student, but actively constructed in the mind of the learner. Learners don't get ideas, they create ideas. Moreover, Constructionism suggests that new ideas are most likely to be created when learners are actively engaged in building some type of external artifact that they can reflect upon and share with others (Han & Bhattacharya, 2001).

Han & Bhattacharya (2001) added that Constructionism is reflected in Project-Based Learning by the creation of a student-centered learning environment and the emphasis on artifact creation as part of the learning outcome based on authentic and real life experiences with multiple perspectives. Thus, learners are allowed to become active builders of knowledge while confronting misconceptions and internalizing content and associated conceptions.

Through student-centered learning, students become self-sufficient and creative thinkers who appreciate and value the subject being taught. By keeping students at the center of one's classroom, a teacher can encourage and inspire students to seek out knowledge and to strive for understanding at a deeper level. Through this process, students see a greater relevance for and a stronger connection to the subject at hand. Through student-centered instruction, our students can achieve independent minds and the capacity to make educational decisions and value judgments (Brown, 2008).

The result of this study was expected to be of great help to the teachers, the students, the school, the community and even the whole educational system.

To the teachers, they could create student-centered activities using open source learning management system. It would be of great support to keep them updated on computer integration especially that we're already in the ever-growing age of technology.

Specially crafted for the students, the student-centered e-learning course has let them do their tasks while knowing their performance from the start until the end, hence, giving them the opportunity to reach their aims in getting the highest score as much as possible. They would likely bring their own personalities, strengths, weaknesses, and learning styles to the class.

Educational institutions are also expected to benefit from this study in which significant information on the development of this e-learning course could be made to have the student-centered approach in learning be applied in all classrooms, online or not. This research study provided baseline information on

design and utilization of student-centered courses in every school online portal, i.e. Moodle, Edmodo, Google Classroom, which would benefit higher education institution and basic education classroom.

## Research Design and Methodology

This research made use of a pretest-posttest one-group design with qualitative support. The qualitative support is in the form of reflection, checklist, and self and peer assessment. The Bachelor of Secondary Education major in Mathematics students (9 were males while 28 were females) of the Department of Science and Mathematics Education, College of Education, Mindanao State University – Iligan Institute of Technology, Iligan City, Philippines, who enrolled in the course History of Mathematics for the first semester, A.Y. 2014-2015 were the respondents of this research study.

The instruments used in this study were the following: Achievement Test (Pre-test and Posttest), Attitudes To Thinking and Learning Survey (ATTLS), Constructivist On-line Learning Environment Survey (COLLES), Activity Rubrics, Perception Questionnaires, Self-Assessment Form and Peer Assessment Collaboration Rubric. Rubrics were used by the students in evaluating the performance or collaboration between their peers, as well as, their outputs in every activity. On the other hand, the data collected from the questionnaires regarding students' perceptions were content analyzed.

This study focused on the development of an e-learning course in History of Mathematics. Backward curriculum design was utilized in designing the course. Learning goals and evidence of outcomes were mapped to determine the appropriate learning activities and assessment tools.

Information is gathered from the students. This includes their prior knowledge, which was measured through pretest; their attitude towards thinking and learning; and their perception on the constructivist online learning environment. Results of the pretest and attitude towards thinking and learning were considered in the development of the course.

MSU-IIT Online Learning Environment, which used Moodle as the open source learning management system, was utilized in delivering the content in the e-learning classroom. The course was not completely online, hence, it used blended mode of instruction wherein students and the teacher also met up face-to-face.

The developed e-learning course which uses the student-centered approach in learning was then presented to the students. Several student activities are incorporated with varied assessment tools such as survey questionnaires, online quizzes, self and peer assessments. A Gradebook was used in this course where students are able to track down their grade standing/performance from the start. Also, activities and deadlines were tentatively scheduled ahead of time so that students can prepare. All these are clearly included in the course syllabus outline, which was posted in the e-learning classroom.

## Results and Discussion

### Development of the e-Learning Course

Backward curriculum design was utilized in developing the e-learning course – the researcher operationalized the goals of the course in terms of assessment evidences. To promote creativity and collaboration among students, constructionism was utilized in designing the activities.

The iterative process in designing the e-learning course was shown in Figure 1. Analysis of the learners was done first. This was when the pretest, ATTLS and COLLES on students' ideal online classroom were conducted to the student respondents. Secondly, the course goals and outcomes were identified.

On the next step, since the end purpose of the study was to produce a positive change of students' performance, outputs and perceptions, the objectives of the course needed to be supported with appropriate and effective assessment tools. Hence, these assessment tools were mapped with their respective purposes which were then incorporated in the Instructional Plan of the e-learning classroom. A unique grading system was then planned wherein assessment tools, outputs, and results in every activity were given points and were automatically lined up in the Gradebook.

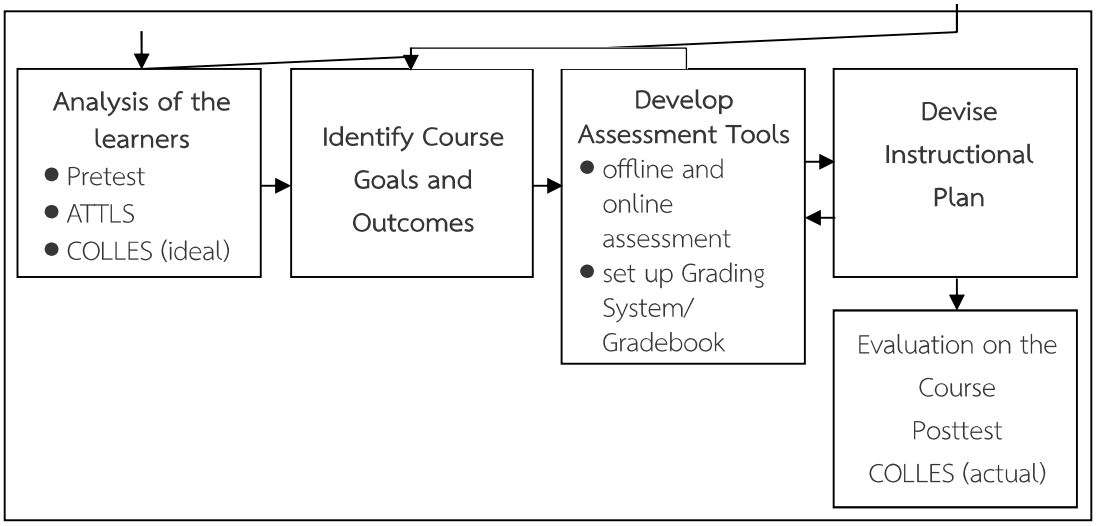


**Figure 1.** Iterative Process in Designing the e-Learning Course

**A. The Attitude of the Students towards Thinking and Learning**

The Attitudes Towards Thinking and Learning Survey (ATTLS) is an instrument developed by Galotti et al. (1999) to measure the extent to which a person is a 'connected knower' (CK) or a 'separate knower' (SK).

People with higher CK scores tend to find learning more enjoyable, and are often more cooperative, congenial and more willing to build on the ideas of others, while those with higher SK scores tend to take a more critical and argumentative stance to learning. In addition, connected knowers are said to be communicative and compassionate, while separate knowers are said to be analytical and solitary. Studies have shown that these two learning styles are independent of each other (Galotti et al., 1999; Galotti et al., 2001). Additionally, they are only a reflection of learning attitudes, not learning capacities or intellectual power.

On the average, the student respondents are more CK – learners; hence, they may show higher adaptability to interactive learning environment as hypothesized by Dougiamas and Taylor (2003).

**B. The Learning Objectives and Outcomes**

History of Mathematics according to Swetz and Yu (1999) has one major goal or objective – that the participants obtain a better understanding of the development and evolution of mathematics. The course, Math 25 (History of Mathematics), explores the humanistic aspects of Mathematics and provides the historical context and approaches developed which lead to the present understanding of the mathematical concepts.

The course specifically aimed to have the students compare early mathematics development within several cultures; distinguish the evolutionary trends in mathematical concepts; and associate the changing societal milieu with changing mathematical outlook.

C. Assessment Tools

Utilizing the result of attitude towards thinking and learning, appropriate assessment tools were embedded in the design of the e-learning course. The assessment tools (i.e., rubrics, checklist, online quiz, and survey) were mapped to the technology utilized in the open source learning management system, as well as to their respective purpose in the attainment of the learning outcomes. Table 1 shows the mapping of each assessment tool according to its purpose, and as well as to the technology tools used if it is in the online classroom in MOLE or offline.

**Table 1.** Mapping of Assessment and Technology Tools

| Assessment Tool | Technology Tools Utilized | Purpose |
|---|---|---|
| Numeration System Reporting Rubric | Google Form *(online)* | To evaluate each group's report on the assigned topic according to the content being summarized; the delivery of the report, as a group and/or as an individual; the visual aids used; the arrangement of the written report; and the uploading of the report in the online classroom. |
| Calendar Rubric | Word processing *(offline)* | To evaluate each group's calendar output according to its content, grammar & spelling usage, presentation and usability. |
| Initial Presentation Check-list | Word processing *(offline)* | To determine if each criterion in the Calendar Rubric is being observed in each of the group's initial layout design of the calendar. |
| Multimedia Rubric | Word processing *(offline)* | To evaluate each group's multimedia presentation output according to the accuracy of its content, effectiveness, presentation, grammar & spelling usage, appropriate graphics usage, background, and text-font choice formatting. |
| Online Quiz | Interactive Quiz *(online)* | To assess students on their understanding of the topic wherein time is not limited and students may browse the internet while answering; hence, giving them new opportunity to learn in their own way. |
| Peer Assessment Collaboration Rubric | Workshop Assessment *(online)* | To enable students to assess their peers according to their performance and effort during group activities. Students can also assess themselves using the rubric. |

| Assessment Tool | Technology Tools Utilized | Purpose |
|---|---|---|
| Self Assessment | Google Form *(online)* | To enable students to rate their own contribution to every group activity using a scale. Open-ended questions were also incorporated to follow-up what were the problems they have encountered along the way and what were the ways they have made to solve or improve them. |
| Attitudes Towards Thinking and Learning Survey (ATTLS) | Pre-installed Survey *(online)* | To measure the extent to which a person is a 'connected knower' (tends to find learning more enjoyable, and is often more cooperative, congenial and more willing to build on the ideas of others) or a 'separate knower' (tends to take a more critical and argumentative stance to learning). |
| Constructivist On-line Learning Environment Survey (COLLES) | Pre-installed Survey *(online)* | To monitor the extent to which the interactive capacity of the World Wide Web may be exploited for engaging students in dynamic learning practices. |

The Gradebook, in Grader Report format (see *Figure 2)*, displays all of the students' records/scores in every activity with their respective total scores which can be seen only by the teacher in a single view. This is like the class record of teachers in traditional and usual classroom experience. On the other hand, the User Report format of the Gradebook displays records of each student in the course, which can be seen by both the teacher and the student. This is just like the usual report cards given to students at the end of the school year.

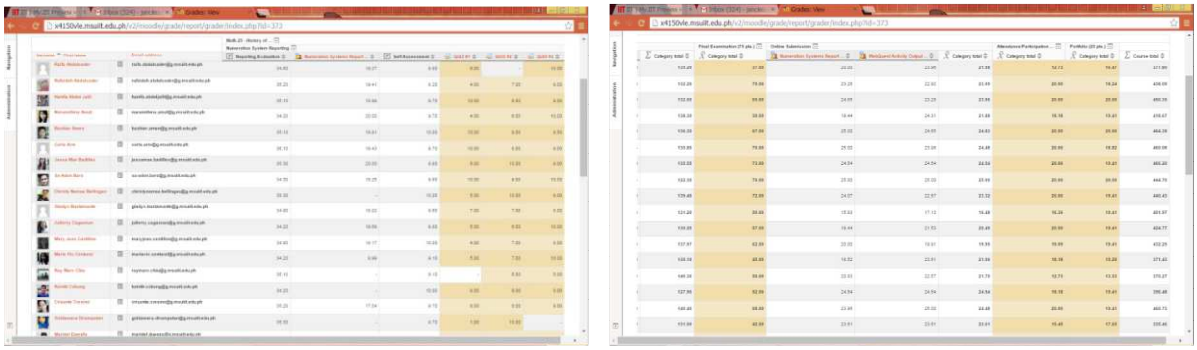

**Figure 2.** The Gradebook in Grader Report Format

**D. The Instructional Plan**

The course description, specific objectives and all of the activities in the classroom are contained in the Math 25 Instructional Plan in a form of a course syllabus outline; and along with these are the topics with their corresponding assessment tools from the very start to the end.

The major activities in the course were in blended mode in which students and the teacher did not just work online but still met face-to-face in the classroom. This is in view of the fact that reporting activity needs to be done in the classroom and student participation in every activity is better monitored when the teacher is with the students at a certain time and place. Each topic has a corresponding tentative schedule as to when it will be carried out, as well as, the activities that students are expected to do.

Jointly, the grading system was developed in such a way that each topic did not just get a percentage of a certain grade, but each activity or output was given points (according to its weight). Hence, all points for all activities or outputs were already planned all along before the course starts. In this course, all points sum up to a total of 500. Then the points were then given grade equivalents, prudently as to the prescribed mode of grading of the school.

The Instructional Plan was incorporated as a webpage so that students were able to see it anytime whenever they were online. A downloadable copy was also attached so that they could have a hardcopy of it whenever they want to see it offline.

**Performance of the Students in the Achievement Test**

The 75-item, researcher-made achievement test was given at the beginning and end of the implementation of the study in the semester-long course as pretest and posttest. Based from Table 2, the mean scores of the pretest and posttest are 22.84 and 59.87, respectively. There was an increase of mean scores, which is 37.03 with a standard deviation of 9.72. Upon application of paired t-test with 36 degrees of freedom, it is found to be significant ($\rho$-value < $\alpha$=.05) which means that there is a significant difference in the pretest and posttest achievement performance of students. This implies further that the students' performance have improved during the semester-long implementation of the student-centered e-learning course.

**Table 2.** Comparison between the Overall Pretest and Posttest Scores of Students

| Students' Performance | Pretest | Posttest |
|---|---|---|
| Mean | 22.84 | 59.87 |
| Standard Deviation | 7.27 | 10.33 |
| Mean Difference | 37.03 | |
| Mean SD | 9.72 | |
| t-test | 23.17* | |
| $\rho$-value (two-tailed) | .000 | |

*with 36 degrees of freedom and significant at

### Pattern of Students' Participation in the e-Learning Classroom

The student and teacher-activities can be traced by the MOLE system wherein posts and views of every role can be counted, and the dates can be recorded. The rise of activity can be noticed in the months of September and November. These dates were when students submitted their major outputs and rate the outputs of others, their peers and themselves. Meanwhile, the teacher also monitored and graded the students' submissions and evaluated the ratings to make sure the points surely go to each of their user report.

In Figure 3, it can be seen that the behaviour of students' activities are fairly relative or proportional enough to the teacher's activities. Furthermore, the teacher really monitored and guided every student's activity in the entire duration of the course.

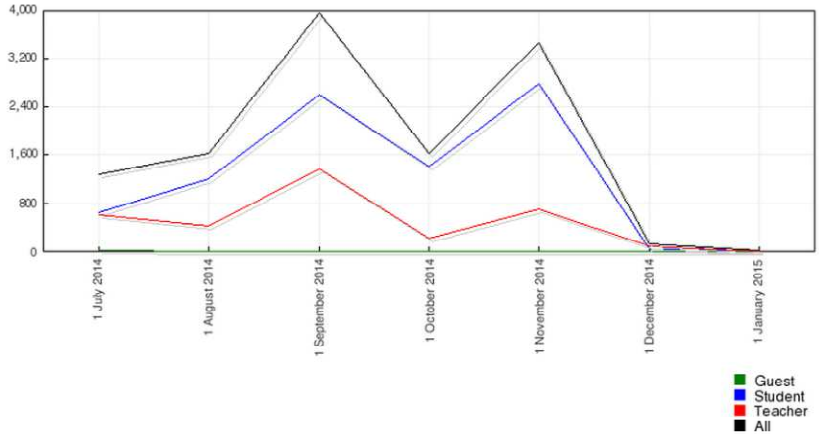


**Figure 3.** All Roles' Activity during the e-Learning Course Implementation

### Peer Assessment: Its Impact on the Improvement of Students' Outputs

Through peer assessment, in a form of an Initial Presentation Checklist, all groups in the class see to it that most, if not all, of what is stipulated in the Calendar Rubric are being observed. A Remarks section is also included to give the groups opportunity to suggest and/or give their comments to help improve the outputs of the groups they have rated.

After the initial presentation of outputs, the evaluation with remarks was given to each respective group. These were then used as the basis of the groups in the revision of their outputs. Some suggestions were incorporated by certain groups, while some also did not follow the other groups' suggestions as they found them not fitting to their expected outcome.

Peer assessment paved a way to ensure good quality of students' outputs at the end of the course. Students did not just make their outputs once since their initial outputs underwent another process which gave the students opportunity to scrutinize the work of others according to the expected standard outcome. Then it was already expected that the groups would be submitting a more polished output of the activity.

### Quality of Students' Outputs

The calendar outputs of students were rated by the students themselves and the teacher using the Calendar Rubric. On the other hand, the multimedia presentation outputs were rated using the Multimedia Rubric. All outputs got high ratings; hence, a good quality of the outputs is really ensured. The multimedia presentations of the students were rated also using the Multimedia Rubric.

The quality of students' calendar outputs were all evaluated as 'Exemplary'. And seven out of eight multimedia presentation outputs were evaluated as 'Exemplary', while one output was evaluated as 'Good'.

## Perceptions of the Students

### A. Perceptions on their e-Learning Experience

In the students' overall learning experiences, it can be seen in their Self-Assessment Form that they appreciated the new kind of learning which is modernized or e-learning as it is a well-organized, useful, accessible, fast and easy learning tool. However, students got a problem on the slow and lack of internet connectivity; hence, making a gap on the effective and successful learning environment.

### B. Perceptions on the Making of their Outputs

Students build a good team work during the activities as they go along in sharing different thoughts and ideas, as well as group decisions, in the making of their outputs. Contrary to the common expectation, students lack the sufficient resources and materials such as laptops and finances in accomplishing the assigned tasks.

### C. Perceptions on the Constructivist e-Learning Environment

During the start and the end of the e-learning classroom implementation, the 24-statement Constructivist On-Line Learning Environment Survey (COLLES) was conducted. The survey gathered the responses of the students towards their preferred versus actual experiences during the implementation of the e-learning course; specifically on students' reflective thinking, interactivity and peer support.

The students' actual responses towards reflective thinking, interactivity and peer support escalated from their preferred responses. This implies further that the developed e-learning course is not just successful in terms of student learning and outcomes, but it also exceeds the expected or preferred experiences of the students towards having an e-learning course.

## Conclusions

This study tried to explore a comprehensive and integrated student-centered protocol in a blended classroom mode that maximizes the cognitive process, as well as, the learning assessments, for the reason that the structure and protocol of student-centered learning are still so varied that a more coherent paradigm is yet to be arrived at.

Backward Curriculum Design approach of designing the course, the course, History of Mathematics, geared towards the student-centered approach in e-learning. As soon as the analysis of the learners was done, the course goals and outcomes were identified. The assessment tools were then mapped with their respective purposes; and a unique grading system was planned wherein assessment tools, outputs, and results in every activity were given points and were automatically lined up in the Gradebook which encourages students to monitor their own progress during the implementation of the e-learning course. The performances of the respondents have improved after its implementation. This implies further that the respondents understood the concepts discussed in the e-learning course. The behavior of students' activities,on the other hand, is fairly relative or proportional enough to the teacher's activities. Furthermore, the teacher really monitored and guided every student's activity in the entire duration of the course. Subsequently, peer assessment paved the way to ensure good quality of students' outputs at the end of the course. Students did not just

make their outputs once since their initial outputs underwent another process which gave the students opportunity to scrutinize the work of others according to the expected standard outcome. Then it was already expected that the groups would be submitting a more polished output of the activity. As a result, the multimedia presentation and calendar outputs got high ratings; hence, a good quality of the outputs is really ensured. As to the perceptions of the students, the course' new and modernized approach is highly appreciated and team work was built as they made the outputs. Lastly, base on the survey conducted, their actual experiences right after the implementation exceeds their ideal experiences for an e-learning course.

With all these thriving results, the researcher recommends the utilization of the developed student-centered e-learning classroom, as a model for other teachers to develop another classroom related to their fields that focuses the student-centered approach in learning. This is with the hope of getting closer, at the least, to the paradigm of an ideal student-centered classroom, online or not; hence, with the possibility of bringing students to an ideal educational environment for the betterment of the community.

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