INNODOCT 2021
Valencia, October 27th -November 1st 2021
DOI: http://dx.doi.org/10.4995/INN2021.2021.13615

MAtMO
A facebook project about Mathematics´teaching and learning

Ana Sofia António[a]; Sofia Rézio[b]
[a]Universidade Lusófona; CeiED, IPLUSO, email: sof_antonio@hotmail.com
[b]Instituto Universitário Atlântica; ISTAR (ISCTE), email: srezio@uatlantica.pt

Abstract

There is published research that justifies that teaching-learning based on mathematical modeling, through problem based learning methodology, in a real context and that stimulates the use of information and communication technologies [ICT] tools will produce many benefits. For this reason, two mathematics teachers recently created the MAtMO project through an account on a social media. In this digital support, pedagogical experiences that are being carried out from the 1st year to higher education have been disseminated, because it is understood that this approach can and must be transversal. It is a page aimed to students, parents, teachers, researchers and anyone interested in these topics. Till the present moment, the following have been published: (1) a challenge for 6th grade students on calculating the purchase price of a grass mat; (2) short videos, produced by students of the Master in Teaching of the 1st Cycle, within the scope of Mathematics´ Didactics course, in which they present a daily problem and the respective mathematical model that solves it; (3) an interdisciplinary modeling activity, integrated in the Go-Lab platform; (4) an activity on the calculation of areas of two-dimensional objects using integral calculation; (5) the presentation of the book Contos e Contas, consisting of a set of stories written by students and proposals of activities involving mathematical contents. The research interests with this project are: (1) to understand how ICT can contribute to the promotion of learning in mathematical modeling; (2) to understand how publications (and interactions) on a social media contents based on mathematical modeling, promotes students' motivation. Created on March, 14/2021, so far, 2090 people have been reached, there are 2237 interactions with publications, 295 followers and 278 likes on the page.

Keywords: *mathematical modeling, problem based learning, facebook.*

Introduction

Just because we can't find a solution it doesn't mean that there isn't no one. (Andrew Wiles)

We are often confronted with the contempt and fear of students and families for the subject of mathematics. Many believe that success in this curriculum area is only available to smart students. These uncomfortable feelings are likely linked to the classroom environment because as Bolstad (2019) explains: "Teachers experience tension between wanting students to have time to "understand math while ensuring they cover the syllabus for the next test. "(p. 94). This perspective is associate do the emotional development of both teachers and students. Oberie, E.; Gist, A.; Cooray, M. & Pinto, J. (2020) investigated "the link between elementary school teacher burnout and students' perceptions of teacher social–emotional competence" (p. 1741) having found common links among teachers' burnout and the worst evaluations of students, in addition the state of the teaches is perceptible by the students.

On the other hand, different academic investigations have drawn attention to the state of exhaustion of teachers, this situation can result in disinvestment in the profession, or even a feeling of loneliness and helplessness. These concerns are not recent, for instances Galkwood, S. & Brantley, P. (1992) found the paradox: "How can a teacher feel lonely when the classroom is a veritable beehive of activity?" (p. 14). To answer that question, researchers suggested that teachers work together and participate in graduate studies.

For all these reasons, and trying to contribute to the motivation of the teaching class, we decided to build the MAtMO project, creating an account in a social network. MAtMO can be seen as a protective factor in teacher's burnout. As Buono, I.; Fatigante, M. & Fiorilli, C. (2017) refer "several studies addressed the associations between teachers' burnout levels and such dimensions including job satisfaction, self-and collective efficacy, positive attitudes toward their profession" (p. 191). Our project consists of a network of teachers, pupils and parents. It is characterized by defending active learning, promote mathematical modelation and the problem resolution (PBL – problem based learning) favoring the use of digital tools.

The research interests with this project are diverse: understanding how information and communication technologies [ICT] can contribute to the promotion of learning in mathematical modeling and understanding how publications and interactions in social media, mathematical content, based on modeling they promote the motivation of teachers and students for teaching and learning. As Wiles says "Just because we can't find a solution it doesn't mean that there isn't no one.", so MAtMO is our answer not only to the low investment of students in mathematics but also to the burnout state of teachers.

Active learning and problem-based learning

Active learning is used when thinking about activities that a teacher might ask students to do, such as answering questions in the classroom, completing tasks and projects outside the

classroom, carrying out laboratory experiments or any other work different from being passively sitting (Felder, Brent, 2009).

Salih Kalem, Seval Fer (2003) conducted a research to determine the effects of an active learning model on student learning, the teaching model, and the communication process. The results revealed that there was a positive effect created by the active learning environment in these three dimensions. On the other hand, it seems to us that the concept of active learning will enhance significant learning if it is supported by a Problem Based Learning [PBL] methodology.

The PBL methodology allows that problems proposed to be solve, lead learning of students. There is a problem that is proposed so that students need to acquire new knowledge before they can solve it, thus being driven to research, integrate theory and practice, and apply knowledge and skills to develop a sustainable solution to the problem.

Uygun and Terteniz (2014) investigated the effect of PBL on student attitudes, and on their approval or retention, obtaining positive evidence on student approval rates. Another study carried out by Mustaffa et al (2014) sought to analyze the impact of the implementation of PBL and the results highlighted its positive impact, namely in the areas of medicine and mathematics. According to these authors, through PBL methodology, students engage in deep learning to build conceptual knowledge and not just to memorize knowledge. In learning mathematics, the success of this methodology is reflected in different dimensions: creative and critical thinking accompanied by technologies helps them to interpret and innovate in the 21st century.

Active methodologies and digital technologies in Education are increasingly found in the classroom. This type of methodologies consists of strategies that make students the main agents of their learning, aided by technologies. From a survey carried out on a large sample of teachers, the results showed that the active methodology best known by them is the one based on problems, followed by projects. These teachers identified Google for Education, Quizz and Kahoot as the most suitable applications for Education (Bruno Leite, 2021)

Methodology

It is a design methodology.

After creating the Page, we felt the need to organize and classify it according to the following mathematical groups: numbers and operations, algebra, geometry and data organization. So with this organization we can better categorize the posted posts.The target of the exercises, involving teachers and students, is described in table 1.

In order to obtain answers to the research interests initially mentioned, we intend, within eight months of the project's creation (November 2021), to carry out a detailed analysis of

the Page's content and apply two questionnaires to students and teachers, respectively, that somehow got involved in the project.

ATIVIVITY	TEACHERS/PROFESSORS	STUDENTS
GRASS MAT	constructed by a teacher of elementary	solved by elementary students
SHORT VIDEOS	proposed by professor of students of Master Education	constructed by students of Master Education
PHOTOGRAPHS OF PEDAGOGICAL MATERIALS	proposed by professor of students of Master Education	constructed by students of Master Education
BOUNCY BALL	professors of students of Master Education	solved by students of Master Education and of high school
AREAS	professor of higher education	solved by higher education students (1st year of engeneering)
FRACTIONAL CIRCLE MODEL	proposed by a teacher of elementary	all public interested
BOOK CONTOS E CONTAS	written by an elementary teacher students in collaboration with elementary students	

Table 1. Target of the exercises

We will consider two samples, a group of teachers and a group of students, who have participated in the Page with pedagogical materials or in the resolution of some proposed activities, or even that had used for themselves the materials.

Here we presente an example of the survey we plan to apply in order to evaluate the effectiveness of the methodology and the influence of this content on the student progress:

a) Teachers survey
- If you were a user of the Page, what pedagogical resource did you use? How did your students reacted to the application?
- How did you interpret the evolution of learning and students motivation?
- Do you consider that your motivation for teaching was influenced by the use of resources on this page? In what way?
- What importance/impact do you attach to the fact that this page promotes the constitution of a network of teachers, interested in mathematical modelling?

b) Student survey
- If you were a student user, what benefits do you identify in the use you made of the digital content on this page?
- Did you like to carry out a real project? What did you like most and least?
- Suggest a theme.

- If you have been a collaborating student, how do you see your collaboration through the publication and consequent dissemination of your pedagogical resources on this page?

We will use a qualitative and quantitative methodology for data analysis.

MAtMO Project

Recently, two math teachers created the MAtMO project through an account on a social media, a facebook page. This digital support has disseminated pedagogical experiences that are being created and implemented, from the first year of schooling to higher education, as it is understood that this approach can and should be transversal. It is a page for students, parents, teachers, researchers and anyone interested in these topics.

Students of the Master's in Teaching of the 1st cycle have participated with videos, problem solving and riddles. So far, the following have been published:

- GRASS MAT - a challenge for 6th graders in calculating the purchase price of a grass mat;
- SHORT VIDEOS - produced by students of the Master in Teaching of 1st Cycle, in the scope of the Didactics of Mathematics course, in which they present an everyday problem and the respective mathematical model that solves it (figure 1);

Figure 1. Font: Facebook MAtMo

- PHOTOGRAPHS of pedagogical materials created and constructed by students of Educational Maser (figure 2);
- BOUNCY BALL - an interdisciplinary modeling activity, integrated into the Go-Lab platform (figure 3);
- AREAS - an activity of calculating areas of two-dimensional objects using integral calculus;
- the proposal of a FRACTIONAL CIRCLE MODEL that can be built and used by whoever wishes, students or teachers (figure 4);
- the presentation of the BOOK CONTOS E CONTAS, composed of a set of short stories written by students and proposals for activities involving mathematical

contents written by their teacher (figure 5).

Figure 2. Font: Facebook MAtMo

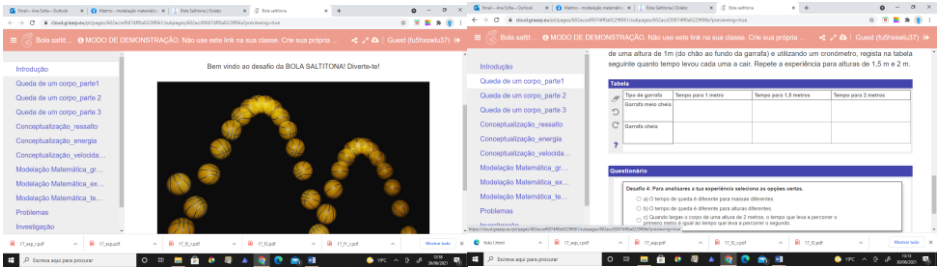

*Figure 3. Font: Facebook MAtMo (*Go-Lab platform*)*

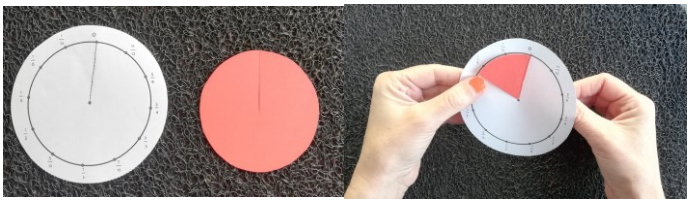

Figure 4. Fractional circle. Font: Facebook MAtMo

Figure 5. the book Contos e Contas. Font: Facebook MAtMo

The sample size of students and teachers that are involved in this Page, till the moment are: 86 elementary students, 35 students of Master of Education, two coordinate professors and two collaborative professors.

Results

Having been created in this digital project, on 03/14/2021, so far, 2,237 people have been reached, of which 1,356 have interacted through publications, 295 are followers and 278 have likes. Given the interest in the subject, we invited the researcher Maria José Araújo to collaborate with this project, through Brazil, and the researcher Arminda Chilembo, through Angola. One of the relevance of this work is that it can be extended to other countries, especially the PALOP. As we can see, the number of interactions with our page increases when a post from Brazil is published, which we justify with two assumptions, the size of the Brazilian population and the videos posted having been filmed in a real context. The comments that come up are mostly encouraging, with no requests for new digital materials or unpleasant comments being recorded.

As this is a project with recent visibility, we cannot make inferences about this situation yet. It is a subject that we would like to explore shortly and based on reference bibliography.

Conclusions

We cannot forget the number of teachers who suffer from burnout, which increases the tendency to isolate themselves, which can lead to future burnout. We firmly believe in the value of teamwork by teachers, sharing responsibilities, providing feedback and building confidence in the pedagogical activities proposed to students. In other works (António, 2004) we argue that many speeches point to a direct correlation between performance and teaching effort. In this scenario, satisfied teachers are synonymous with competent teachers. The participation and promotion of a project of this nature, in our opinion, brings together characteristics that favor teamwork, combat professional isolation and stimulate the emotional well-being of teachers, also as human beings.

Academically, teachers seem to be interested in collaborating with each other, but teamwork and collaboration are not commonly found in schools. As Polega et al. (2019) argue teamwork brings benefits to schools: “Different forms of teacher teamwork are associated with greater impact on students, readiness to teach, teacher commitment, teacher entrepreneurial behavior, and higher student performance in math and reading” (p. 14). So when teachers work together they have a positive impact on each other and this can contribute to the improvement of the school.

This project proposes the training of teams of teachers in Portuguese Language Communities: in Portugal, Brazil and Angola. Although Portuguese schools regularly receive students from Angola and Brazil, Portuguese students and, of course, Portuguese teachers have little

knowledge of the values and customs of these communities. Therefore, it is defined as one of the objectives to provide contact with the daily experiences of different communities, through this page.

We believe that when several actors work together to identify and disseminate effective practices, they can create real conditions for success and guarantee the concept of global citizenship. With this project, we intend to show that PBL and mathematical modeling can be transversal to all levels of schooling, contributing to the dissemination of this methodological practice.

References

António, A. (2004). O outro lado do espelho. Vivencia e Imaginários. Porto: Editora Asa

Bolstad (2019). Teaching for mathematical literacy: School leaders' and teachers' rationales. European Journal of Science and Mathematics Education, 7(3), 93-108.

Buono, I.; Fatigante, M. & Fiorilli, C. (2017). Teachers' Burnout Profile: Risk and Protective Factors. The Open Psychology Journal, 2017, 10, 190-201.

Felder, R., Brent, R. (2009), Acttive learning: An introduction. ASQ Higher Education Brief.2.

Galkwood, S. & Brantley, P. (1992). Teacher isolation. Loneliness in the classroom. In Journal of Adventist education.

Kalem, S., Fer, S. (2003). The Effect of tha Active Learning Model on Students´ Learning, Teaching and Communication. Educational Sciences Theory and practice, 3(2), 433-461.

Leite, B. (2021). Tecnologias digitais e metodologias activas: quais são conhecidas pelos professores e quais são possiveis na educação? Retrieved from https://doi.org/10.37781/vidya.v41i1.3773

Mustaffa et al (2014). Problem-based learning (pbl) in mathematics: a meta analysis. Retrieved from https://core.ac.uk/download/pdf/83531187.pdf

Oberie, E.; Gist, A.; Cooray, M. & Pinto, J. (2020). Do students notice stress in teachers? Associations between classroom teacher burnout and students' perceptions of teacher social–emotional competence. In Psychology in the Schools (1741-1756).

Polega, M; Amorim Neto, RC; Brilowski, R; Baker, K. (2019). Principals and among teachers: an exploratory study. Revista @mbienteeducação. São Paulo: Universidade Cidade de São Paulo, v. 12 (2), 12-32 mai/ago

Uygun, N., Terteniz, N. (2014). Effects os Problem-Based Learning on Students Attitudes, Achievement and Retention of Learning in Math Course. Education and Science, 39(174), 75-90.