Use of Learning Analytics in Remedial Courses

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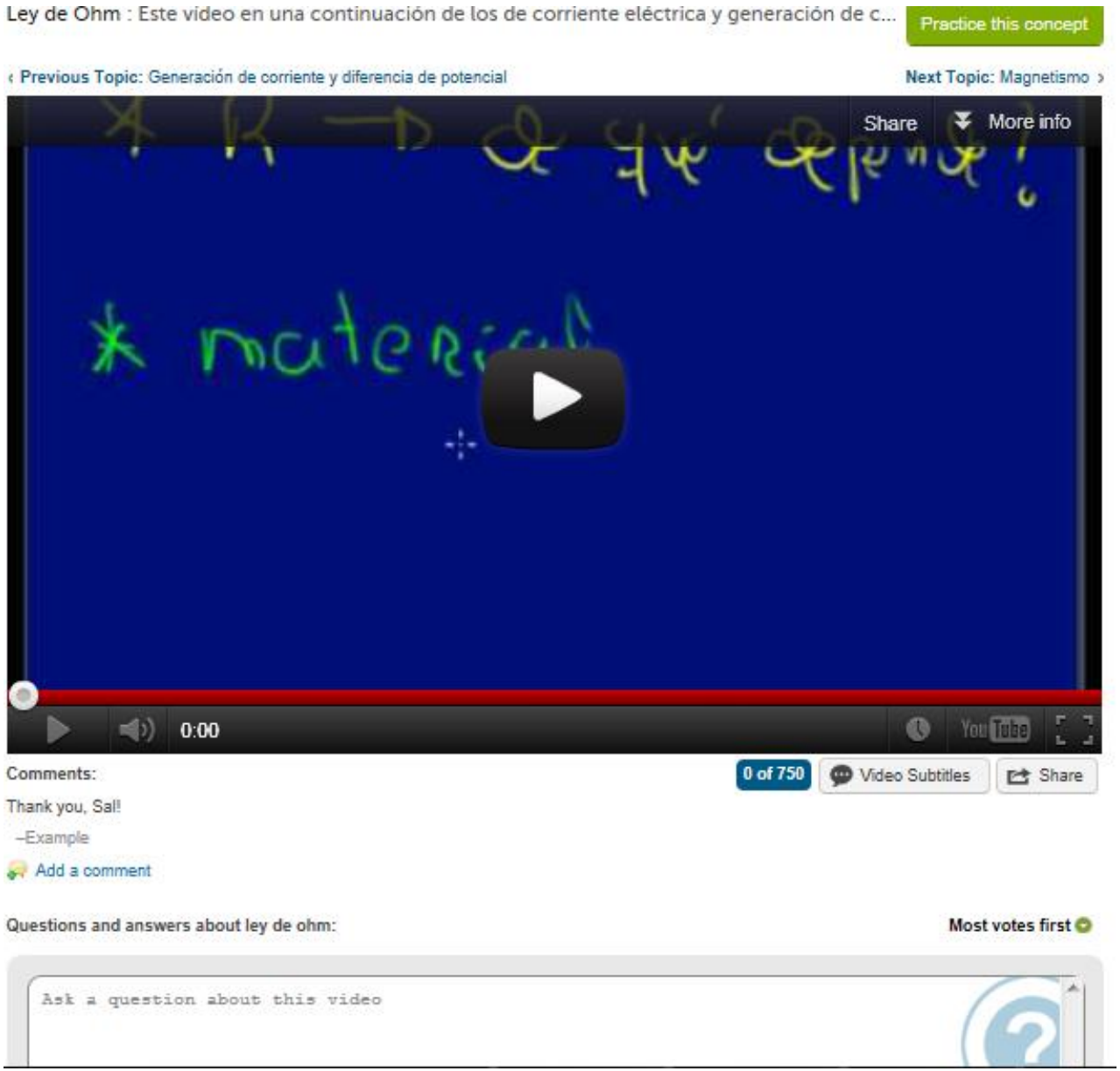
Introduction

- Experiences in remedial coures
  - Remedial coures: reinforce student skills
  - Topics: physics, maths, chemistry
  - Number of students: from 100 to 300 per course

Introduction

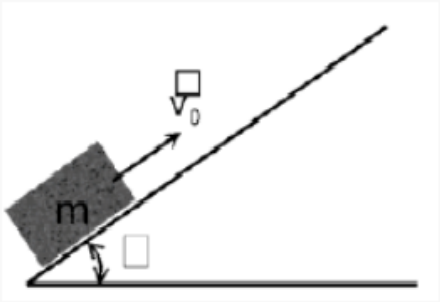
- Experiences in remedial courses
  - There is not a single platform which is according to all the requisites
  - Combination of KA and Moodle
  - The complexity of the authoring process
  - The need of adaptation of the gamification
  - Adjustment of the learning analytics functionality

Khan Academy: Videos



Khan Academy: Exercises

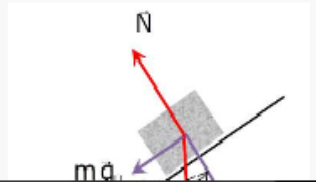
Se proporciona una velocidad inicial $v_0 = 3\ m/s$ en dirección ascendente a un bloque que se encuentra sobre un plano inclinado un ángulo α = 67° con respecto a la horizontal, y que no presenta rozamiento.



¿Qué distancia en metros asciende el bloque por el plano inclinado antes de detenerse? Considere la aceleración de la gravedad g como 9.8 m/s^2. La solución final se redondeará a 1 cifra decimal

Pista 1

- Dibuja las fuerzas que actúan sobre el cuerpo (peso y normal).
- Descompón las fuerzas en componentes perpendicular y paralela a la superficie del plano inclinado.



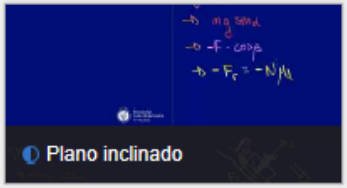
Answer Acceptable formats

Check Answer

Need help?

I'd like another hint (2 steps left)

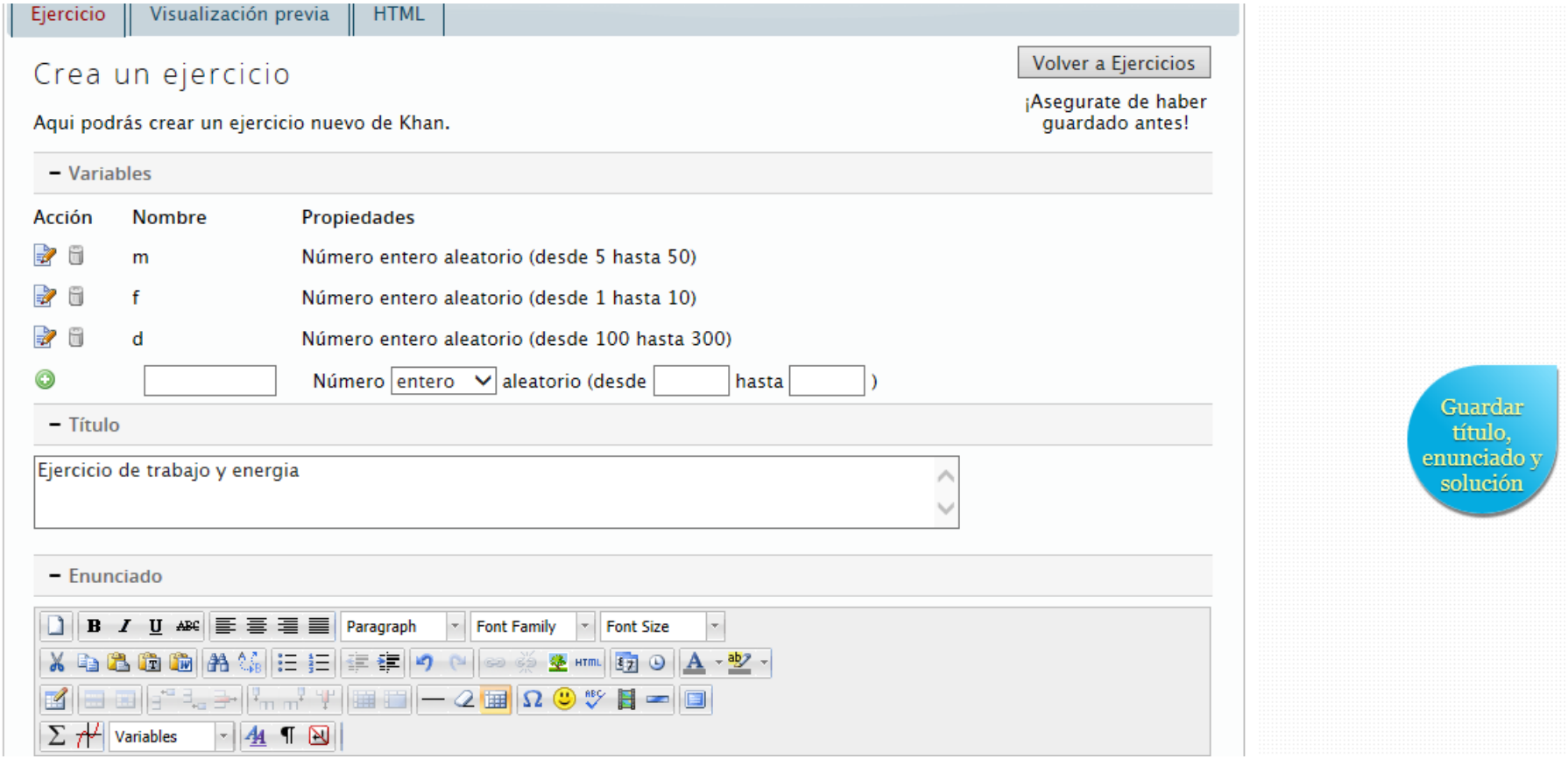
Stuck? Watch a video.



Khan Academy: Exercises Format

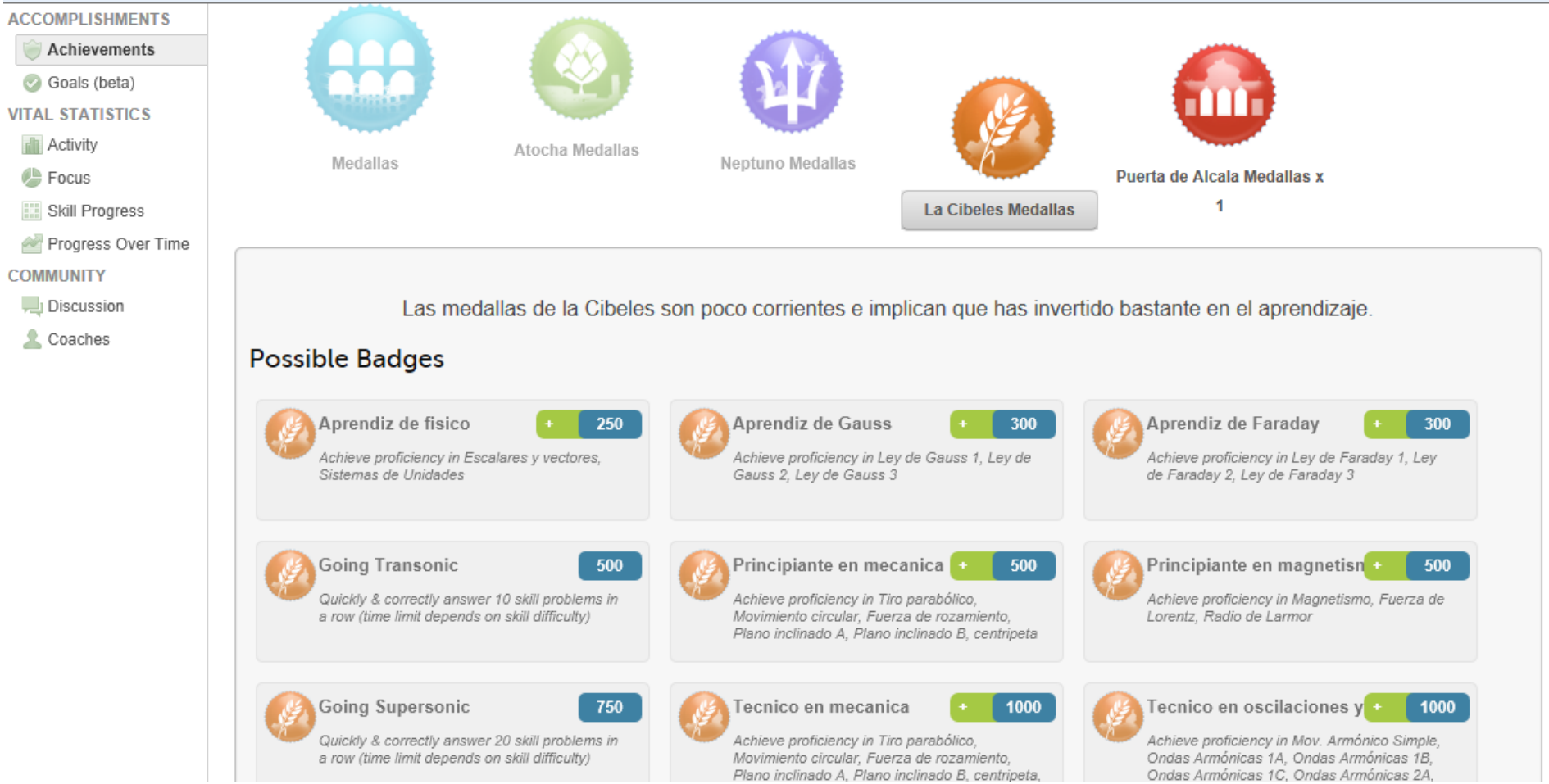
```
<html data-require="math word-problems">
<head>
        <meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
        <title>Ejercicio de trabajo y energia</title>
        <script src="../khan-exercise.js"></script>
</head>
<body>
        <div class="exercise">
        <div class="vars">
                <var id="m">randRange(5, 50)</var>
                <var id="f">randRange(1, 10)</var>
                <var id="d">randRange(100, 300)</var>
        </div>

        <div class="problems">
                <div>
                        <div class="problem">
                                <p>Un bloque de masa <var>m</var> kg se mueve
sobre una superficie horizontal. En un instante dado, cuando la velocidad del bloque es <code>{v}
_{{{0}}}</code>  , empieza a actuar una fuerza de frenado uniforme cuyo módulo
es <var>f</var> N. Sabiendo que el bloque recorre una distancia de <var>d</var> m desde ese
instante hasta que se detiene:</p>
<p>Calcular el valor <code>{v}_{{{0}}}</code>  de la velocidad inicial. (Utilizar para el cálculo el
teorema del trabajo y la energía cinética)</p><b>Solución aceptada: </b><var>roundTo(1,sqrt
((2*f*d)/m))</var>
                        </div>
                        <div class="question">
                                <p></p>
                        </div>
                        <div class="solution" data-type="decimal"><var>roundTo(1,sqrt
((2*f*d)/m))</var></div>
                </div>
        </div>

        <div class="hints">
```

Khan Academy: Authoring Tool for Exercises

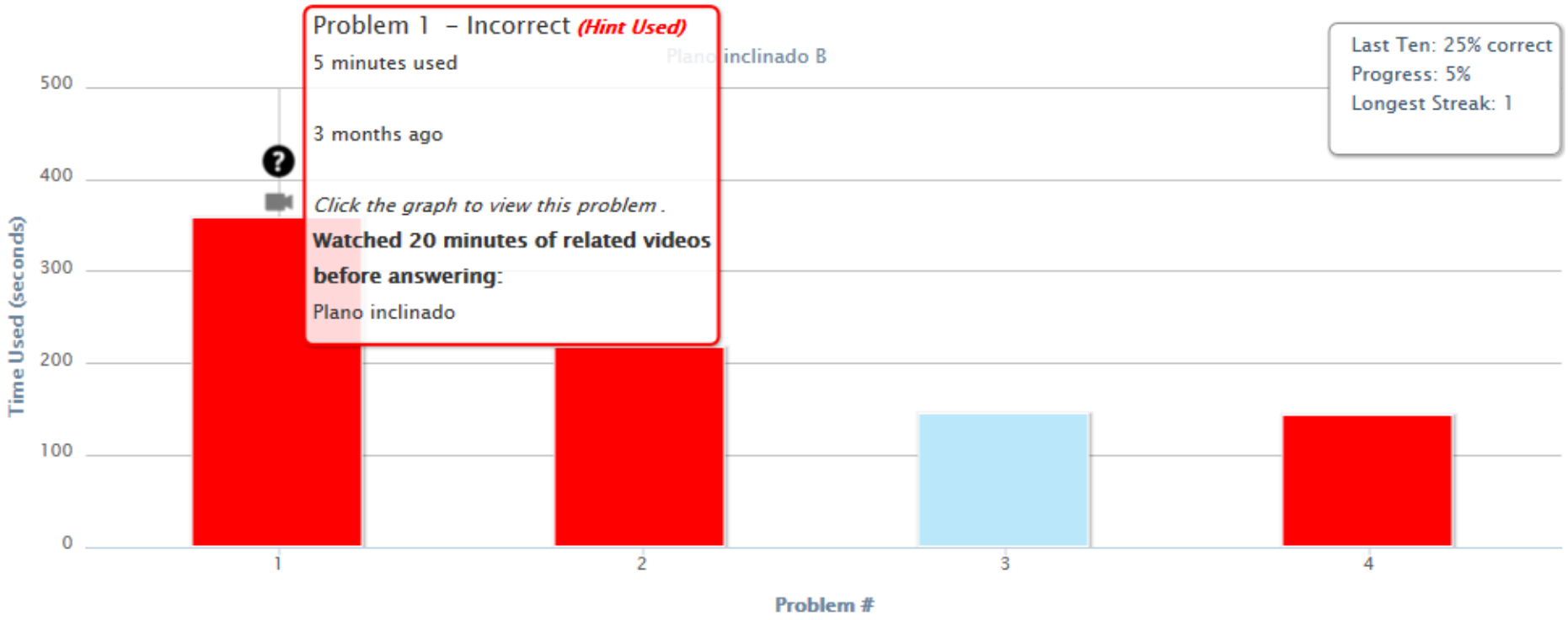


- Source code
  - https://github.com/kadaki01/Genghis

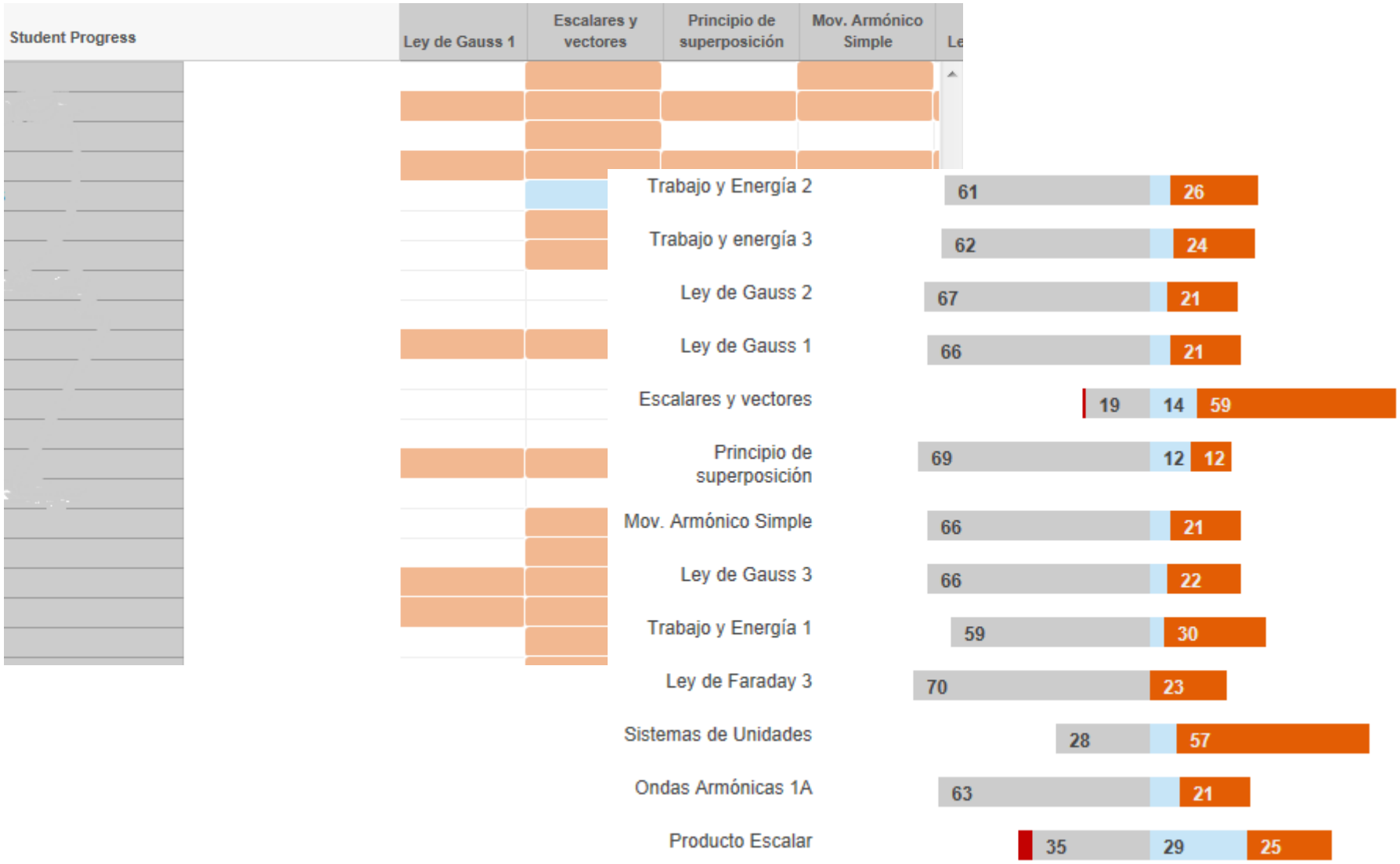
Khan Academy: Gamification



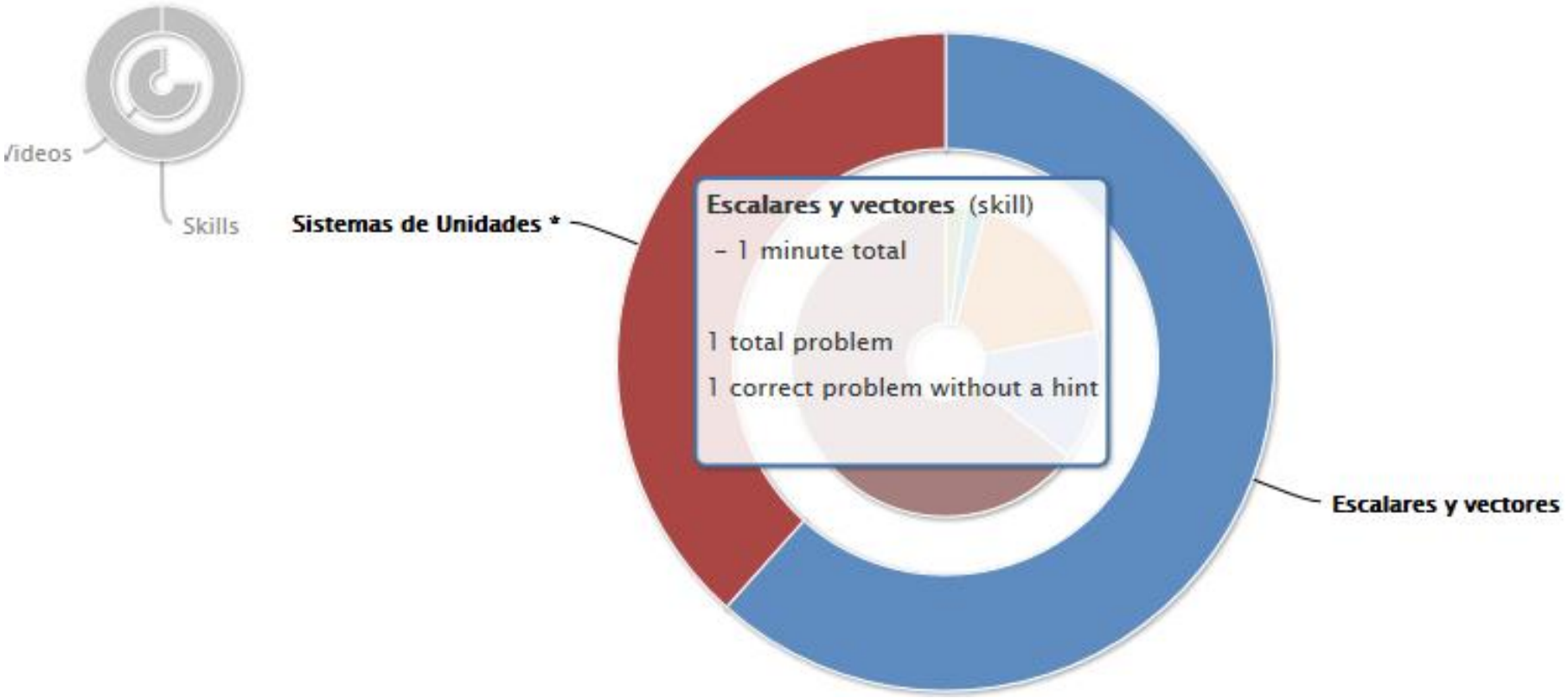
KA: Report by details on exercises



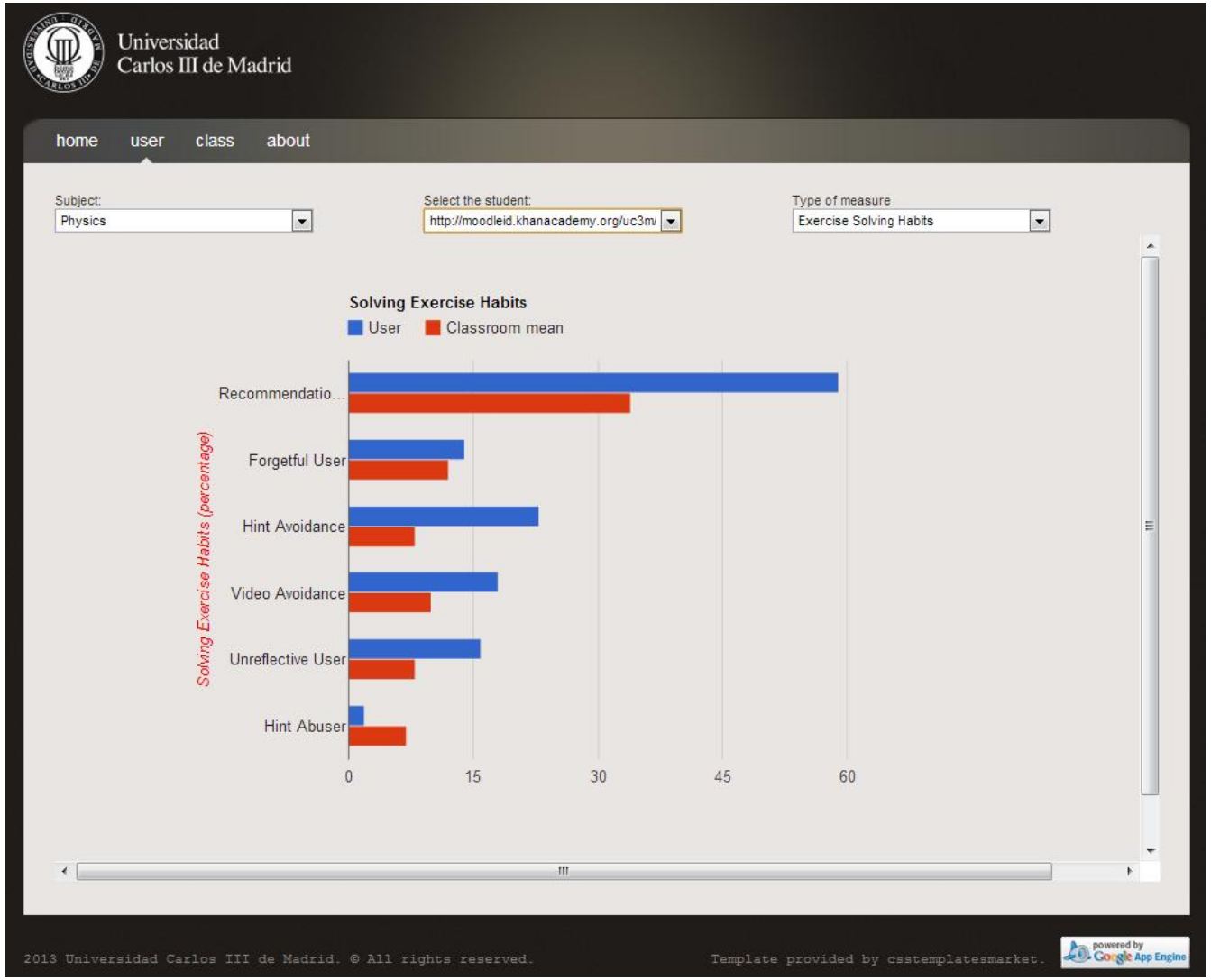
KA: Report by Skills



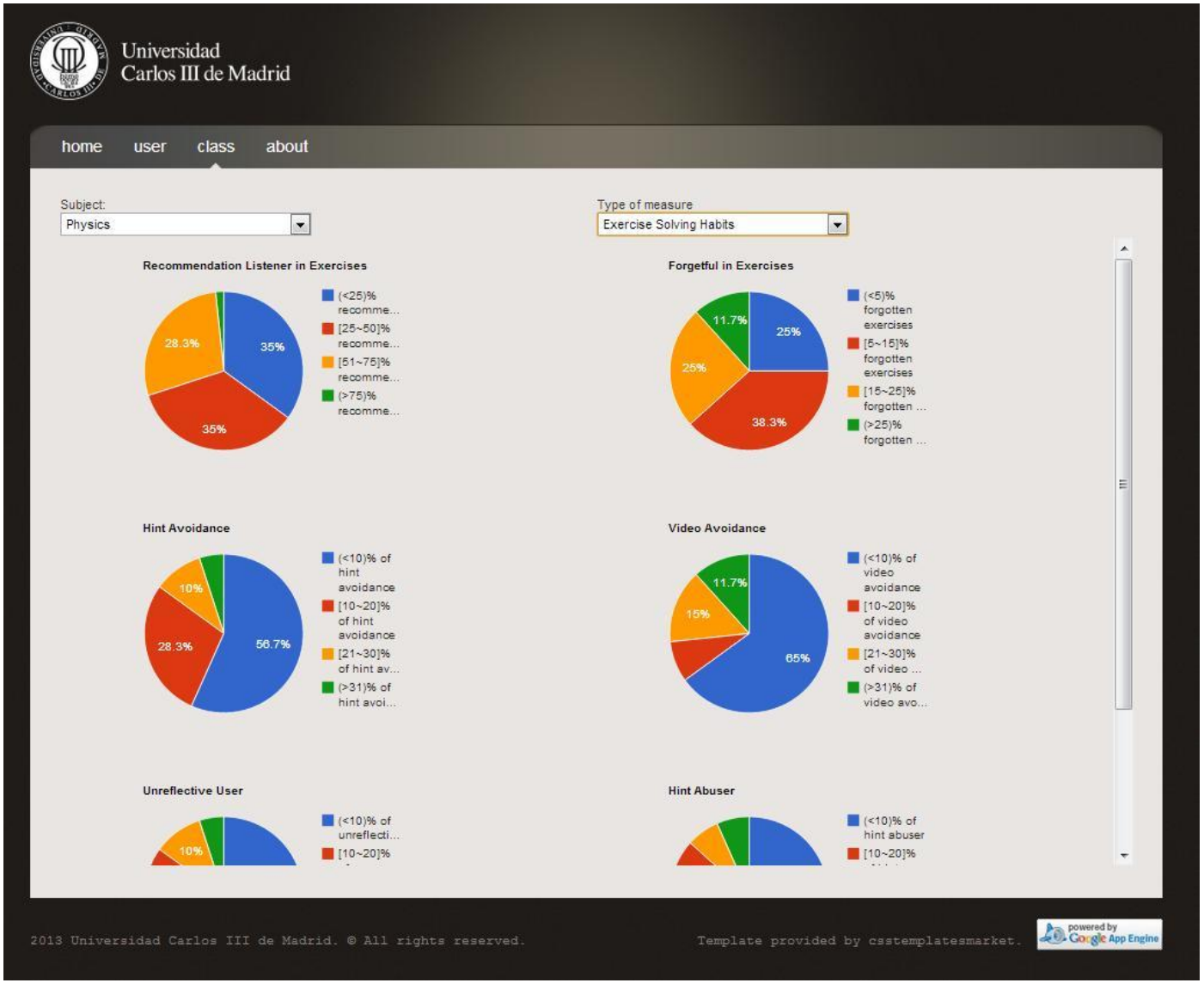
Khan Academy: Report by time in topics



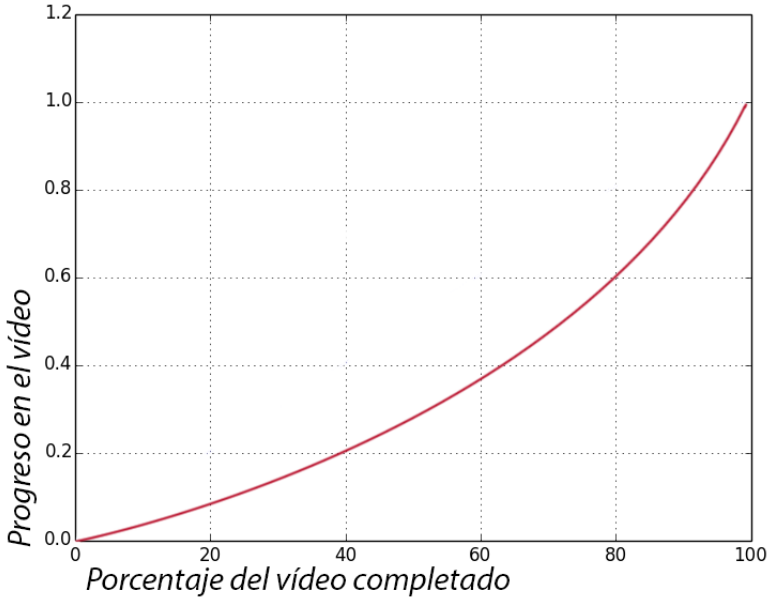
KA: Individual reports: self-reflection

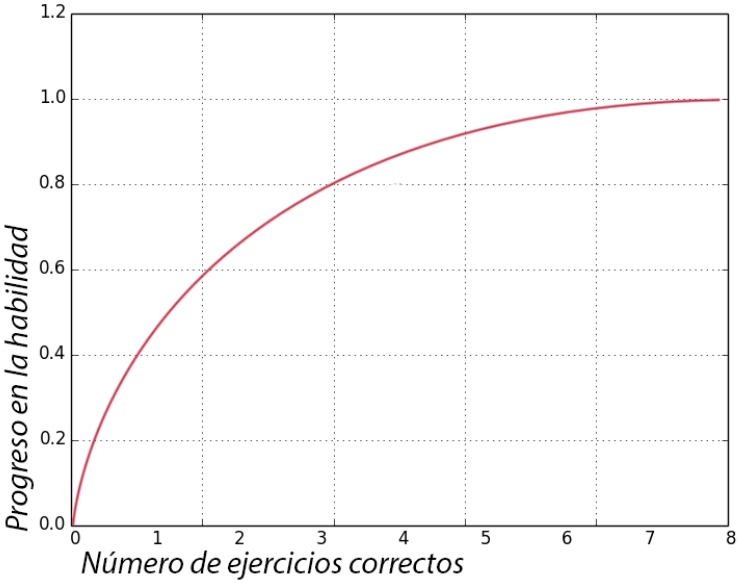


KA: Evaluation of the whole class



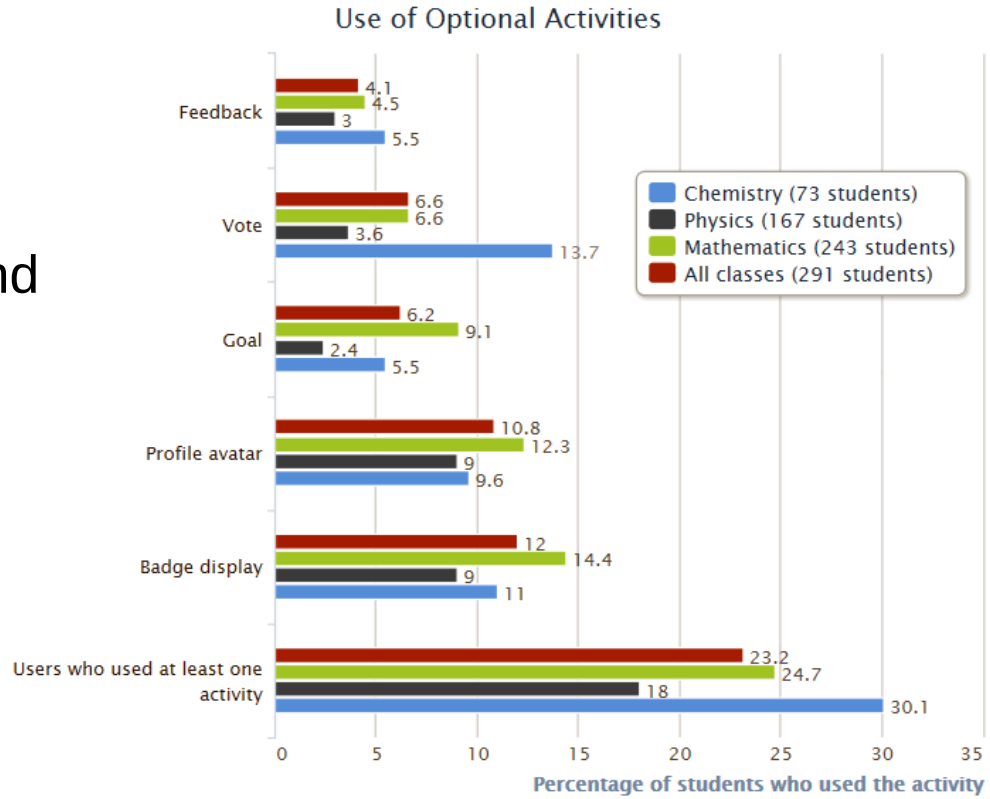
KA extensions: Effectiveness





KA extensions: Analysis of optional activities

- 76.81% of students who accessed, did not use any optional activities
  - Difference of use per course and depending on type of optional activities
  - 55 goals (50.9% completed)
  - 40 votes (26 positive, 13 indifferent, 1 negative)



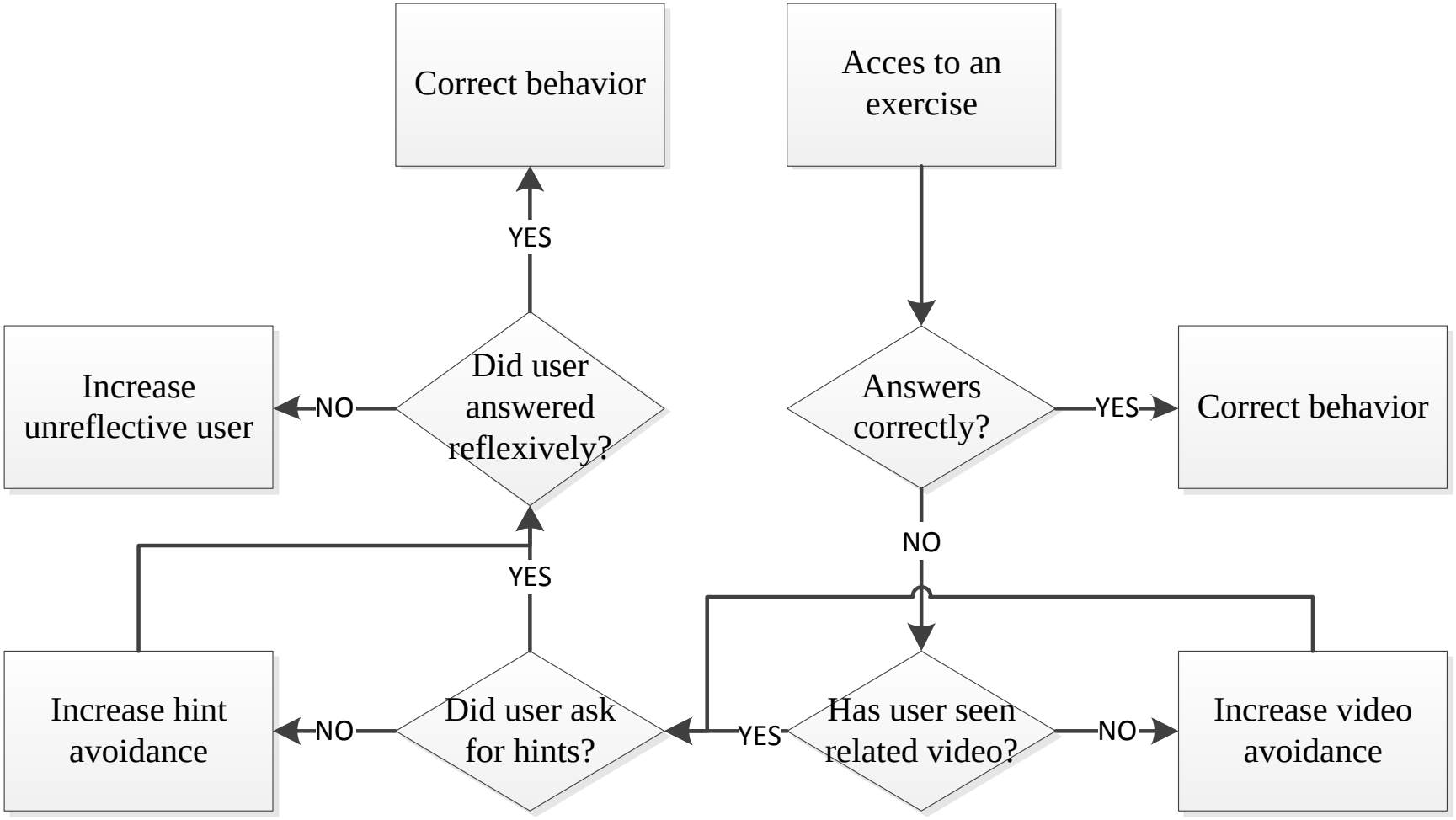
Type of activity	Percentage of activities accessed				
	0%	1-33 %	34-66%	67-99%	100%
Regular learning activities	2.48%	51.55%	23.19%	18.84%	3.93%
Optional activities	76.81%	18.43%	4.14%	0.41%	0.21%

Prediction models

Learning gains= 25.489 - 0.604 * pre_test + 6.112 * avg_attempts + 0.017 * total_time + 0.084 * proficient_exercises

- Hierarchical regresion
- Can explain more than 50% of variability
- New model with higher level indicators improve the model

ALASKA: exercise solving habits

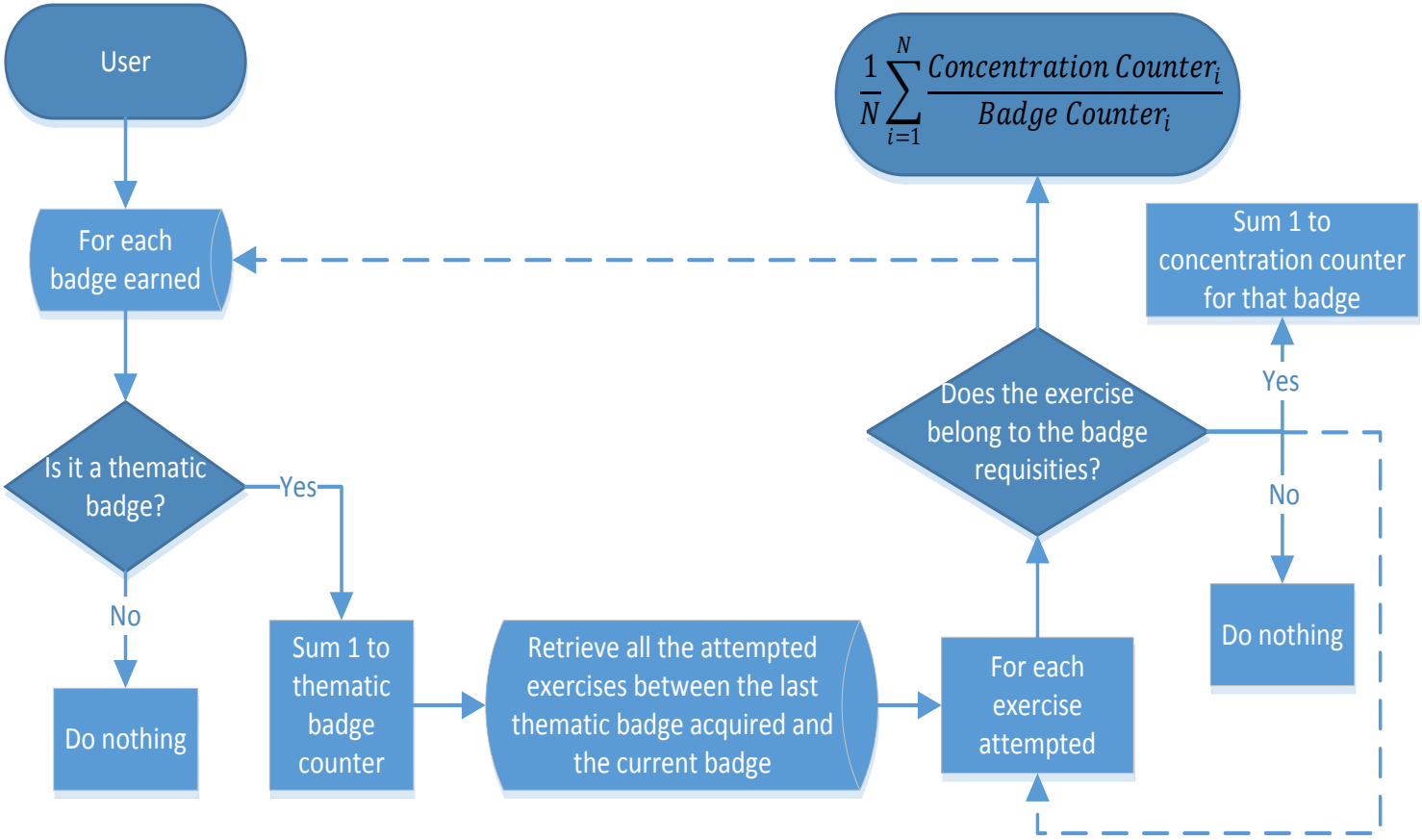


KA extension: exercise solving habits

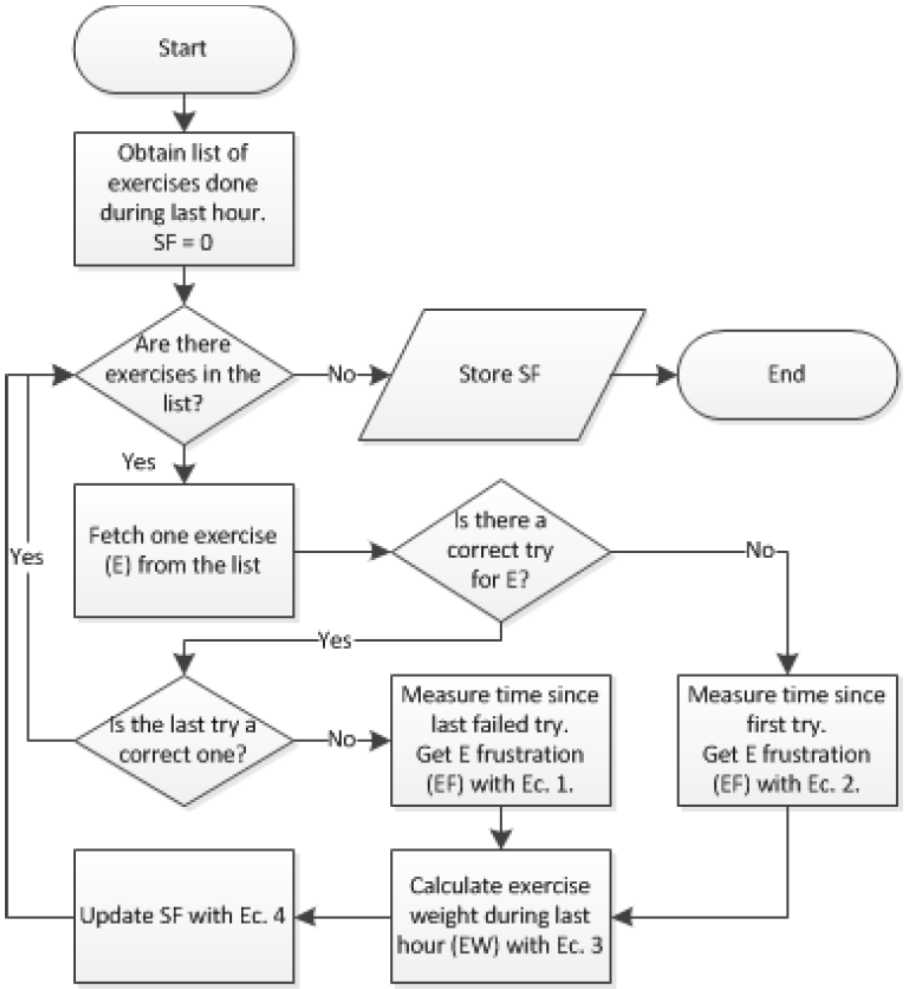
- Some statistics with a level of 25%
  - 30.3 % hint avoider
  - 25.8 % video avoider
  - 40.9 % unreflective user
  - 12.1% of hint abuser

	Hint avoid.	Video avoid.	Unrefl . User	Hint abuser
Hint avoidance	1	0.382	0.607	-0.186
Video avoid.	0.382	1	0.289	0.096
Unrefl. user	0.607	0.289	1	0.317

KA extension: gamification habits



KA extensions: Detection of emotions



KA: Selected Publications and video

- Publications
  - Muñoz-Merino, P. J., Ruipérez-Valiente, J. A., Alario-Hoyos, C., Pérez-Sanagustín, M., & Kloos, C. D. (2015). Precise Effectiveness Strategy for analyzing the effectiveness of students with educational resources and activities in MOOCs. Computers in Human Behavior, 47, 108-118.
  - Ruipérez-Valiente, J. A., Muñoz-Merino, P. J., Leony, D., & Kloos, C. D. (2015). ALAS-KA: A learning analytics extension for better understanding the learning process in the Khan Academy platform. Computers in Human Behavior, 47, 139-148.
  - Muñoz-Merino, P. J., Valiente, J. A. R., & Kloos, C. D. (2013, April). Inferring higher level learning information from low level data for the Khan Academy platform. In Proceedings of the third international conference on learning analytics and knowledge (pp. 112-116). ACM.

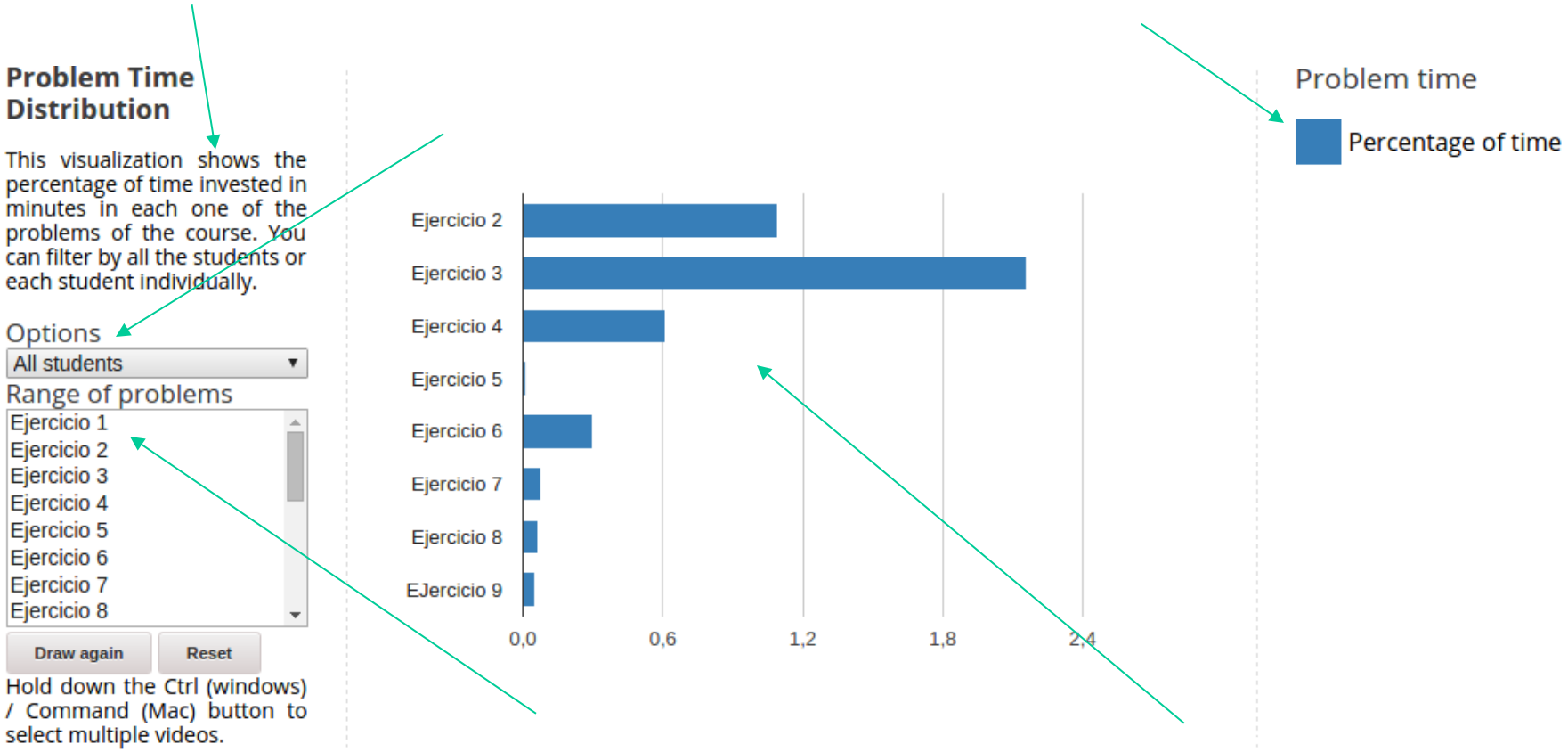
KA: Selected Publications and video

- Publications
  - Ruiperez-Valiente, J., Munoz-Merino, P., Kloos, C. D., Niemann, K., Scheffel, M., & Wolpers, M. (2016). Analyzing the Impact of Using Optional Activities in Self-Regulated Learning, IEEE Transactions on Learning Technologies
  - Leony, D., Muñoz-Merino, P. J., Ruipérez-Valiente, J. A., Pardo, A., & Kloos, C. D. (2015). Detection and evaluation of emotions in massive open online courses. Journal of Universal Computer Science, 21(5), 638-655.
- Video
  - http://www.youtube.com/watch?v=nQ-80sZOfT8

Open edX

- We made a new release which includes:
  - Better color usage to transmit information along all the interface
  - Visualizations scaling to massive amount of students and high variety in the number of educational resources
  - Improves the processing design making a relative-computation of only new events (tracking logs)
  - Adapted to newer releases of Open edX (tested in Cypress and Dogwood)
  - GitHub https://github.com/analyseuc3m/ANALYSE-v1
  - Video https://www.youtube.com/watch?v=3fpIlTON1bs

Interface of ANALYSE



Students Grades

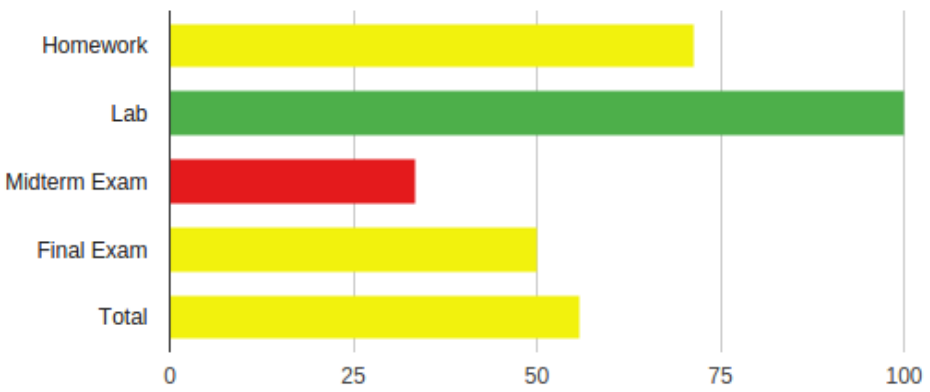
Students Grades

This visualization shows the average grade in each category of resource in the course. You can filter by all the students, each student individually or by students' groups (by grades). Click on a bar in order to see the results decomposed in each item within the category.

Options

Select student ▾

paloma ▾



Grade categories

Proficiency

OK

Fail

Video Time Watched

Video Time Watched

This visualization shows in light orange the percentage of different video watched (it does not count if the same parts are watched several times, the max. is the 100% of the video) and in dark orange the percentage of total video watched (total amount of time spent compared to the length of the video in percentage). You can filter by all the students or each student individually.

Options

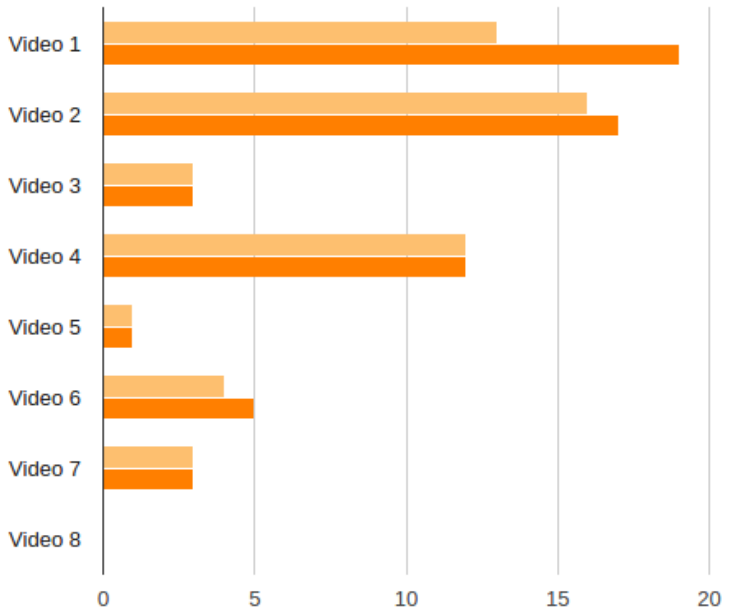
All students

Range of videos

- Video 1
- Video 2
- Video 3
- Video 4
- Video 5
- Video 6
- Video 7
- Video 8

Draw again | Reset

Hold down the Ctrl (windows) / Command (Mac) button to select multiple videos.



Video Time Watched

- Different Video Time
- Total Video Time

Repetition of Video Intervals

Repetitions of Video Intervals

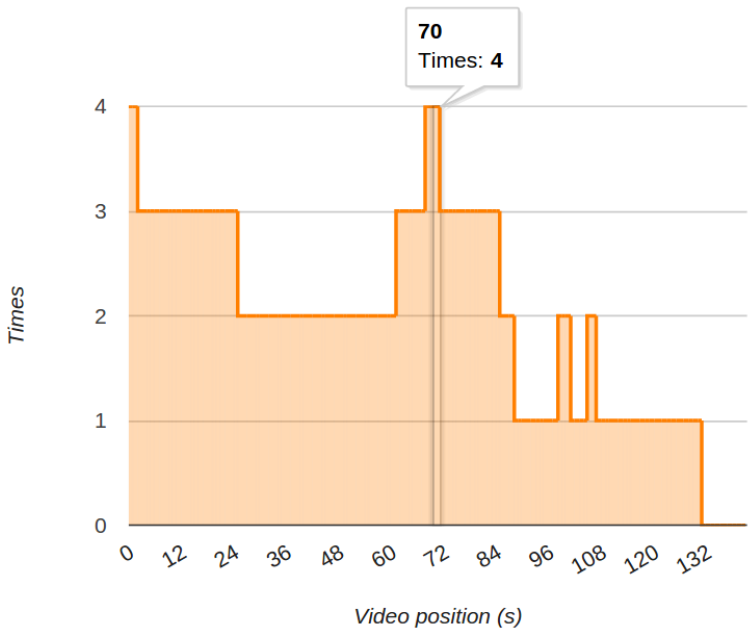
This visualization shows the number of different times that each second of a video have been watched by all the class. You can select two different options; either each student can count only 1 time, or each student can count up to the number of times that he/she has watched that video second. You can You can also pick students individually.

Options

Class: total times

Videos

Video 1

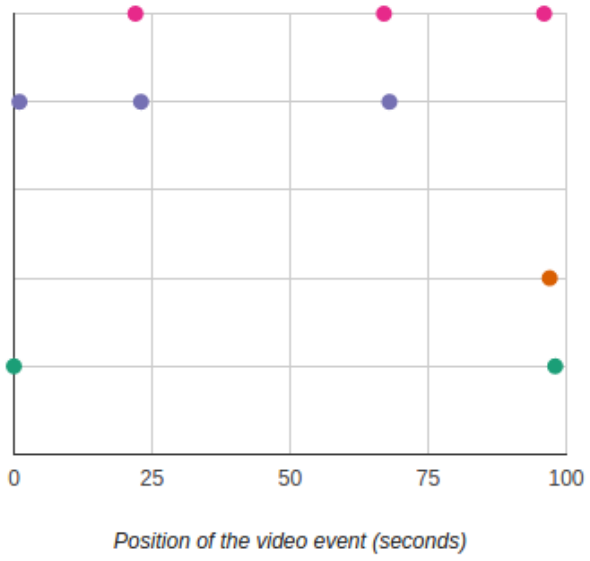


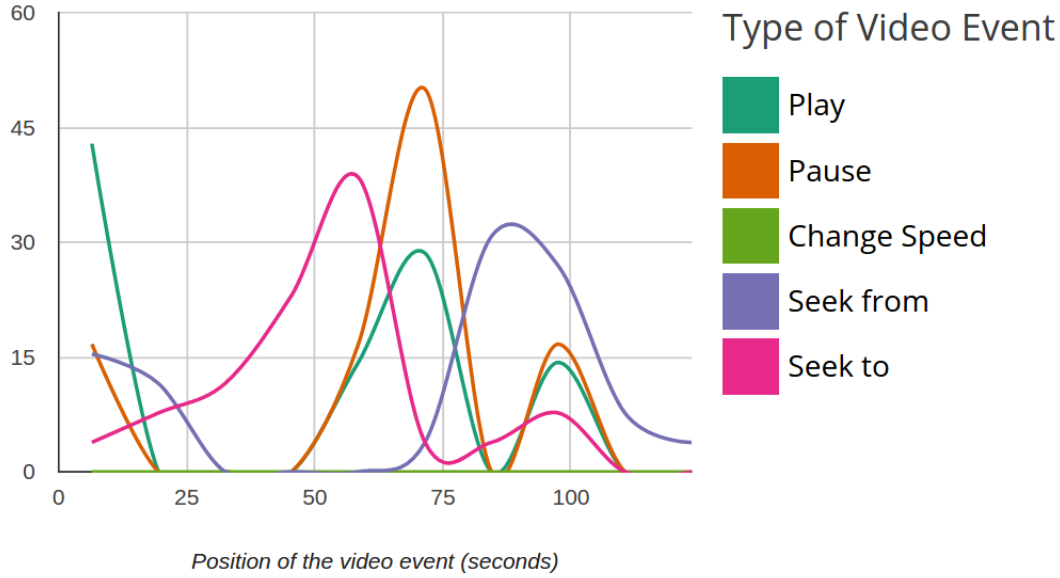
Repetitions

Number of Times

Video event distribution

- Video events (play, pause, change speed, seek from, seek to)
- Possible use related to detection of problems in resources
- We can see many ‘seek from’ events around second 85 and ‘seek to’ around second 55 → Seeking backwards





People involved in the development of ANALYSE

- José A. Gascón Pinedo
- José A. Ruipérez Valiente
- Héctor Pijeira Díaz
- Javier Santofimia
- Jaime Alzola
- Javier Orcoyen
- Carlos Delgado Kloos
- Pedro J. Muñoz-Merino

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