Yo Math Is So Arty: Inspiring Creative Learning with Mathematical Internet Memes

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Giulia Bini[1] and Ornella Robutti[2]

[1]Dipartimento di Matematica G. Peano, Università di Torino, Italy; gbini@unito.it
[2]Dipartimento di Matematica G. Peano, Università di Torino, Italy; ornella.robutti@unito.it

Abstract

Memes are digital artefacts iconic of the Web 2.0. They are cultural expressions exemplary of contemporary society, made possible by digital technologies, and they embody the inventive participatory culture that permeates social media interaction. For this reason, we believe they can be fruitfully included in teaching practices aimed at eliciting students' creative contributions, with the intent to expand traditional teaching methods. The purpose of this workshop is to show the didactical potential of memes. This goal will be pursued in four progressive steps: getting participants acquainted with memes, guiding them through the unpacking of the social and mathematical messages carried by a meme, analyzing a series of examples of mathematical memes and their possible uses for teaching, and finally experimenting with a guided hands-on activity focused on the creation of mathematical memes, using online devices.

Introduction: Internet Memes and Mathematics Education

The workshop presented in this paper is intended as an illustration of how mathematical Internet memes can enrich curricular mathematics lessons, connecting school mathematics with young people's language and giving value to their everyday culture. We believe that one of the challenges for XXI century education is to explore teaching practices that foster both learners' creativity and critical thinking abilities. In Schleicher's words, the focus of education must shift from "teaching content and routine cognitive skills" to "enabling people to become lifelong learners [and] to manage complex ways of thinking" [5]. Although almost unexplored at present in education, we think that memes can support this new culture of learning [7], both if used by the teacher as ice breakers or discussion starters, or if students are asked to create their own versions. Memes can offer students a less formal, but still mathematically meaningful, setting to show their knowledge, where they can take advantage of non-standard and non-routine abilities, as their creativity, sharpness, and popular culture expertise.

Nevertheless, integrating memes into the teaching practice requires some effort from the teacher, because these virtual objects are well known and widely shared by young people who have interiorized their logic, but may be uncomfortable to manage for older people. The purpose of this workshop is to get participants acquainted with memes, to guide them through the unpacking of the message carried by a meme, to analyze a series of examples of mathematical memes and their possible uses for teaching, and finally to experiment with a guided hands-on activity focused on the creation of mathematical memes. Attendees are suggested to bring their own on-line devices to carry out this closing activity.

Structure of the Workshop

First part - Getting acquainted with memes*: the opening of the workshop will be dedicated to a brief introduction of the historical development of the concept of meme and Internet meme.*

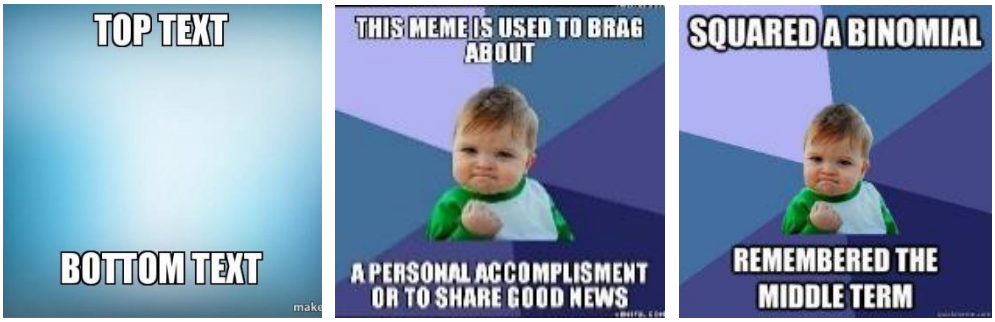
In 1976, long before the advent of the world wide web, evolutionary biologist Richard Dawkins [2] coined the term meme to indicate a unity of human culture that is transmitted from person to person, changing and evolving in the passage, while at the same time maintaining its identity and recognizability, like a tune or a catchphrase. In the following 40 years, this neologism has undergone several different interpretations, from the original idea of the meme as a cultural replicator in an evolutionary process to the

contemporary "social network" use of the term to indicate artefacts typical of the Web 2.0 participatory culture. In today's most diffused sense, the expression *Internet memes* - or just *memes* - is used to designate images or viral videos that are not simply copied and shared on the web, but undergo a remixing in the hands of network users, who personalize and reinterpret them, typically in a humorous way.

While maintaining the common goal of making people laugh, the themes on which netizens create memes have changed and evolved over the years: from simple funny images to tools to make satire and express a political opinion, up to opportunities to show off specific knowledge (for example mathematical) within the numerous specialized groups, spontaneously born on the net. "While seemingly trivial and mundane artefacts", memes "reflect deep social and cultural structures" and "epitomize the very essence of the so-called Web 2.0" [6] where young people live immersed in during their lives outside school (80 million occurrences of the hashtag #memes on Instagram in April 2019). In light of these premises, we can imagine a variety of possible educational uses for memes, funneling their creative and critical thinking potential to review and systematize knowledge, encourage group discussion, or flip the classroom.

Second part - Understanding memes: *as a second step, we want to make sure that we fully grab the creator's message when interacting with a meme, this passage is pivotal to both understand memes created by others and be able to create our own.*

To unpack memes' meaning, we have identified what we call a ***triple-s construct*** of the partial meanings, necessary to grasp the full meaning of a meme [1].



(a) (b) (c)

Figure 1: *Meanings of a meme*

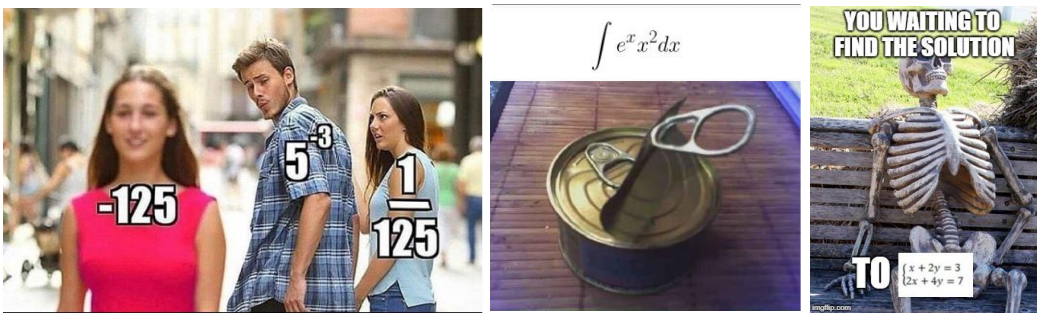
1. The first partial meaning is ***structural*** and lies in its being a meme, namely to have a specific and shared structure and graphics (font, color, text position, Figure 1a).
2. The second partial meaning is ***social*** and lies in the shared conventions of viral images, compositional setups and syntaxes. (Figure 1b, in How to use memes, source 9gag.com]).
3. The third partial meaning is ***specialized*** and lies in images, symbols or text referring to a specific topic (in our case mathematical, to be framed within a "sphere of practice", adhering to a common set of rules, where "mathematical meanings are constructed" [3]). (Figure 1c, source quickmeme.com.).

Due to their huge exposure to this type of artefacts, young people are naturally proficient in cracking the meanings of a meme, provided that they own the specific knowledge skills implied in the specialized level. For non-digital natives, to whom this workshop is addressed, the trickiest part is usually the social meaning level, which is based on community-enforced rules [4], socially accepted and shared meaning and sometimes local connotations of the chosen image. Information about social meanings can be traced down in the Know Your Meme website, that will be explored during the activity.

Third part - Examples of mathematical memes*: to focus more on the potential of memes in mathematics education, we propose and analyze together a selection of web found and custom created mathematical memes.*

What makes us believe that memes can be suitable for augmenting the teaching and learning of mathematics is that mathematically themed memes already exist. They stemmed naturally in the web,

within assiduously frequented thematic groups on social media like Facebook or Instagram, which act as veritable and spontaneous communities of practice, where knowledge is shared in a process of collective learning [8]. In this part of the workshop, we will share information about these thematic groups, and use the ***triple-s construct*** exposed above to unpack together the layered meanings of some selected examples picked within these groups, created by teachers (the first author) or by students during teaching experiments. Here below we provide examples of these three categories, with the aforesaid analysis.



(a) (b) (c)

Figure 2: *Examples of mathematical memes*

Figure 2a

Source: Instagram page Juicy Mathematical Memes

Structural meaning: *object labelling* meme, where elements of an image are labelled to create a humorous interpretation of the picture.

Social meaning: the *Distracted boyfriend* image is used to represent situations where someone or something (the boyfriend), instead of connecting with the right thing (the girlfriend in blue on the right), is diverted to something else (the woman in red on the left), apparently more alluring.

Specialized meaning: the meme refers to the well-known cognitive obstacle of distinguishing the role of the sign in the expression of a power of a number. The wrong outcome, connected to the girl in red, is, in fact, the result of $(-5)^3 = -125$ which is often mistaken for $5^{-3} = \frac{1}{125}$.

Figure 2b

Source: created by the first author, using a web-found image

Structural meaning: *white border* meme, composed by an image and a caption in a white strip above the image.

Social meaning: the image used in this meme is known as *Me Opening up to Someone* and it is conventionally used to represent how difficult it can be to expose oneself, here it is used as a metaphor of a mathematical problem that isn't solved in a single step.

Specialized meaning: the mathematical content of the meme refers to the solving technique required by the integral in the text above, that implies using integration by parts twice. In fact $\int e^x x^2\, dx = e^x x^2 - \int 2xe^x dx = e^x x^2 - 2[xe^x - \int e^x dx] = e^x(x^2 - 2x + 2) + c$

Figure 2c

Source: created by a 10th-grade student during a teaching experiment (translated by the authors)

Structural meaning: *image macro* meme - one of the prevalent forms of Internet memes - consisting of images with superimposed text, usually in white bold Impact font

Social meaning: *Waiting skeleton* is an image used to describe situations where someone is held waiting too long without hope of getting what he waits for.

Specialized meaning: the subtle mathematical message of this meme is hidden in the system inserted in its bottom half $\begin{cases} x + 2y = 3 \\ 2x + 4y = 7 \end{cases}$; the two linear equations of this system, in fact, represent parallel lines in the cartesian plane and therefore the search for their intersection point is destined to last indefinitely.

We think that all three examples clearly show memes' creative and educational potentials and might fit well in a class discussion scenario, to encourage students' critical thinking. The third example has the added value of having been produced directly by a student, within a teaching experiment involving the creation of memes on linear systems.

Fourth part – hands on activity*: the final part of the workshop is dedicated to a guided experiment of the creation of a mathematical meme, using online devices.*

To wrap up our workshop, we will guide participants along the steps of the creation of a mathematical meme, with the use of one of the meme generator websites. We will also share with attendants the scaffolding of a meme-centered teaching path, that can be realized during school hours and is described in its details in a dedicated website. The experience aims at putting students at the center of a creative act, in which they become authors of a meme, of a short video, which has the didactic purpose of eliciting the mathematical content while strengthening the narrative ability, and possibly of a symbolic or graphic representation of the same content, realized using GeoGebra.

Summary and Conclusions

The hardest part of including non-standards resources into regular teaching practices is the lack of support and training for experimental teachers: we hope that this workshop can provide assistance for those who want to try out new resources in their classrooms. As Sir Ken Robinson pointed out, in a community-driven Q&As session promoted in 2009 by TED and Reddit, "creativity isn't a specific activity; it's a quality of things we do. You can be creative in anything — in math, science, engineering, philosophy — as much as you can in music or in painting or in dance", and memes are one of the most representative artefacts of young people creative skills.

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References

[1] G. Bini. and O. Robutti, "Meanings in Mathematics: using Internet Memes and Augmented Reality to promote mathematical discourse", U. T. Jankvist, M. van den Heuvel-Panhuizen, & M. Veldhuis (eds.), *Proceedings of the Eleventh Congress of the European Society for Research in Mathematics Education*, Freudenthal Group & Freudenthal Institute, Utrecht University and ERME, Utrecht, the Netherlands, 2019.

[2] R. Dawkins, *The selfish gene*, Oxford University Press, Oxford UK, 1976.

[3] J. Kilpatrick, C. Hoyles and O. Skovsmose, "Meanings of 'Meaning of Mathematics"' J. Kilpatrick et al. (eds.), *Meaning in Mathematics Education*, Springer, New York NY, 2005, pp.9-16.

[4] A. Osterroth, "Semiotics of Internet Memes" 10.13140/RG.2.2.12320.89605, 2018.

[5] A. Schleicher, http://www.thefivethings.org/andreas-schleicher/ retrieved February 2019

[6] L. Shifman, *Memes in digital culture*, MIT Press, Cambridge MA, 2014.

[7] D. Thomas and J. Seely Brown, *A new culture of learning: cultivating the imagination for a world of constant change*, CreateSpace Independent Publishing Platform, Lexington KY, 2011.

[8] E. Wenger, *Communities of practice: Learning, meaning, and identity*, Cambridge University Press, Cambridge UK, 1998.