HOW DOES INTEGRATING TECHNOLOGIES STIMULATE AND ACTIVATE LEARNERS IN LARGE UNDERGRADUATE MATHEMATIC CLASSES?

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Abstract:
Teaching is changing and, in many ways, becoming a more difficult job because of increasingly numerous contradictory expectations. Math teachers are expected to teach students to solve complex problems that require necessary knowledge. Moreover, they are expected to meet the needs of all students and move them toward fulfillment of their individual potential even as they are pressured to prepare students for maximum performance on high-stakes assessment tests that are the primary measure of student and university success. These issues have become much more challenging with large number of students in Math classes. The unavoidable success of technology in many fields encourages us to strongly integrate technologies in learning and university class management. A real life example was taken contained a sample of size 200 students from Elementary Algebra course in Foundation Program at Qatar University. We concluded that integrating technologies in Math class can help students by encouraging them and teachers by supporting them a variety of examples.

Keywords:
E-learning, Active learners, Learning Management System

1. INTRODUCTION
The role of technology in higher education has increased in the last 15 years. Some Universities strongly believe that integrating technologies has become one of the top important strategic priorities. (Resta, Laferrière, 2007) The big challenge is how much we successfully implement this in a way that leads to achieve the objectives and makes students more active learners. Educational technologies show high input results when applied in many University subjects. For example, Mathematics is one of the most important subjects in all science and engineering colleges.

In 1989, the organization for Economic Cooperation and Development (OECD) began to investigate how science, mathematics, and technology education were changing of the thirteen countries participating in the study; no country was satisfied with its existing program in science or mathematics education. (Souter, 2001) Many researchers expressed high expectations for the computer and new technologies in improving teaching and learning of mathematics. On the other hand, many teachers still find the traditional teaching way is the most effective and much secure for learning management system.

There are many debates concerning the effects of using and integrating technologies in math classroom. Qatar University is one of some universities which started since 2006 using Blackboard system to integrate technologies in education and teaching classrooms. Today, new and much more effective technologies are activated and taking place very seriously in different subjects. Foundation Program was started
using Blackboard from the beginning and it always shows pioneer results. These results published in many researches and workshops held by Foundation Program instructors.

Math Department in Foundation Program, started use *MyLabsPlus* the online software system since summer 2012. This step was very important to help the department to integrate technologies in math courses and to accommodate the large number of students in every semester. Positive effects were very positively reflected on both teachers and students. Moreover, we still count a lot on implementing all available technology resources to hold on a powerful learning management.

This paper is organized as follows: Section 2 describes the relation between active learning and technologies, section 3 introduces the collaborative learning and technology, the issue of inquiry-based learning with technology presents in section 4, section 5 shows challenging in managing large mathematics groups, section 6 mentions a case-study from Qatar University experiences, disadvantages of integrating technology list in section 7, finally, section 8 presents results and conclusions.

2. ACTIVE LEARNING AND TECHNOLOGY

Active learning requires students to do meaningful learning activities and think about what they are doing. Active learning is generally defined as any instructional method that encourage students in the learning process (Prince, 2004). Form the daily teaching experiences of different students’ ages, we can figure that integrating technology in learning system can fit with the strategies of active learning because of the following reasons:

- Adult learners prefer to be engaged in their learning rather than just listening.
- Adults want to be able to apply new information and skills immediately.
- Many of active learning strategies can be effectively adapted when developing self-study material and courses.

Integrating technology is effective because it can assess participant’s mastery of the material either by observing and providing feedback or by using an online test or quiz.

It is very powerful when there are auto corrections and step-by-step problem solving.

It is very helpful to participate by using blogs, discussion boards and e-mail sharing.

3. COLLABORATIVE LEARNING AND TECHNOLOGY

Collaborative learning can refer to any instructional method in which students work together in small groups toward a common goal. The closed classroom represents a physically outdated teaching model which does not match the inter-connected virtual world we now live in. Students are learning collaboratively through a vast array of informal learning spaces both on and off campus, yet are still crammed into outdated traditional models.

In collaborative learning there are three effective strategies: (Fisher, 2010)

- Develop resources that empower learners by encouraging them to work with every other learner in classrooms.
• Make complex ideas accessible by breaking ideas down and re-present them with lots of same examples.
• Encourage students to share all learners with what they have learned to fill any missed gaps.

Some researchers think that technologies in education standoff collaborative learning, they support their ideas by the fact that involving in technologies makes students much more individual learners.

Technologies can help as an engine between the last three collaborative learning strategies. Moreover, when a student masters specific computer skill there is pride and enjoyment derived from helping other peer students. (Motamedi)

4. INQUIRY-BASED LEARNING AND TECHNOLOGY

We can generally understand the inquiry based-Learning as a type of learning providing the skills which a student needs to solve problems and make good decisions. (Jarett, 1979), (Furtak et.al., 2012)

Inquiry-based approach is one that provides and supports learning environments where learners observe events, ask questions, construct explanations, test those explanations, use critical and logical thinking, generalize observed patterns, and consider alternative explanations. (Dogan-Dunlap, 2003)

The inquiry cycle matches with the integration of technology in classrooms, especially for math classes. Figure (1)

Most educational scientists like Denise Jarret, Kitt Peixotto and others associated the inquiry learning with teaching science and math. (Jarett, 1979) We think the most important positive point in inquiry-based learning is that it can work with different age groups.

![Inquiry-Based Learning Cycle](image)

In Qatar University, Foundation Program encourages students to use offered technology system, it is evaluable for all students 24 hours 7dayes a week. The strategy of this is to know and know more to build the knowledge base learning cycle to become a mastery.
The system we are using is working parallel with different kinds of assessments, study plans and tests. Each of that has a specific role and all work together to master students in their courses (figure 2).

Figure 2 (Knowledge Base Growing)

5. CHALLENGES IN MANAGING LARGE UNDERGRADUATE MATH CLASSES:

An instructor teaching a first-year university course has seemingly contradictory tasks to balance. On the one hand, the instructor has a responsibility to teach foundational material in an aim to prepare students for future courses; on the other hand, the instructor plays the role in welcoming, encouraging, supporting students during the most important transition in their lives. (Jungic, V. et al., 2006) There is no unique solution to the problem of managing a large class. One specific benefits of managing a large class is to use technology very effectively. After we used new technologies for large number of groups in Math Foundation class, we can say that this action solved many problems:

- Flowing up all students, especially students at risk.
- Balancing students’ levels in the course.
- Directing and continuing to assist students.
- Using many different and creative ways to solve problems.
- Encouraging students to do homework and different assessments on time.

From our experience, technologies can also be very helpful to cover course syllabus on time. This inference was very clear when we applied a short term-semester last academic year. The short academic semester is for only 8 weeks with three lecture peer week. It was big challenge to cover the course syllabus every part of the semester, if the online study plan and homework not effectively done on the right way.

6. CASE-STUDY: INTEGRATING TECHNOLOGY IN ELEMENTARY ALGEBRA COURSE IN QATAR UNIVERSITY, FOUNDATION PROGRAM:

Elementary Algebra is a course for foundation students in Qatar University. About
two thousands students in every academic year have to take this course. This course is one of requirements courses for science and engineer students. We always seek for the best way to give this course for large number of basic students with high quality teaching. Encourage all students, especially weak students is much recommended.

Table 1 shows a summary statistics of a sample contains two hundred students in Elementary Algebra course.

We can figure from the table that the number of students who got less than 60% was decreased in both quiz 2 and mid-term exam. The table also shows that students' score average was also increased through quiz 2 and mid-term exam.

<table>
<thead>
<tr>
<th></th>
<th>No. of STD &lt; 60%</th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz1</td>
<td>120</td>
<td>42%</td>
<td>6.4%</td>
<td>60%</td>
</tr>
<tr>
<td>Quiz2</td>
<td>96</td>
<td>56.2%</td>
<td>5%</td>
<td>55%</td>
</tr>
<tr>
<td>Mid-Term</td>
<td>67</td>
<td>64.4%</td>
<td>17.5%</td>
<td>85.8%</td>
</tr>
</tbody>
</table>

Table 1: Students’ Statistics for Quiz1, Quiz2 and Mid-Term

In Table 2 we compared and flowed up students that have got less than 60% in quiz 1, the statistics shows that 24 students out of 120 students which mean about 20% of students that not passed in quiz 1 have passed in quiz 2.

At the same time, more than 50% of weak students had the chance to pass in mid-term exam when they involved through MathLabsPlus tools. MathLabsPlus system procedure encourage students to do hard work to reach the required score by doing more exercises in study plan, homework and other tools, that gave students enough knowledge base growing to encourage and raise students’ level in the course.

<table>
<thead>
<tr>
<th></th>
<th>Students’ Number</th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiz1 &lt;60</td>
<td>120</td>
<td>42%</td>
<td>6.4%</td>
<td>60%</td>
</tr>
<tr>
<td>And Quiz2&gt;60</td>
<td>23</td>
<td>75.2%</td>
<td>65%</td>
<td>100%</td>
</tr>
<tr>
<td>And Quiz2&lt;60</td>
<td>83</td>
<td>37%</td>
<td>5%</td>
<td>55%</td>
</tr>
<tr>
<td>Mid-Term&gt;60</td>
<td>67</td>
<td>64.4%</td>
<td>17.5%</td>
<td>85.8%</td>
</tr>
</tbody>
</table>

Table 2: Students’ comparison in Quiz1, Quiz2 and Mid-Term
7. INTEGRATING TECHNOLOGY DISADVANTAGES:

Technology is playing the engine role in our daily life, many educational experts insist to use technology into schools subjects, classrooms and high education (Rana, 2008). While others still don’t fully trust with technology, especially for some critical subjects for example mathematics.

After long time using technology in many courses, we can general conclude the following disadvantages:

- Using technologies needs more labs to activate the system.
- Some software and hardware are very expensive.
- Integrating technologies in learning system needs full qualified stuff.
- Incomputable issue: When the organization has much different educational software.
- Tiredness: Some students use computers for long hours in a day.
- Various degrees of comfort with technology for both teachers and students.
- Using technologies, especially in math classes, for long time may lose the direction of how students think. In some cases, we are not sure enough if all students really have understood the class objectives.
- Some teachers involve tailoring teaching class in a way that fits the technology system.
- Time managements and cheating: Not all students have enough skills to manage their times in quizzes and exams.

8. CONCLUSIONS

We can conclude that integrating technologies in Math class can help both students and teachers. On first hand, it is encouraging students to build their Knowledge learning base system, and on the other hand, technologies can support teacher when this technology has a verity of examples and step by step solving problems. It can play the tutorial teacher role, especially for beginners and for students need more help and support in math subject. The challenges now are how much can we reduce the disadvantages of using technologies in math classrooms to meet standard higher educational visions.

The promising results are much recommended; the future plan in Foundation Program is to continue integrating technology in different Math and English courses as well. Today; many departments in Qatar University are planning seriously to follow up with same procedure.

9. REFERENCES


Motamedi, V. Integration of technology in our classrooms: A divisive issue.