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Reflections on Using a Digital Collaborative Classroom to Teach Mathematics to Adults

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Introduction

When I first saw one of the new "collaboration classrooms" in our university's new building two years ago, I immediately knew that I wanted to try using them. I did not realize then what an impact that would have on how I teach and even what I teach. Could these types of rooms be the future of mathematics education, particularly for adult learners? This presentation includes benefits and lessons learned and cautions for future use.

Method

First, here is a description of the rooms. They are designed for collaboration among students which is facilitated through the use of digital technology. The rooms have a number of "pods" around the outside of the room that each seat up to six students. Each pod has tables and chairs, a large white board, and a monitor. Students can plug in a laptop or mobile phone to their monitor (or, as is the case with one of the rooms, connect wirelessly through a mobile phone app). There is no front of the room but there is an instructor station in one corner through which PowerPoints or websites can be broadcast to all of the students' monitors. It is also possible to broadcast one pod's screen display to the other pods. The rooms have wireless internet access

The course I taught was Quantitative Reasoning which is a required mathematics course for non-STEM students, all of whom are adults with most in their early to mid twenties with a typical age range from 18 to 45 years old.

Findings

I have been greatly encouraged by what I have seen. Student reviews were very positive about the rooms and how working with classmates helped them considerably. I found myself thinking differently about my role as a teacher and the students' role as learners.

Here are positive aspects of the room design:

1. To take advantage of the room, I had to approach teaching with the following in mind: lecturing needs to be minimized; class time should center around group projects; students would be asked to help each other learn the course objectives; students would be encouraged to develop and share methods of solutions; and real, authentic problems should be used.

2. For students to take advantage of the room, they need to: be willing ask for help when they have questions and provide help when they see that someone needs

help; have a device to access the internet (although not required); and engage in the learning activities (I put the responsibility for their learning on them).

3. The configuration of furniture in the room which allows students to see and communicate with each other helps to establish a learning community in the classroom.

4. Each pod of students can share their work with other pods through the whiteboards or their screen displays. It is easy as a teacher to stand in the center and point out different assumptions. approaches, etc. of the pods.

5. Because virtually all students have a smart phone, tablet, or laptop with them; I can have them search for the information themselves, as they would on their own in real life, and not provide them everything they need. This has pushed me to provide authentic problems. I also teach internet search techniques.

6. Traditional mathematics instruction in the United States seems to involve a lot of doing problems by hand. But in this non-traditional room, I stress the value of using mobile apps and various calculators and how to interpret the results they see.

7. With no front of the room, I had to put my content on PowerPoint slides. These are posted in the learning management system so that students have access to them. Some students use their tablets to take notes on the slides. Busy adult learners who occasionally miss class can still view the slides.

8. Younger students whose high school mathematics is more recent frequently help older students but in some authentic problems the older students have the advantage due to their life experience and can help the younger students (for example, mortgages).

9. Productive persistence by students in problem solving is seen as an important quality in learning. Some students persist longer in this classroom because they have the support of their pod-mates.

Here are some cautions:

- Some students have learned to survive math classes by taking a lot of notes and memorizing steps. This collaborative approach makes some students uncomfortable, at least at first.

- The rooms have their share of technical problems so rapid support is needed.

- While more and more learners have access to the internet, there can still be a digital divide.

- Students with anxiety issues may have trouble in a room and teaching philosophy that requires this level of collaboration.

E-learning – different ways of learning numeracy

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Introduction

Skills Norway is the Directorate for Lifelong Learning and works to ensure that adults have access to skills training. In the past year the focus area has been basic skills through e-learning. The basic skills include literacy (including how to read graphs and charts), digital skills (including how to use online banking and prices) and finally numeracy. In addition, Skills Norway was part of the EU Erasmus project "Managing Money" which resulted in a website and app focusing on adults and financial literacy. All these resources are available online, free of charge and can be used as a part of a class or on its own.

Method

The poster presentation will present the e-learning sites and managing money app. The poster itself will include QR codes to the different resources, this way the public can easily access the resources while looking at the poster. Some of the sites are available in Norwegian only, however, the Swedes should be able to understand most of it, while the others are in English. It will be clearly marked which language they are available in and during the "poster session" we will be available to discuss and show examples of all resources. The poster will include "screenshots" that have been translated into English.

References

Norwegian site (the original website)

www.kompetansenorge.no

English site

www.skillsnorway.no

All basic skills:

https://www.kompetansenorge.no/kompetanseporten/

Financial literacy:

http://managing-money.eu/

https://www.kompetansenorge.no/personligokonomi

“Math-Art Walks” – The Art of Looking at Public Art and Architecture with Mathematical Eyes

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Introduction

In 2015, I participated in the ALM22 Conference in Washington D.C. having the theme” Opening Our Math Eyes To See Math In Everything We Do”. All the inspiring keynote speeches and presentations I got to take part in opened my “math-eyes” as well. Back in Sweden, I started to work out a project proposal, The Art of looking at public art and architecture with mathematical eyes. I was granted a scholarship from Gudrun Malmérs Foundation and a teacher colleague, Bengt Eklund, joined the project that started in 2018.

The project aims to encourage students to see, discover and learn math through art and architecture while learning about the culture and history of their home town. In practice, this is done by “Math-Art walks” with the support of a study compendium that I developed based on the Swedish mathematics curricula (Skolverket, 2012, rev.2017), ZalayaBáez´s (2004) classification of mathematical sculpture, and art history. The relationship between art, architecture and mathematics is expressed in the aims of the mathematics curricula of adult education, compulsory school, and upper secondary school. For example, teaching mathematics in compulsory school should aim at:

> helping the pupils to develop knowledge of mathematics and its use in everyday life and in different subject areas. Teaching should help pupils to develop their interest in mathematics and confidence in their own ability to use it in different contexts. It should also provide pupils with the opportunity to experience aesthetic values in mathematical patterns, forms and relationships. (Skolverket, 2012, rev. 2017).

The upper secondary curriculum in mathematics describe that:

> Teaching should cover a variety of working forms and methods of working, where investigative activities form a part. Where appropriate, teaching should take place in environments that are relevant and closely related to praxis. Teaching should give students the opportunity to communicate using different forms of expression. In addition, it should provide students with challenges, as well as experience in the logic, generalisability, creative qualities and multifaceted nature of mathematics. teaching should provide students with challenges, as well as experience in the logic, generalisability, creative qualities and multifaceted nature of mathematics. (Skolverket, 2012).

My intention with the project is to visualize how integrating local art and culture in formal math education may open, not only “Math Eyes”, but “Math-Art-Culture Eyes”.

Method

As my practice is in the city of Lund, I have chosen to focus on public art and sculptures found here. All in all, the project includes 76 sculptures and buildings. To create a structure for the Math-Art Walks, the city has been divided into 20 geographical areas. For each sculpture and building, we have compiled general information about the object and tasks that, as a whole, cover many of the knowledge requirements that the students encounter in their courses. Engaging in a Math-Art Walk requires from an hour up to a day depending on how many objects are included in the walk. I have developed a compendium to be used during the walk comprising a short description of art movements, ZalayBáez´s classification of mathematical sculptures, a set of tasks associated to each sculpture and building, and a response template.

Overall, the first and last task for each sculpture and building are identical. The first task is divided into smaller exercises. In the first, the students have to mention the name of the sculpture or building, who made it, when it was made, if it is site-specific, and what they think the artist or architect wanted to express. For the sculptures, the students also have to describe the art work with words, marking those they find mathematical. They are encouraged to identify the art movement (ism) and to find the mathematics in the object by using ZalayaBáez´s classification. The last task is to formulate a mathematical exercise involving the sculpture or building. In between the first and last task, there are specific tasks with different mathematical content.

Invitation to a discussion

I would be very grateful for comments that can develop and improve the project as well as your thoughts about if you could bring the concept of the project to your workplace.

References

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