

# Using video-based methods to teach rational number to Pre-Service school teachers

JULVE-TIESTOS, Carmen; ARNAL-BAILERA Alberto, GONZÁLEZ-HERRERA Antonio

University of Zaragoza, Spain

*carmenjt@unizar.es, albarnal@unizar.es, gonzalezh@unizar.es*



# INTRODUCTION

- **Technological instruments** in rare occasions become an essential part of the learning/teaching processes with Pre\_Service teachers.
- **Pre-Service teachers look for videos in websites** such as youtube, but rarely with a didactical point of view.
- **Focus**
  - i. To analyze pros and cons than arise when introducing different video-base methods to teach rational number problems.
  - ii To use rich and poor video sequences to show didactic issues to our students.

# THEORETICAL FRAMEWORK - TPACK

This framework shows **the general domains** that our students should cover in our course and **some basic facts about the use of internet videos in mathematics.**

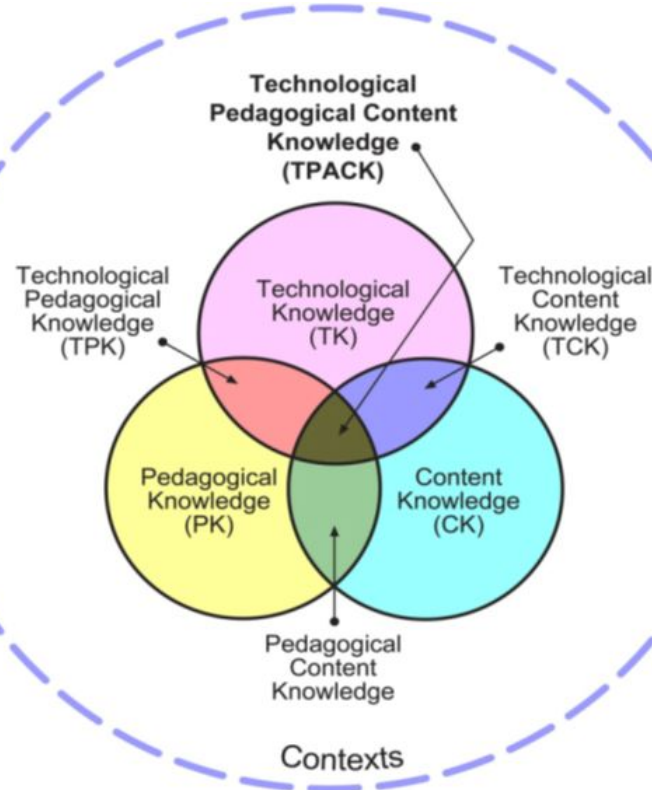
TPACK is the framework that we use to study the integration of knowledge and technology .

Technology can improve our classes, but our focus is mathematical education.

# THEORETICAL FRAMEWORK - TPACK

**TK:** Teacher's knowledge that permits him to find different ways of solving a given task using IT.

**CK:** Teacher's knowledge of the mathematical content, including concepts, theories, etc



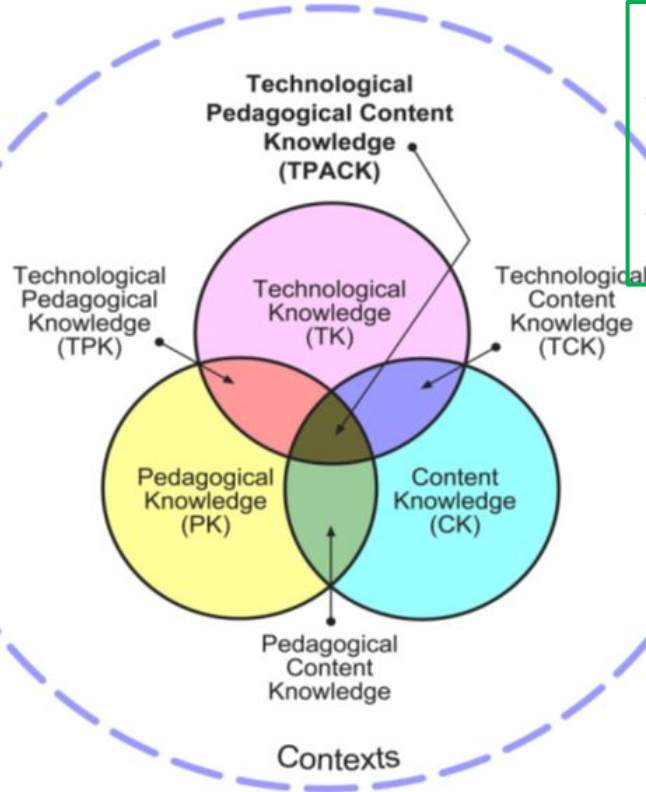
**PK:** Teacher's knowledge of the processes involved in the teaching and learning of mathematics.

# THEORETICAL FRAMEWORK - TPACK

**TPK:** Teacher's knowledge of the changes that technology generates in learning and teaching.

**TCK:** Teacher's knowledge of the possible adaptations of the mathematical content to its teaching.

**TPACK:** Teacher's knowledge of the mutual influences and limitations of technology and content.



# VIDEO IN MATHEMATICS

**\*Recordings of a class**, including images of the teacher and digitalized writing systems.

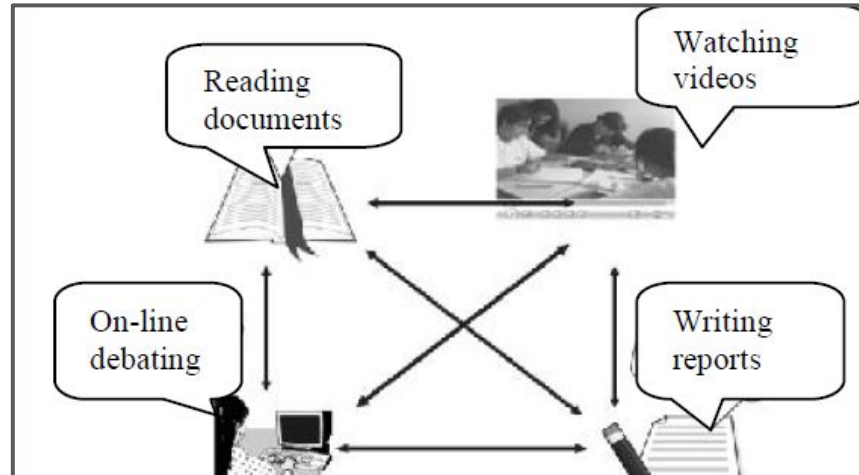
**\*Public platforms**

**Khan Academy** ([www.khanacademy.org](http://www.khanacademy.org)), an international platform, mostly in English and

**AINTE Academia** a youtube channel of a Spanish mathematics teacher.

# VIDEO IN MATHEMATICS

Integrate four different types of activities: **watching videos**, **reading documents**, **participating in on-line debates** and **writing reports**. All of these activities were designed to promote a deeper understanding of the concepts based both in reflection and in mathematical communication.



# VIDEO SEQUENCES

Different approaches of video sequences

\***The first approach** consists in the viewing of a video sequence, before or after the lesson.

\***The second approach** consists in the recording a video sequence by our students after attending the lesson, it promotes a deeper understanding.



# USING A YOUTUBE VIDEO

Our example is a mathematics academy **with more than 28.000 followers.**

We focus in the video “Fraction in an equal\_sharing context.” designed to support explanations about the interpretation of the fraction in an equal sharing context.

# USING A YOUTUBE VIDEO



Students are told that **two cakes are equally shared among three people**. He divides each cake in thirds. He asks to the students about the fraction of cake that every person receives.

# USING A YOUTUBE VIDEO

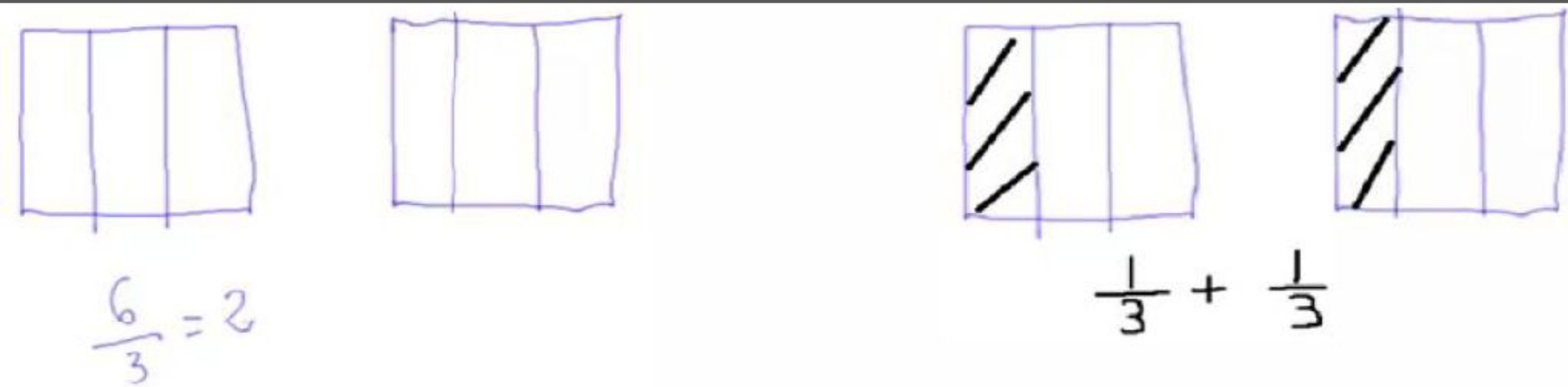


Fig.4. Answer given in the video (left) and correct answer (right).

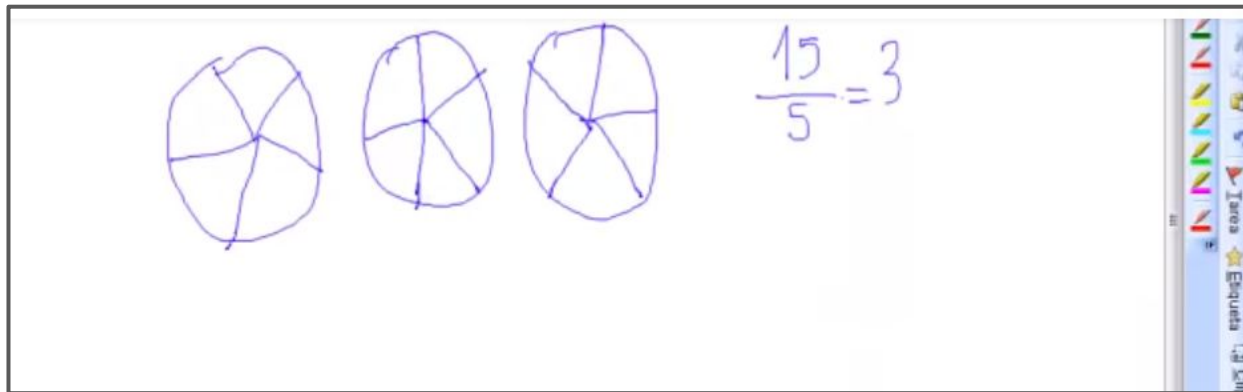
The author **changes the unit from "cakes" to "parts"**, where each part corresponds to one third of cake. He **counts the number of "parts"** and he divides it by the number of people, and the answer is "two parts".

## Correct answer

We have to use a **one-phase technique**, giving one third of each cake to each of the three persons.

The answer, **would be given in terms of the original unit "cake"**  $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$  of cake

# USING A YOUTUBE VIDEO



Afterwards, the author poses similar problems using the same technique and using the "part" as a unit.

This unit corresponds in the following problem with one fifth of the cake, generating a bigger confusion because the same name corresponds in the new problem with a different unit

# USING A YOUTUBE VIDEO

Along with the viewing of this video some questions were posed by using the Edpuzzle software . Edpuzzle permits to introduce multiple choice question, open ended question and comments along the video. Teacher receives feedback about the answer given by our students.

Example of an **intermediate question**, posed right after the teacher in the video asked to their students: what fraction of cake corresponds to each person? instead of how much cake...? (Pedagogical Content Knowledge)

● Open ended question

¿Crees que está bien planteada la pregunta desde el modelo de reparto igualitario? si tu respuesta es negativa, indica como plantearías la pregunta.

---

---

Example of an open ended question  
**(Do you think the question is well formulated according to the equal sharing context? If not, write an alternative question)**

# RESULTS

- 37% of our prospective primary school teachers gave correct answers.
- Finally, we asked about the actual solution of the problem (Content Knowledge) with the same percentage of correct answers.
- Considering the errors, some students answered "2/3" without any reference to the unit or "1/3 of each cake, thus 2/3 of both cakes" changing the unit from one cake to the whole.

# RECORDING A NEW VIDEO

Once the researcher **explain in class the different measurement situations**, pre-Service teachers have to **record a 3 minutes video** with examples of one of the studied situations.



*Example: Student A Calculates the measure of the area of a rectangle using an arbitrary unit.*

# RECORDING A NEW VIDEO

In the analyzed videos, Pre\_Service school teachers used a wide range of easy-to-handle materials and they use to propose easy situations to explain different measurements situations.



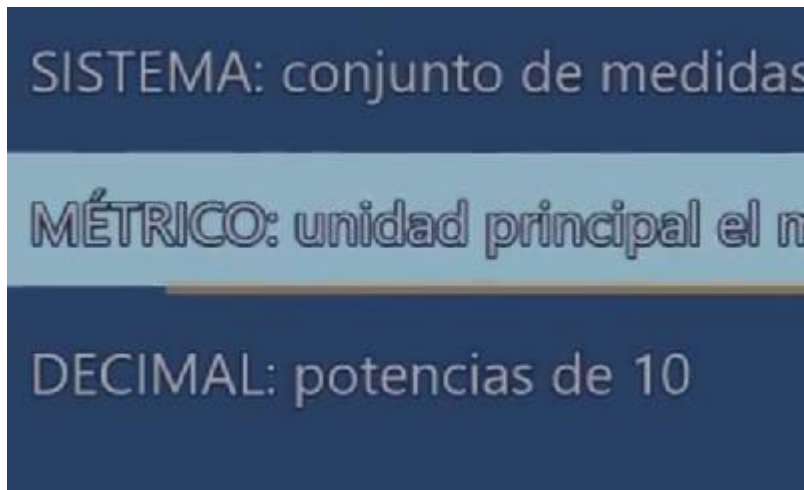
*Student B Constructs two modeling clay blocks weighing half of the given block.*



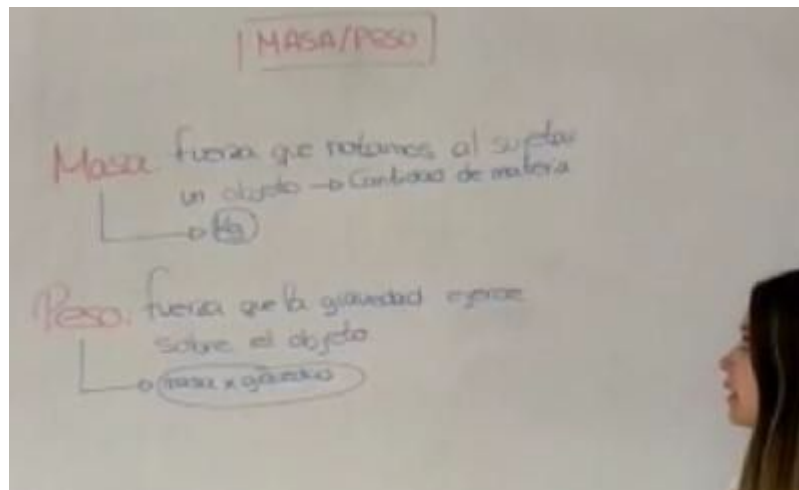
# RECORDING A NEW VIDEO

We also observed a **great trend to use a traditional teaching model:** before explaining the measurement situations and activities, they gave a series of theoretical explanations but we only ask them for measurements activities.

# RECORDING A NEW VIDEO



Student A Previous explanations about the Metric System



Student B distinguish between mass and weight magnitudes

# CONCLUSION

Our students enjoyed these activities.

**TPK** They considered very interesting to watch and analyze the way actual teachers deliver their lessons. Specially, the possibility of watching them many times paying attention to different details, but they complain about not being possible to ask for details to the teacher in the video.

**PCK:** they indicate that teacher's explanations lead them to incorrect answers because they got convinced by them.

**TPK:**The use of video-based activities has permitted to our students analyze their professional practices when explaining concepts related to rational numbers.

# CONCLUSION

- Watching actual teaching sequences enables our students to **acquire some analysis strategies**.
- These strategies **could be used for the analysis of their own videos and, in the future, their professional practice**.
- Most of the videos in internet about rational number teaching, are based in the **part-whole model, it promotes a limit interpretation of fractions**.
- They can realize **how the part-whole model, the traditional model for the fractions teaching, limits the use of others models like measure or equal\_sharing model**.

# Using video-based methods to teach rational number to prospective primary school teachers

JULVE-TIESTOS, Carmen; ARNAL-BAILERA Alberto, GONZÁLEZ-HERRERA Antonio

University of Zaragoza, Spain

*carmenjt@unizar.es, albarnal@unizar.es, gonzalezh@unizar.es*

