

1837
2017
YEARS



HELLENIC REPUBLIC
National and Kapodistrian
University of Athens

CREATIONS
Developing an Engaging
Science Classroom



Local masterclasses in Greek schools within the framework of the CREATIONS project



IASA

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CREATIONS

Developing an Engaging
Science Classroom



<http://creations-project.eu/>

A Horizon 2020 European outreach project to Develop an Engaging Science Classroom

- 36 months (Oct 15->Oct 18), 1.8 ME, 16 partners
- Coordinator: University of Bayreuth
- Improve skills of youngsters in STEM subjects
- HEP partners are UoA/IASA, UoBirmingham, Art@CMS, STFC

Some partners focus on combining science and art and boost creativity in schools

ex. Global Science Opera, Cultural Collisions , science using theater

A successful local Masterclass (half-day) in a school involves:

- Introduction and analysis of events with embedded HYPATIA online in an educational scenario with a circle of learning phases



- Combine it with a VV to an LHC experiment
- Have a long Q&A session

Evaluate impact with:

- “Pisa like” assessment questions at each phase**
- Use indicators on the success of the event analysis (# of Z's found, # of Higgs found, e-pair/ μ -pair)**
- Pre and post creativity questionnaires**



HYPATIA DEMONSTRATOR ENGLISH v.2

ORIENTING & ASKING QUESTIONS

HYPOTHESIS GENERATION & DESIGN

PLANNING & INVESTIGATION

ANALYSIS & INTERPRETATION

CONCLUSION & EVALUATION



- Estimated duration of this activity: 90 minutes
- Additional equipment: A PC/tablet for each student to analyze data with the HYPATIA tool

The HYPATIA tool will help you perform the investigation. Use the user manual for the use of the tool. Visit the ["Application Instructions"](#) document and read pages 18-21. Then...

HYPATIA online is embedded in an educational scenario with a circle of learning phases

The screenshot shows the HYPATIA tool interface. On the left, there are two detector views: a top-down view of the ATLAS detector and a side-view cross-section. A 'ZOOM IN' button is visible in the top left of the top-down view. On the right, there are control panels for event selection and data display. The event information shows 'Event: 1/50 (899368/204796) 2012-06-11' and 'ETMiss: 30.54 GeV φ: -1.02 rad'. Below this, there are buttons for 'Previous Event', 'Next Event', 'Insert Electron', 'Insert Muon', and 'Delete Track'. A table at the bottom left displays particle tracks with columns for 'Tra +/-', 'p [GeV]', 'p_T [GeV]', 'φ [rad]', and 'θ [rad]'. The table contains three rows of data. To the right of the table, there is a text area with the name 'C.Kourkoumelis'.

Tra +/-	p [GeV]	p _T [GeV]	φ [rad]	θ [rad]
2014/2017	2.87	2.51	3.061	2.075
Tra +	5.54	5.49	0.124	1.428
Tra -	3.38	3.05	3.061	2.012

“Pisa like” assessment questions

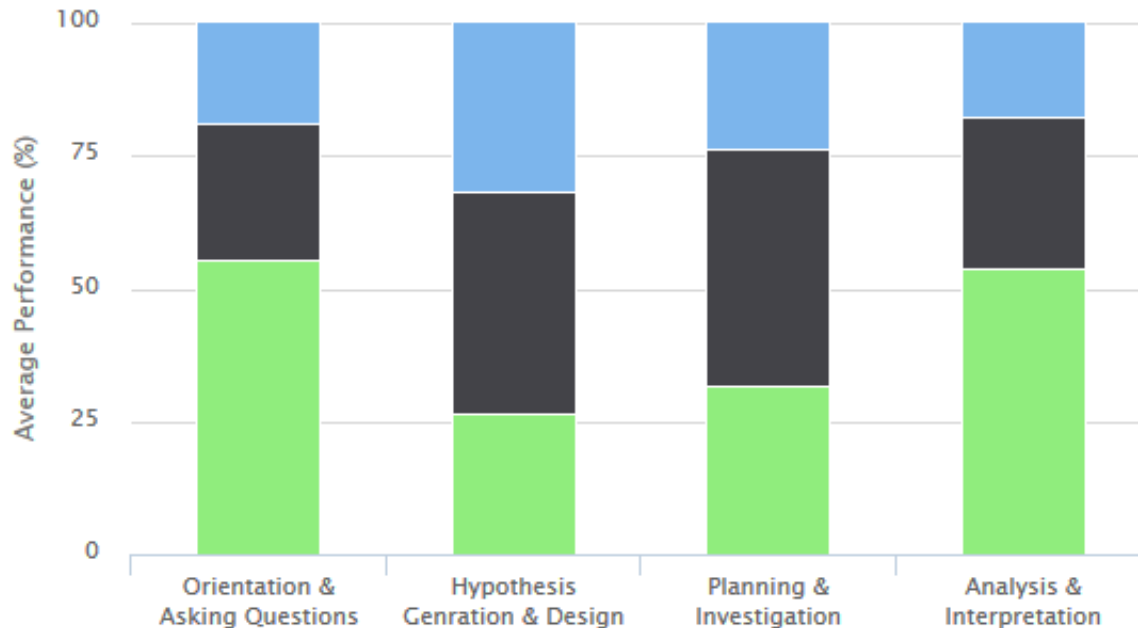
Had 39 runs with ~520 students answering all 2*4 questions

General information

Total runs:	39
Run Avg. Duration:	1:27:20
Students Participated:	709
Students Completed PSQ:	518 (73.1%)
Period From:	02/05/2015
Period To:	03/11/2017

Class Profile

Number of replies Percentage (%)



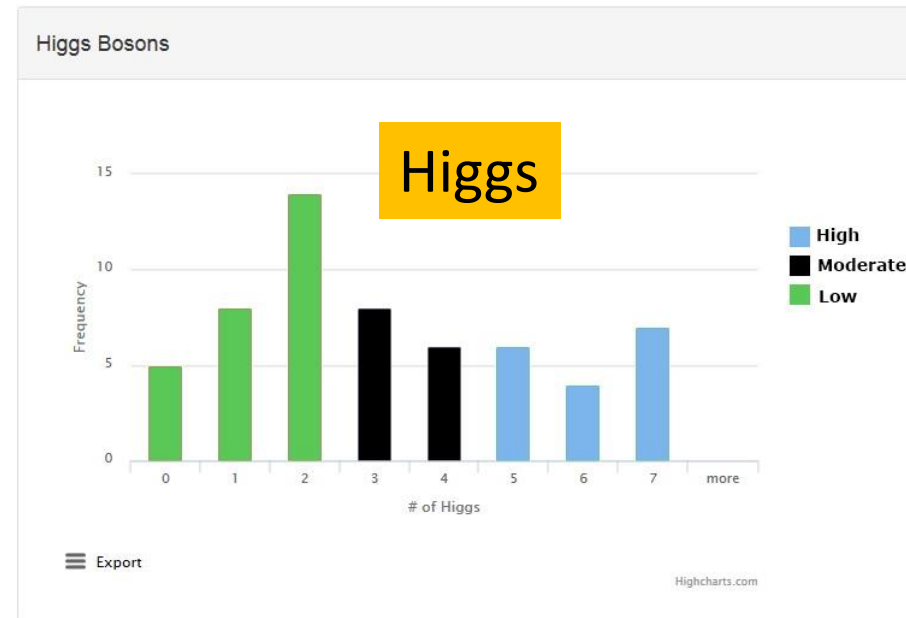
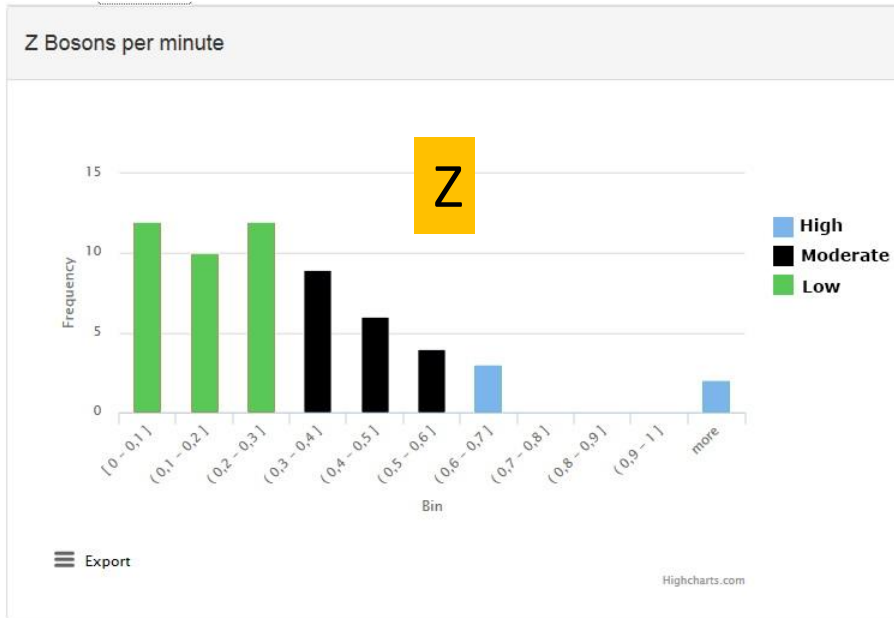
Results/phase
Green=L
Black=M
Blue=H

Students outperform the OECD averages

Built in HYPATIA indicators

- In December 2016 we introduced a system that rates student performance **within the HYPATIA online** tool
- The system uses a combination of the **7 parameters** to give an overall rating of **low, moderate or high** to each student
- In addition, the histograms of 5 parameters are represented individually, completing the student evaluation

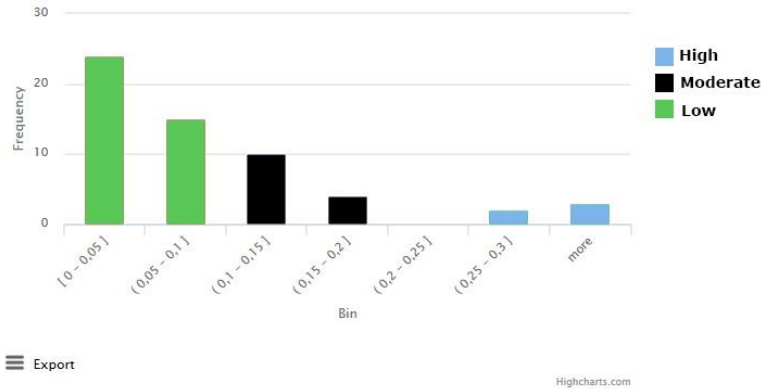
Z Bosons / Higgs bosons per minute



- Here we want the students to find as many Z/Higgs bosons as possible
- Students are given a limited amount of time and this is why we normalize their performance on time

Absolute number of Higgs bosons found

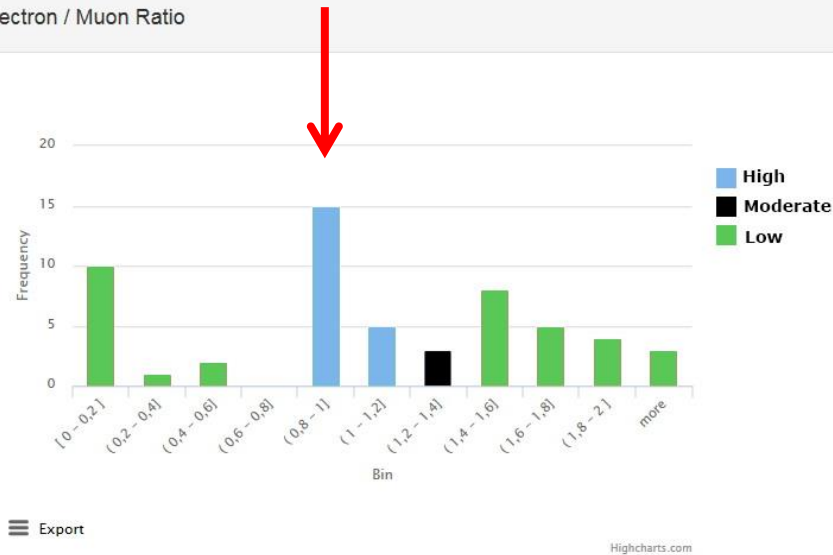
Higgs Bosons per minute



Additional
success indicator

Electron pair/Muon pair ratio

Electron / Muon Ratio

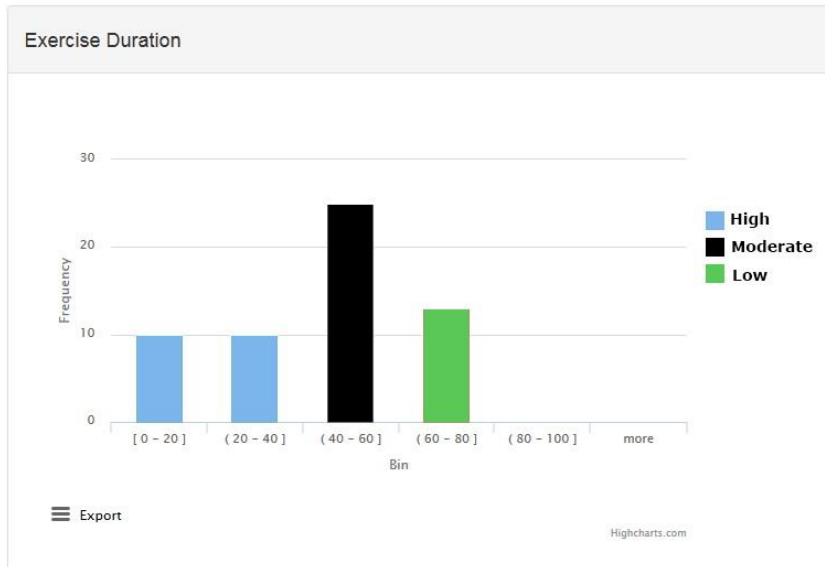


We evaluate the
students' ability to
identify different particle
signatures

Implementation

Exercise duration

Average Duration of analysis ~70 mins

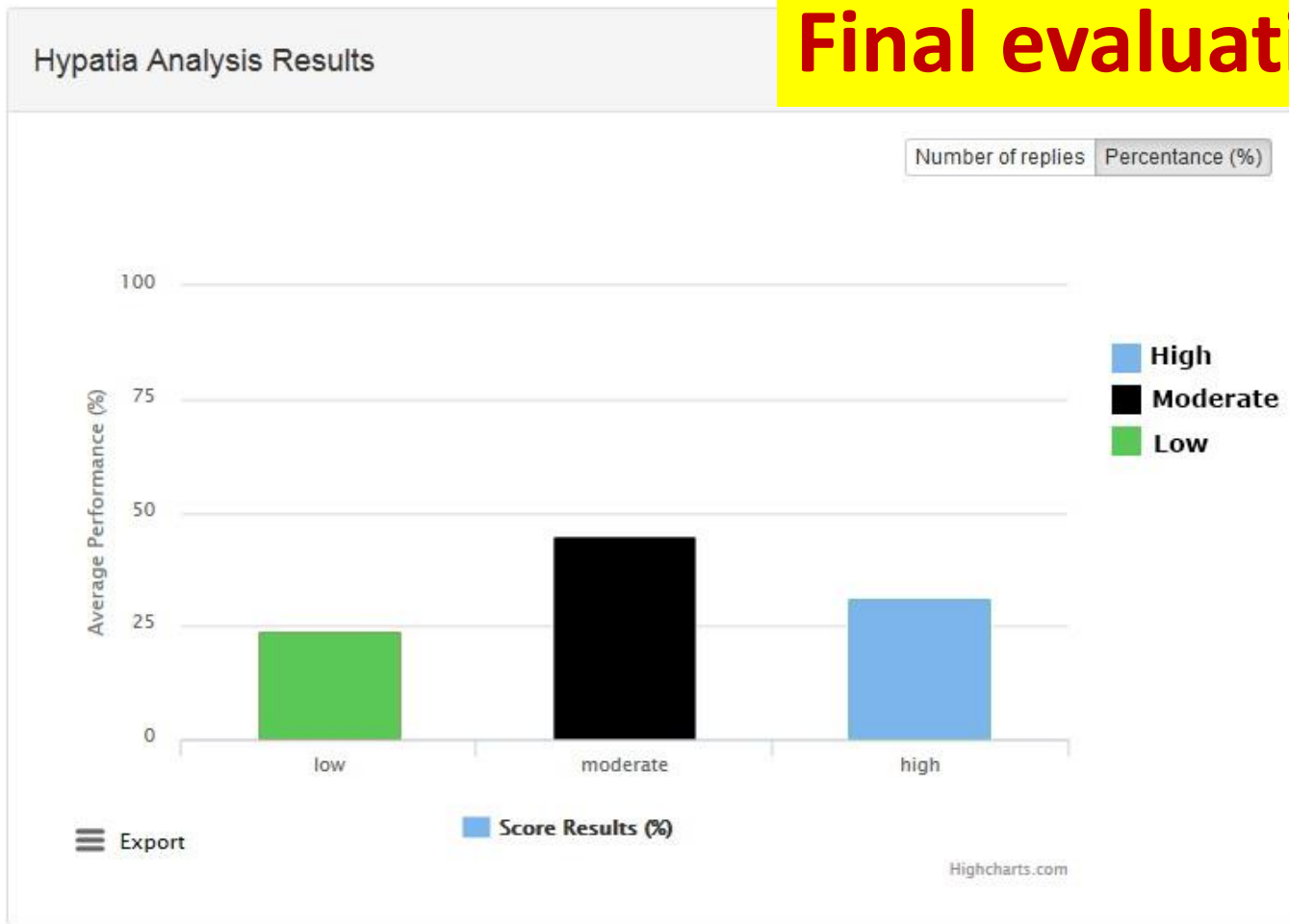


- We have had **5 runs** with the new analysis methodology
- Data on a total of **72 students** has been analysed

Hypatia information

Number of students:	72
Number of schools:	3
Number of runs:	5
Period From:	12/17/2016
Period To:	03/16/2017

Final evaluation



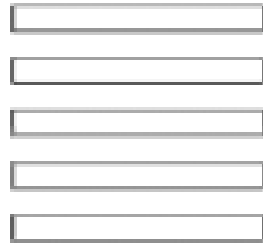
A total of 7 parameters (including the 5 shown above) **are combined** to give the final 72 student sample rating

Creativity questionnaire: Filled by all students

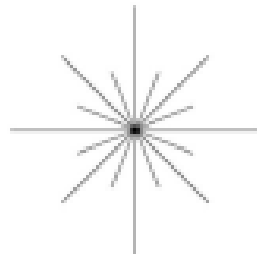
PRE-→ Days before the intervention

POST-→ Immediately after

Now look at the first below and write down as many things as you can for what that figure might be. What does it look like? What could it be?



Now make a list of all of the things that this figure could be. Remember, the more things you write down, the better!



Now for the last figure. Remember that there are no grades, this is a game, and you should list as many things as you can!

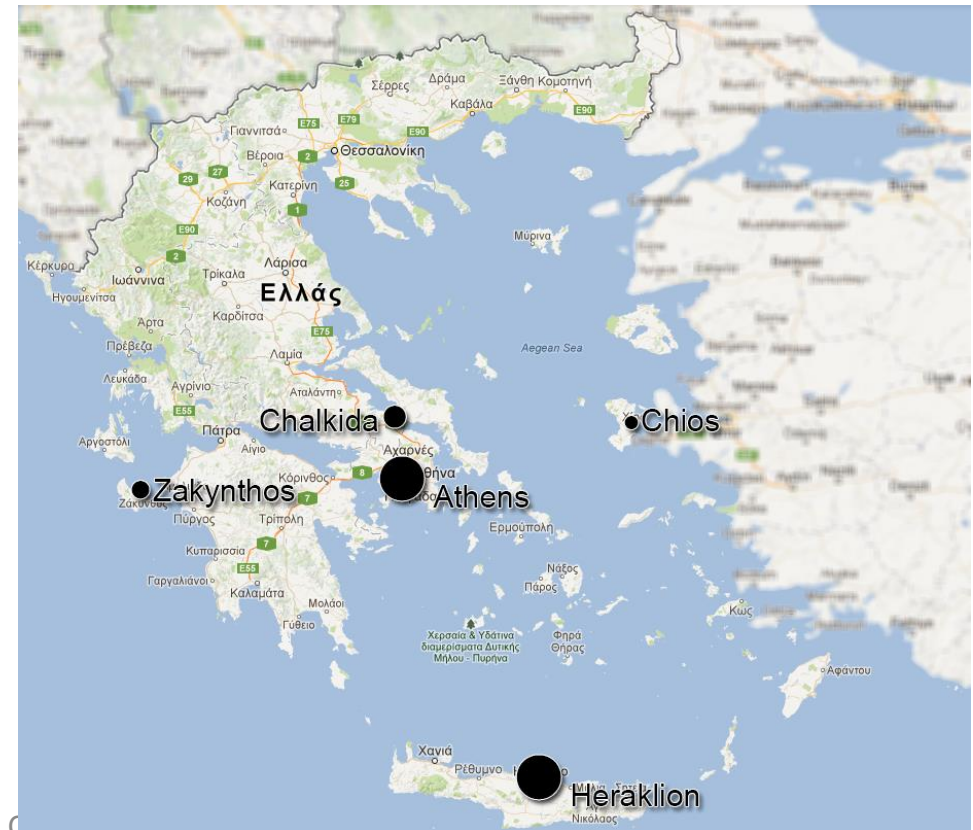


Does their interpretation of the **three shapes** change given the exposure to HEP??

Conclusions

- Since the beginning of the school year we have added **two more assessment tools** in order to monitor the effectiveness of the CREATIONS HEP interventions
- We are in the process of evaluation and collecting statics from more scheduled runs

- ❑ **First indicators show very positive results**
- ❑ **Students are enthusiastic, eager to learn**



Back up

<http://tools.inspiringscience.eu/delivery/view/index.html?id=41fbf7bc710a470aa531911f744973cf&t=p>

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 LISTEN CONTENT

Orienting: Provide contact with the content and/or provoke curiosity