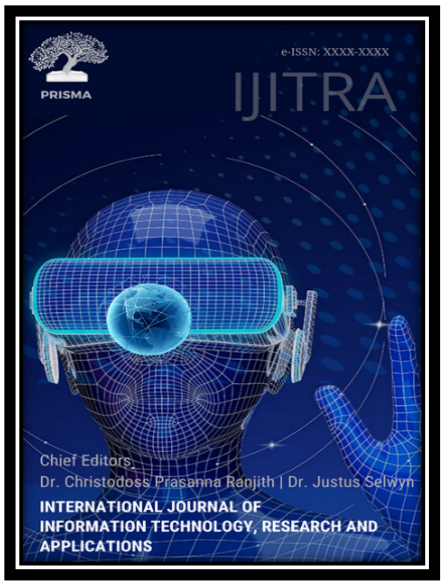

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Effective Adoption of Learning Management System MOODLE for Math Placement Test at Nizwa College of Technology

Naseer Ahmed[1], Khalifa AlShaqsi[2]
[1,3]Information Technology Department, University of Applied Sciences and Technology, Nizwa, Oman
[2]Mathematical and Physical Sciences, College of Arts and Sciences, University of Nizwa, Nizwa, Oman

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ABSTRACT

A mathematics placement test is mandatory for all freshmen in Nizwa College of Technology, one of the branches of University of Technology and Applied Sciences, Sultanate of Oman, as well as in other branches too. This article presents the way of effectively adopting the learning management system Moodle for conducting online mathematics placement test for freshmen at Nizwa College of Technology. Also, comparison and comprehensive analysis are done based on the results of mathematics placement tests conducted at Nizwa College of Technology. The findings and observations in this paper strongly recommend the structure of the mathematics placement test in online mode through MOODLE quiz activity with multi-choice questions to all the general foundation programs at higher educational institutions in Sultanate of Oman.

Corresponding Author:

Naseer Ahmed
Information Technology Department
University of Technology and Applied Sciences
Nizwa
Sultanate of Oman
Email: naseer.shukoor@utas.edu.om

1. INTRODUCTION

General Foundation Program at the colleges of technology (CoTs) in Sultanate of Oman has two bridge courses in mathematics: the first is basic math, which is a common bridge course to all the students irrespective of their specializations; the second is pure math / applied math. Pure math is offered for the students belonging to engineering, applied science, and information technology specializations, whereas, applied math is offered for the students belonging to Business studies, fashion designing, and photography specializations. Basic math is the prerequisite for both the pure math and applied math courses.

Math Placement Test (MPT) is mandatory for all freshmen in Nizwa College of Technology (NCT), Nizwa, as well as in other CoTs also in Sultanate of Oman. Direct placement into pure math / applied math courses is the sole purpose of this test. Though it is primary, we get additional information about the area of strength and weakness of the participants in the basic math course content by analyzing their answers of placement test. Also, the students get enrichment in the online activities which will be part of the assessment activities in their mathematics courses. The teacher could quickly analyze the lack of skills of the participants in the categories included in the MPT that is designed as a tool to assist the management in placing students into pure math / applied math courses directly. The questions for the test are specifically selected with this single purpose in mind. This means the test is not a measure of everything that is learned in high school Mathematics courses. The test is not designed to measure program success or to compare students from one high school with students from another. It might be viewed only as a tool to be used for placing students directly in pure math / applied math course. Math Specialization Committee (MSC) decided to conduct MPT uniformly in all the seven CoTs in Sultanate of Oman.

In this article, a modified way of designing the MPT online by using Moodle for the freshmen at CoTs in the Sultanate of Oman is discussed in detail. The merits and demerits are highlighted based on creating questions in Moodle, scheduling and conducting MPT, and the performance of the student in MPT.

2. E-ASSESSMENT IN MOODLE

In academic and non-academic fields, there are a variety of multiple-choice test methods used in the assessment on subjects' knowledge and decision ability: conventional multiple-choice, elimination testing, liberal multiple-choice, confidence marking, probability testing, and order-of-preference scheme. However, current research findings still could not enable researchers as well as academicians to identify which multiple-choice test method is the best to use. In paper [1], the authors would let people be familiar with multiple-choice test methods and thus facilitate people to conduct more effective assessment tests. In addition to subject knowledge, if the examiner wants to measure the confidence of the participants, then choosing the correct weight of positive and negative marking concerning for confidence will play a vital role while setting the questions. Currently, the quality of the Multiple Choice Question (MCQ) and the number of the distractors appearing in the choices play a major bearing upon how 'easy or hard' a question is in a traditional system [3]. Multiple-choice tests are very much popular in academics for several reasons: they offer greater objectivity, are easy to grade, and can allow more outcomes of the course to be covered on a single test. Due to its popularity and utility in academics, several researches are going on in the structure of an MCQ. The inclusion of "none of the above" or "all of the above" as one of the alternatives or distractors should be avoided on MCQs [5,6].

One of the most widely used traditional assessment tools is multiple-choice tests. The multiple-choice tests are commonly utilized by teachers, schools, and assessment organizations due to its merits, though it has some demerits [10]. In the recent past, the academic institutions with a larger number of students, reduced resources and increasing use of new information and communication technologies have led to the increased use of multi-choice questions as a method of assessments in higher education courses [9]. There are interactive e-assessments could be done for any course instead of the multi-choice test [10]. Due to its novelty and additional requirements like software, the learning time of it, the training cost and the presence of experts to get the technical assistance and solve the errors while the formation of a question, the interactive e-assessment is used in very few institutions. Even the Free and Open Source Software (FOSS) used, it also requires expert assistance to learn and handle it. Nuha Alruwais et. al. discussed the advantages and challenges of using e-assessment in the view of student, teacher, institution and educational aims. Moreover, they concluded that the main advantages of using e-assessment are: providing direct and immediate feedback for the students after each attempt, improving the students' subject knowledge by encouraging high-order thinking which is primary purpose of education, reducing the time and effort of the teacher, decreasing the cost of scheduling and conducting for the institution [4, 8].

Most of the academic institutions are conducting or planning to conduct online placement tests, in particular, the English placement test and the MPT, for their freshmen. Due to the advantages of using multi-choice questions, many institutions adopted multi-choice questions for their MPT rather than English placement test. Though commercial and FOSS Learning Management System (LMS) both available with their own merits and demerits for conducting a MPT, many researchers have recommended FOSS-LMS for MPT. Moodle is a free online learning management system, providing educators around the world with an open-source solution for e-learning. Sofia et. al has stated in [11] that LMS Modular Object-Oriented Dynamic Learning Environment (Moodle), a free and open-source platform based on socio-constructivist perspectives developed by Dougiamas in 1999, allows users to incorporate various resources and functionalities in a modular structure. In addition to that Moodle seen as a Course Management System, it can be used to manage the students' path, to monitor their performance, to create and distribute content, to organize e-activities, to evaluate, as well as to provide tools for communication, collaboration and interaction between the peers involved in the educational process. As per Moodle statistics in [12], the Sultanate of Oman has 101 registered sites on Moodle, including all the seven CoTs located in Muscat, Nizwa, Ibra, Salalah, Al-Musanna, Shinas, and Ibri. NCT was given the responsibility by the Math Specialization committee for creating the common online MPT for all CoTs. As all CoTs have been using Moodle as the platform for e-Learning and e-Assessments, NCT strongly recommended to conduct the MPT in Moodle by a creating quiz with Calculated multi-choice question type [15] which are like multi-choice questions with the additional property that the elements to select can include formula results from numeric values that are selected randomly from a set when the quiz is taken, instead of adopting a new software for MPT.

3. ADVANTAGES OF MPT WITH CALCULATED MULTI-CHOICE QUESTIONS IN MOODLE

In addition to the immediate automatic marking scheme, the following are the advantages of LMS Moodle for conducting MPT by using calculated multi-choice questions. Moodle allows bilingual (English and Arabic) text in question stem as well as answer options. This helps the students who studied mathematics courses up to K12 in Arabic to answer the questions without the language barrier.

Due to the use of calculated multi-choice questions in the MPT, each student appearing for the MPT gets the same question with different numerals, because Moodle generates hundred data set for each question, which results in almost every pair of neighboring students getting distinct questions at the same time. It completely reduces the chance of copying the answers from their neighbors.

All the features of a test provided in paper, like appearance, is there in the Moodle as well. Like a paper-based test, students can navigate between the questions as per their wish, review their answers, change the selected option before final submission of the MPT- online Moodle quiz activity. Besides, students can increase the font size according to their comfort, if they have any visibility problem and the uniformity in the marking happens to all the students irrespective of the teachers/examiner. After completing the MPT in Moodle, students can view their results immediately. So, comparatively, the MPT through online quiz activity in Moodle is better than the MPT in paper.

Moodle allows the restrictions to access online quiz activities like: password protected, restricted in particular network, section-wise and student-wise restriction, browser, time and number of attempts by the student. The multimedia and interactive worksheet of GeoGebra can also be included in questions to give the lively interactive nature for the MPT. The overall data analysis for measuring the student's performance, the level of understanding and the ability problem solving can be easily done by using the information about the attempt of each student. The strengths and weaknesses of the whole freshmen can also be identified by interpreting the available data by using statistical tools.

Collectively, if students understand the advantages of Moodle online activities, then the probability of malpractice in MPT is very low and time taken by the students for their studies relatively high according to their interest. The total process of MPT can be easily monitored at any time by the MPT-coordinator who is acting as an administrator. Even there are more advantages of designing and conducting MPT in Moodle, few limitations are there in the calculated multi-choice question in Moodle. Even there are no limitations to include mathematical symbols and texts by LaTeX commands; they were not working in the answer options. This limitation could be overcome by doing the following changes in Moodle by server admin [16].

Site Admin→Plugins→Filters→Manage filters→[disableTeX notation]

1. *Site Admin→Appearance→Additional HTML→[add the following to the "Within HEAD" field]*
   <script type="text/javascript" src="http://cdn.mathjax.org/mathjax/latest/MathJax.js?config=TeX-AMS-MML_HTMLorMML"> </script>
2. *Consider installing and pointing Additional HTML HEAD to your own copy of MathJax.*

These changes enable and validate the LaTeX code in answer options of the multi-choice question type.

4. MPT IN NCT

NCT used to conduct the MPT in the paper for the entire freshmen with objective type questions. There were a lot of practical difficulties involved from the creation of the question paper to evaluation of the answer scripts and publishing the results on time. A lot of manpower was involved in the successful completion of the task. The disadvantages of conducting the MPT in the paper included a bulk number of students attending the MPT every time, the same questions for all the students, evaluation of the answer scripts in a limited period. The pass percentage was less than a percentage, which was very negligible compared to the efforts taken in conducting the MPT for more than 600 students. This resulted in searching for new methods for conducting the MPT. Based on the previous experiences of the math section in conducting online assessments for the GFP math courses in Moodle, it was decided to make use of the features of Moodle to conduct the MPT online [14].

As a first step, in the academic year 2015-16, new policies and procedures were created for systematically conducting the MPT way by covering all the course outcomes in Basic Math and giving appropriate weight for all the outcomes. As per the drafted approved policies, the MPT contains forty multi-choice questions for a total of 30 marks with the passing minimum 15 marks which accounts for 50% of the total. Also, the students who got 24 (80%) or more marks will be considered as high flyers who are eligible to write the exit exam for pure math or applied math depending on their specialization. The forty questions of MPT might be answered in the duration 90 minutes. Of these 40 multi-choice questions, 20 were easy questions carrying half marks each and the rest 20 were moderate questions carrying one mark each. All the multi-choice questions where created with one correct answer and four distractors.

As the next step, a new course named MPT was created in Moodle of NCT, named e-Learning Portal of NCT. Calculated multi-choice questions were created in the question bank of this course based on the policies of MPT with one correct answer and four distractors, and these questions were reviewed to check its compatibility with the policies of MPT. Then a Moodle quiz activity was created as MPT with all possible protections on the Moodle page of this course in scheduled time of MPT and questions which have already been created and reviewed were added to this quiz activity from the question bank.

5. CHERECTERISTICS OF MPT IN NCT

MPT is designed as a test of skill as well as the speed of the participants. Ample time is given for most students to answer all MCQs from basic math course. The expectation is that less prepared students will answer fewer questions correctly than the students who are well prepared. The test is scored as the number of correct answers, with no penalty for guessing. To support the preparation of the students for MPT, the study materials which cover the outcome of basic math and mock MPT are available in NCT e-learning portal. The students are guided in the orientation program which is usually conducted three to five days before the schedule of MPT, such a way that they could be familiar with the real-time MPT environment in Moodle. Also, they are all trained to handle the computer, login to Moodle courses and its activities on computer as well as mobile in the two hours' session which was carried out by the staff members of Information Technology department. After these sessions, the students feel more comfortable in the real-time online MPT in e-Learning Portal of NCT.

The MPT committee decided to test the knowledge and skill of the students in all the outcomes of the Basic Math course. The question will not contain a direct formula or definition. Questions covering each of the fifteen outcomes are selected to cover all the topics of basic Math course. Since the sole purpose of conducting MPT is to filter the students who are eligible to skip the basic math course, all the outcomes of basic math course are given equal importance: Each outcome is covered with either two or three questions in MPT. In GFP, the first bridge course for mathematics, basic math is offered for the student in level 2 English or more and the next bridge course pure math or applied math is offered for the student in level 3 English or more. As the maximum grade for MPT was 30, the freshmen who scored 15 or more marks in MPT are eligible to enter directly into pure math / applied math course in Level 3-English. Even the freshmen who failed to enter in Level 2 or more in the English placement test, will still be eligible to enter directly into pure math / applied math course if they scored 15 or more in MPT. Such freshmen, after completing their Level 2 in English, can study pure math / applied math course. The students who are transferred from other institutions to NCT without passing basic math, can also attempt MPT to enter directly into pure math / applied math course if passed.

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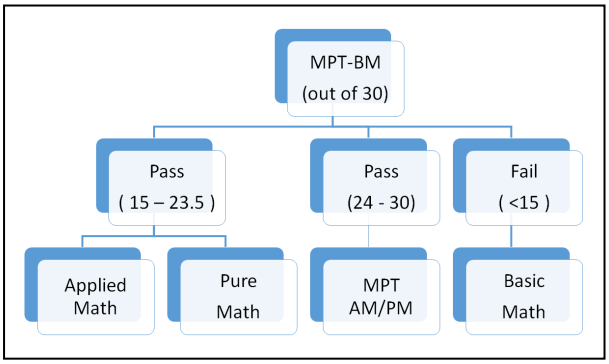

Figure. 1: Grade break up for MPT in AY 2016-2019

Figure 1 shows the clear grade break up for MPT. Since MPT grade doesn't have a particular period of validity, MPT grade is considered as the mark of basic math course. The grade out of 100 is calculated from the grade which they are taken in MPT out of 30 and the same is considered as the mark for the respective student in the course basic math.

6. DISCUSSION

This report describes the experience of a Math section of NCT over the past three years. To the best of our knowledge, this report is the first to address MPT in Moodle on CoTs, Sultanate of Oman. This discussion is based on the analysis of the grade of 3094 student participants of NCT in online MPT. One of the factors that allowed the establishment of online MPT was the use of LMS Moodle which is free and open-source. Even there was few cost involved in its setup, hosting on a web-based server, technical support and maintenance, NCT admin was accepted to support the additional online activities for the bulk students in a single day. Due to mixed opinions of math staff members of NCT about online MPT in Moodle and limited math staff members could be involved in MPT committee to process the creation of online quiz activity in Moodle, only the feedback of students was assessed through a user survey in Moodle itself about e-assessment on MPT.

In total, 619 students who already attempted MPT have answered the survey questions, the satisfaction and comfortability level of students were measured as 78.2%. After analyses the survey data, the improvement plans were implemented like sharing the video link of accessing the MPT course and activities before real-time MPT, allowed usage of calculator, distributing papers for rough work, etc. To overcome the reduced involvement of teaching staff, a series of workshops on Moodle usage for e-assessment was conducted by the in-house experts. All the eighteen math staff members of NCT attempted each MPT and the average time taken by the math staff was 26.07 minutes. So it was accepted by the MPT committee to give the same set of questions which cover all the outcomes of the basic math course with the duration of 90 minutes for freshmen.

Time Taken in Minutes	# of Pass	# of Fail	Total
0-15	0	16	16
15-30	3	67	70
30-45	4	205	209
45-60	34	432	466
60-75	104	827	931
75-90	287	1115	1402
Total	432	2662	3094

Table 1. Relation Between Time Taken and Result of MPT

The average time taken by the freshmen for online MPT in Moodle is 67.97 minutes. By comparing these numerals of Table 1, MPT as a summative assessment, most of them passed students around 90.5% took more than 60 minutes and 1.6% of the passed students took less than 45 minutes to answer the MPT.

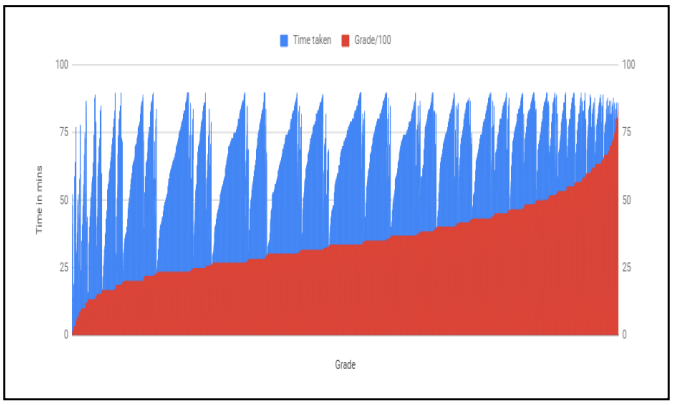

Figure 3: Grade vs Time Taken for MPT

The average time taken to answer the MPT is 67.97 minutes. In total, 72.95% of students attempted more than 60 minutes to answer MPT which clearly shows that the majority of the students are very seriously attempted the MPT. So far, no student scored more than 26, only 6 students scored in between 24 to 26 out of 30 marks.

The overall average grade 34.82% shows the basic math course is required to teach as a bridge course for the GFP students, even the outcomes all covered already in their schooling in Arabic. The passed student average grade is 57.32 which shows that the passed MPT student also required quick revision on Basic math course before studying their next math course.

It is observed from Fig. 3 that the students who guess their answer options with the minimum time taken failed to succeed. Besides, the calculated correlation coefficient is 0.4082 between time taken and grade. This moderate positive correlation signifies that as the time is taken increases for the attempt of MPT, the grade also increases and vice versa.

AY	#	SEMESTER	MPT		TOTAL	Passed students in English level			
			Pass	Fail	STUDENTS	1	2	3	4
2016-2017	MPT0001	Semester 1	34	640	674	9	15	6	1
	MPT0002	Semester 2	41	523	564	13	21	5	2
2017-2018	MPT0003	Semester 1	140	458	598	29	70	28	13
	MPT0004	Semester 2	98	547	645	16	52	26	4
2018-2019	MPT0005	Semester 1	119	494	613	27	55	30	7
		Total	432	2662	3094				

Table 2. Distribution of Passed Student in Different English Level Groups

Table 2 shows the result figures of the past five attempts of online MPT. The last four columns show the distribution of the passed students of respective students' English levels which was decided based on the English placement test. As per the policy of MPT, these different level students who are considered pass in basic math course falls into two categories. The first category is that the freshmen who are in English level 1 and 2 not required to study basic math course and not able to study pure/applied math also. The second category is that the freshmen who are entered directly English level 3 or more not required to study basic math course but should study pure/applied math on the semester. It is required to do the grouping for math in addition to the English grouping according to the MPT result. The following different categorizing is mandatory before grouping the student. This categorization is used to group the GFP students according to their English level as well as a respective math course.

1. Students who passed

- Level 1 and passed Basic Math (in MPT)
- Level 2 and failed Basic Math
- Level 3 and failed Pure Math
- Level 3 also passed Basic Math
- Level 3 and failed Basic Math
- Level 4 and failed Basic Math
- Level 4 and failed Pure Math
- Level 4 and failed Applied Math

2. Students who failed
   - Level 2 and passed Basic Math
   - Level 3 but failed Basic Math
   - Level 3 but passed Basic Math
   - Level 3 but passed Pure Math
   - Level 3 but passed Applied Math
   - Level 4 also passed Basic Math
   - Level 4 also failed Pure Math
   - Level 4 also failed Applied Math

By considering the two different categories of students, the GFP grouping which is common for English and Math is done by the registration department. The students who transferred from other CoTs are also falling in any one these categories.

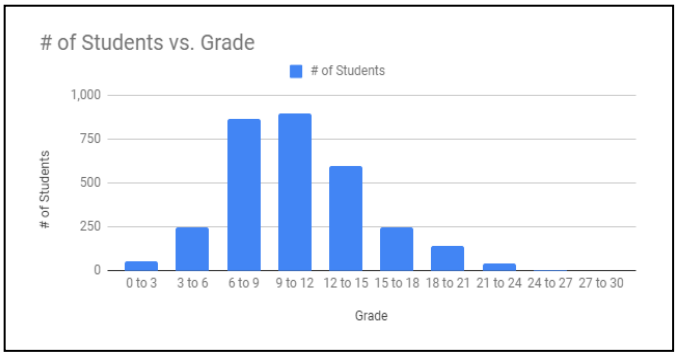

Figure. 4: # of Student vs Grade

In Figure. 4, the distribution of grade of MPT moderately right-skewed with a measure of skewness 0.56. The mock MPT attempted by average 223.6 students per MPT. Also, the top 10% of the students in MPT attempted the Mock MPTs an average of 1.89 times as compared to an average of 0.16 times by the bottom 10%. So, the expectation that less prepared students will answer fewer questions correctly than the students who are well prepared is met with the existing set of questions of MPT.

Outcome #	**Question #**	**Max Grade**	**Avg Grade - Question**	**% of Grade - Outcome**
1. Identify and use the arithmetic properties of subsets of integers, rational, irrational and real numbers including the closure properties for the four basic arithmetic operations where applicable.	Q1	0.50	0.23	28.45
	Q2	1.00	0.24	
	Q3	1.00	0.25	
2. Identify and use the arithmetic properties of subsets of integers, rational, irrational and real numbers including the closure properties for the four basic arithmetic operations where	Q4	1.00	0.52	37.81
	Q5	1.00	0.24	
3. Perform operations on polynomials and manipulate numerical and polynomial expressions and solve first degree equations.	Q6	0.50	0.34	41.68
	Q7	1.00	0.36	
	Q8	1.00	0.34	
4. Simplify rational expressions and rationalize numerators and denominators.	Q9	0.50	0.31	55.59
	Q10	0.50	0.25	

5. Demonstrate an understanding of the exponent laws, and apply them to simplify expression and manipulate fractions, ratios, decimals and percentages.	Q11	1.00	0.27	29.44
	Q12	1.00	0.29	
	Q13	1.00	0.32	
6. Translate word problems into mathematical one and model simple real life problems with equations and inequalities.	Q14	1.00	0.26	29.60
	Q15	1.00	0.34	
7. Solve linear equations, equations involving radicals, fractional expressions and inequalities.	Q16	0.50	0.24	34.15
	Q17	1.00	0.26	
	Q18	0.50	0.18	
8. Use the quadratic formula to find roots of a second degree polynomial.	Q19	0.50	0.15	27.75
	Q20	0.50	0.13	
	Q21	1.00	0.28	
9. Use coordinate plane to solve algebraic and geometric problems and understand geometric concepts such as equation of circle, perpendicular, parallel and tangent lines.	Q22	0.50	0.21	30.98
	Q23	1.00	0.26	
10. Use the three types of symmetry of an equation to sketch its graph.	Q24	0.50	0.24	37.06
	Q25	0.50	0.20	
	Q26	1.00	0.30	
11. Know the relationship between degree and radian measures of an angle and find the length of a circular arc and area of sector.	Q27	1.00	0.29	37.88
	Q28	0.50	0.19	
	Q29	0.50	0.28	
12. Understand trigonometric and circular functions and use the fundamental trigonometric identities in various problems.	Q30	0.50	0.16	30.83
	Q31	1.00	0.29	
	Q32	1.00	0.32	
13. Solve the right triangle using angles of elevation and depression.	Q33	0.50	0.18	36.42
	Q34	0.50	0.19	
	Q35	0.50	0.18	
14. Apply knowledge of basic algebra and trigonometry in real life problems.	Q36	0.50	0.09	31.62
	Q37	1.00	0.38	
15. Understand measurement and conversion from one unit to another.	Q38	1.00	0.24	28.17
	Q39	0.50	0.16	
	Q40	0.50	0.17	

Table 3. Mapping Between the Outcomes of Basic Math Course and MPT Questions

Table 3 shows the strengths and weaknesses of the students in the respective questions as well as the outcomes through of its percentage of grade in an outcome. This table helps to frame the basic course delivery plan in which the required number of hours given according to the percentage of grade taken on the outcome.

7. CONCLUSION

This article presents a new and effective way of conducting the common MPT for the CoTs in the Sultanate of Oman. Conducting the MPT in Moodle using calculated multi-choice questions has a major advantage that the students will get one hundred sets of different calculated MCQs has a major advantage that up to one hundred non-identical copies can be created for each question using the wildcards appearing in the question. It discusses advantages, also a few disadvantages, of using LMS Moodle for online MPT. The complete analysis is also given for the past five attempts of online MPT in the eLearning Portal of NCT from 2016 to 2019. The analysis concludes that the online MPT is the required tool to filter the students who are eligible to skip basic math course. Finally, it is strongly recommended to have online quiz activity in LMS, in particular, Moodle, with calculated multi-choice questions with options for conducting online MPT in all CoTs in Sultanate of Oman. At present, this practice is adopted in all campuses of UTAS, Oman.

REFERENCES

[1] Annie W.Y. Ng and Alan H.S. Chan, "Different methods of multiple-choice test: implications and design for further research," Proceedings of the International MultiConference of Engineers and Computer Scientists (IMECS), Vol II, March 18 - 20, 2009, Hong Kong.

[2] Maha M.A. El Tantawi, Maha M. Abdelsalam, Ahmed M. Mourady and Ismail M.B. Elrifae, "e-Assessment in a Limited-Resources Dental School Using an Open-Source Learning Management System," Journal of Dental Education, May 2015, 79 (5), 571-583.

[3] P. Davies, "There's no confidence in multiple-choice testing," Proceedings of 6th CAA Conference, Loughborough: Loughborough University, 2002, 119-130.

[4] Nuha Alruwais, Gary Wills, and Mike Wald, "Advantages and Challenges of Using e-Assessment," International Journal of Information and Education Technology, January 2018, 8 (1).

[5] Haladyna, T. M., Downing, S. M., and Rodriguez, M. C., A review of multiple-choice item-writing guidelines for classroom assessment. Applied Measurement in Education, 2002, 15, 309-344.

[6] Pachai, M. V., DiBattista, D., & Kim, J. A., A systematic assessment of 'none of the above' on multi-choice tests in a first year psychology classroom. The Canadian Journal for the Scholarship of Teaching and Learning, 2015, 6(2).

[7] Odegard, T. N., & Koen, J. D., "None of the above" as a correct and incorrect alternative on a multiple-choice test: Implications for the testing effect. Memory, 2007, 15, 873-885.

[8] Roediger, H. L. III, & Marsh, E. J., The positive and negative consequences of multiple- choice testing. Journal of Experimental Psychology: Learning, Memory, and Cognition, 2005, 31, 1155-1159.

[9] David Nicol, "E-assessment by design: using multiple-choice tests to good effect," Journal of Further and Higher Education, February 2007, 31 (1), 53-64.

[10] Semire Dikli, "Assessment at a distance: Traditional vs. Alternative Assessments," The Turkish Online Journal of Educational Technology – TOJET, July 2003, 2 (3), Article 2.

[11] Sofia B. Dias, José A. Diniz, Leontios J., "Towards an Intelligent Learning Management System Under Blended Learning, 2014, 42-43, Springer International Publishing, Switzerland.

[12] https://moodle.net/sites/index.php?country=OM

[13] Rajani Ranganath, Chitra Rajalaksmi, Miriam A Simon, "Medical Students' Perceptions of E-assessment: Multi-choice Questions used as a Tool of Assessment for Preclinical Years", Journal of Medical Education, 2017, 16(1), 35-43.

[14] Ranjith Kumar K R, Naseer Ahmed A, "Using functions and cyclic group in calculated questions Moodle 3.2," International Journal of Data Mining Techniques and Applications, 2017, 6(1), 39-42.

[15] https://docs.moodle.org/35/en/Multiple_Choice_question_type#Calculated_multichoice_question_type

[16] https://moodle.org/mod/forum/discuss.php?d=193975

BIOGRAPHIES OF AUTHORS

Naseer Ahmed received the bachelor degree in Mathematics from Madurai Kamaraj University, Madurai, in 2004 and the Master degree in from Madurai Kamaraj University, Madurai, in 2006 and the Doctoral in Mathematics from Bharathidasan University, Tiruchirappalli, in 2018. He is currently working as a Lecturer at University of Technology and Applied Sciences, Nizwa, Sultanate of Oman. His research interest includes Domination and Coloring in Graphs, Uncertainty: Fuzzy, Intuitionistic Fuzzy, Vague Graph, Blended Learning through eAssessment. He has published articles in the National and International Indexed journals. He can be contacted at email: naseer.shukoor@nct.edu.om.

Khalifa AlShaqsi received Ph.D. Mathematics from the National University of Malaysia in 2009,or M.S.c in Mathematics from the National University of Malaysia in 2006, and B.Ed. in Mathematics from College of Education- Oman in 1999. He is working as an acting HoS, Associate Professor Mathematical and Physical Sciences - Mathematics Section College of Arts and Sciences, University of Nizwa, Nizwa, Sultanate of Oman. His research interests are Geometric Function Theory and its application, Complex Analysis, Real Analysis. Published many papers in various national, international conferences and Journals. Has authored book and chapters in Mathematics discipline. He can be contacted at email: khalifa.alshaqsi@unizwa.edu.om