

# Learning Analytics or how to improve the teaching and learning processes from data

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- ✓ Defining Learning Analytics
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# Data Explosion

- ✓ More and more data is available.
- ✓ Data-driven decision making is common in many fields.
- ✓ Higher education has traditionally been inefficient in its data use.



# Special Considerations

Addressing  
organizational  
resistance

The complex  
nature of  
educational data

Ethical and legal  
concerns

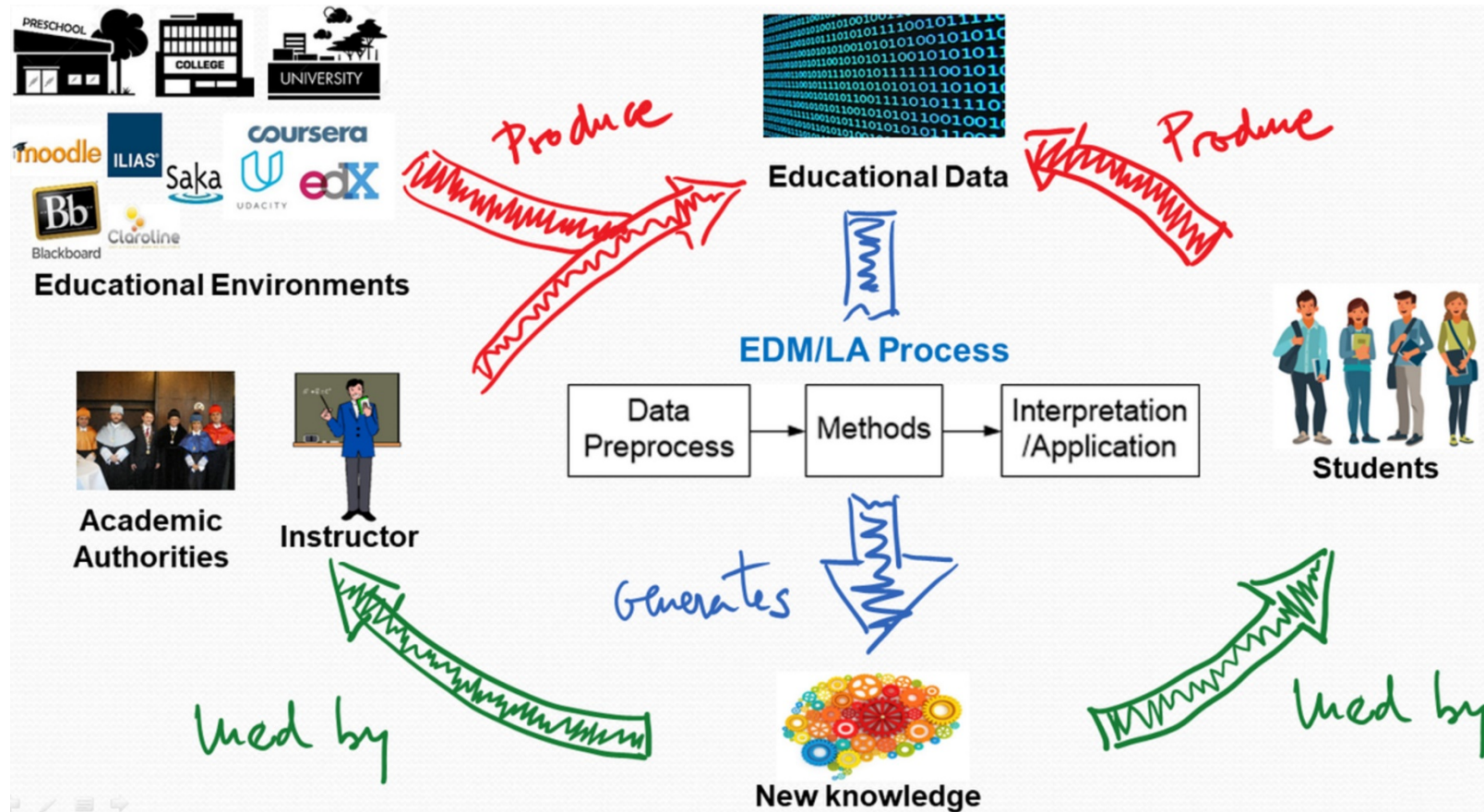
# Defining Learning Analytics

- ✓ Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimising learning and the environments in which it occurs.

Long, P., & Siemens, G. (2011, September 12). Penetrating the Fog: Analytics in Learning and Education | EDUCAUSE. EDUCAUSE. <https://er.educause.edu/articles/2011/9/penetrating-the-fog-analytics-in-learning-and-education>

- ✓ **Learning Analytics** is the development and application of **data science methods** to the distinct characteristics, needs, and concerns of educational contexts and the data streams they generate for the purpose of **better understanding and supporting learning processes and outcomes**.

Wise, A. F. (2019). Learning Analytics: Using Data-Informed Decision-Making to Improve Teaching and Learning. In Contemporary Technologies in Education (pp. 119–143). Springer International Publishing. [https://doi.org/10.1007/978-3-319-89680-9\\_7](https://doi.org/10.1007/978-3-319-89680-9_7)



Romero, C., & Ventura, S. (2020). Educational data mining and learning analytics: An updated survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 10(3). <https://doi.org/10.1002/WIDM.1355>

**Could Learning Analytics**  
help us to **improve student**  
**learning** in our particular  
context?





# Data Sources

Demographics

Prior  
educational  
background

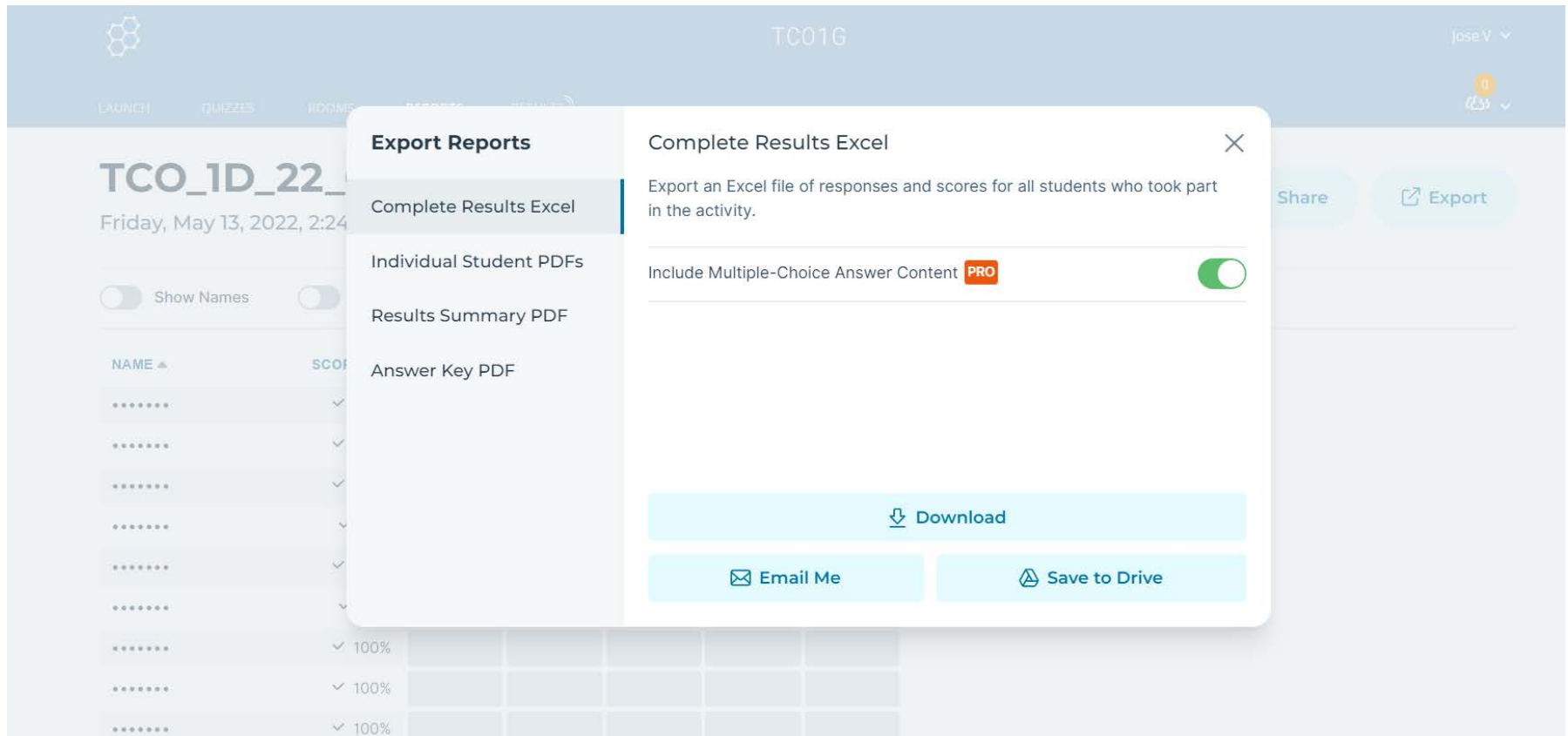
Data from  
physical space

Log data  
(educational  
environments)

Artifact data  
created by a  
student

Academic  
performance






The screenshot shows the Socrative interface for a quiz titled "TCO16". The user is logged in as "Jose V". The "Export Reports" menu is open, showing options: "Complete Results Excel", "Individual Student PDFs", "Results Summary PDF", and "Answer Key PDF". The "Complete Results Excel" option is selected, opening a dialog box. The dialog box contains the text: "Export an Excel file of responses and scores for all students who took part in the activity." Below this, there is a toggle switch for "Include Multiple-Choice Answer Content" which is currently turned on (green). At the bottom of the dialog, there are three buttons: "Download", "Email Me", and "Save to Drive".


Obtaining reports from *Socrative* quizzes

1	username	T0_09_09	T1_11_09	T1_16_09	T1_18_09	T1_02_10	T2_08_10	T2_10_10	T3_06_11	T3_18_11	T4_2_12	T4_9_12	T5_16_12	Agregado	#NP	Nota (1)
2		5	2	5	3	4	5	5	5	5	5	5	6	55	0	0,93
3		6	4	3	2	3	5	5	5	4	5	5	6	53	0	0,90
4		6	4	4	2	3	5	3	5	4	4	5	5	50	0	0,85
5		3	1	5	3	3	5	5	4	4	5	5	6	49	0	0,83
6		4	2	5	3	4	4	4	4	3	5	5	6	49	0	0,83
7		6	4	4	2	3	5	4	5	3	5 NP11		5	46	1	0,78
8		5	4	3	2	3	5	4	5	3	4	5	3	46	0	0,78
9		4	4	4	3	3	4	3	3	3	5	5	4	45	0	0,76
10		4	4	3	3	3	4	3	5	3	2	4	5	43	0	0,73
11		5	2	5	3	3	5	2	4	4	4	5 NP12		42	1	0,71
12		5	1	5	3	3	4	3	3	4	4	5 NP12		40	1	0,68
13		5	4	4	3	3	4	5 NP8		3	5 NP11		4	40	2	0,68
14		5	2	4	2	2	5	3	4	3	3 NP11		5	38	1	0,64
15		5	4	4	3	3	4	3	4	3	5 NP11	NP12		38	2	0,64
16		5	4	4	2	3	4	2	3	2	0	4	3	36	0	0,61
17	NP1		4	4	2 NP5		3	3	4	3	3	4	5	35	2	0,59
18		4	2	2	2	3	4 NP7		3	2	5	4	4	35	1	0,59
19		4	2	4	2	3	3	2	4	2	2	5 NP12		33	1	0,56
20		5	4	2	3	3	5	2	2	2	4 NP11	NP12		32	2	0,54
21		5	2	4	3	3	4	4	4	3 NP10	NP11	NP12		32	3	0,54
22		5	2	2	1	2	4	1	2	2	2	5	4	32	0	0,54
23		5	2	3	2	2	3 NP7		3	2	0	5	4	31	1	0,53
24		4	2	3	2	3	3	0	3	1	4	5 NP12		30	1	0,51
25		4 NP2		2	2	3 NP6	NP7		3 NP9		5	5	4	28	4	0,47
26		3	2	3	0	3	3	2	0	2	1	3	5	27	0	0,46
27		4	2	4	2 NP5		3	3	4	2	0 NP11	NP12		24	3	0,41
28		4	2	4	2	3	3	2 NP8		2	2 NP11	NP12		24	3	0,41
29		5 NP2		4	2	2	3 NP7	NP8		2 NP10	NP11		4	22	5	0,37
30		1 NP2		1	1	2	1	2	3	2	0	3	2	18	1	0,31
31		3 NP2		3	1	2 NP6	NP7	NP8	NP9	NP10	NP11	NP12		9	8	0,15
32		3 NP2		1	0	2 NP6	NP7	NP8	NP9	NP10	NP11	NP12		6	8	0,10
33		3 NP2		1 NP4		2 NP6	NP7	NP8	NP9	NP10	NP11	NP12		6	9	0,10
34	NP1	NP2		2	0	3 NP6	NP7	NP8	NP9	NP10	NP11	NP12		5	9	0,08
35	NP1	NP2	NP3	NP4	NP5	NP6	NP7	NP8	NP9	NP10	NP11	NP12		0	12	0,00
36	NP1	NP2	NP3	NP4	NP5	NP6	NP7	NP8	NP9	NP10	NP11	NP12		0	12	0,00
37	# items	6	4	5	3	5	5	5	5	5	5	5	6	59		
38	#NP	4	9	2	3	4	7	10	9	7	8	15	15	Total items		
39	#P	31	26	33	32	31	28	25	26	28	27	20	20			


Aggregated scores for all students who took part in the activities (Socrative Quizzes)

 **What?** Select activity to report.


Activity:

 **When?** Select time period to report.

Period:  (PoliformaT server time zone)

 **Who?** Select users to report.

Users:

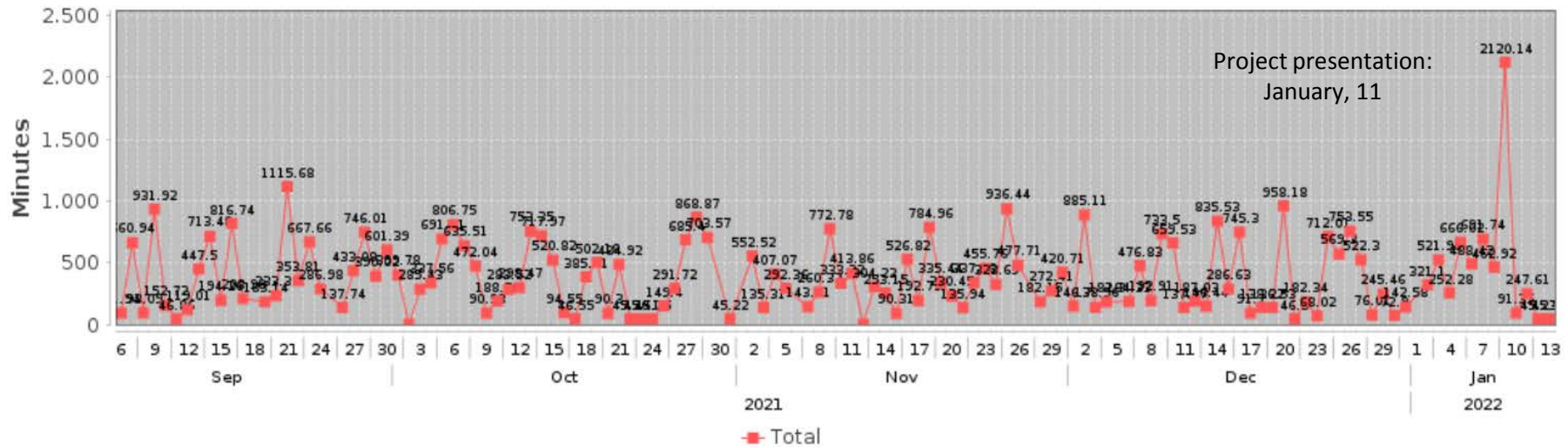
 **How?** Specify how results should be presented.

Totals by:

Number of results: ☐ Limit to:

Presentation:

How to get a new report from *PoliformaT* (UPV Learning Management System)?



Site: "Elr" (DOC\_33421\_2021)

Activity type: Presence Time

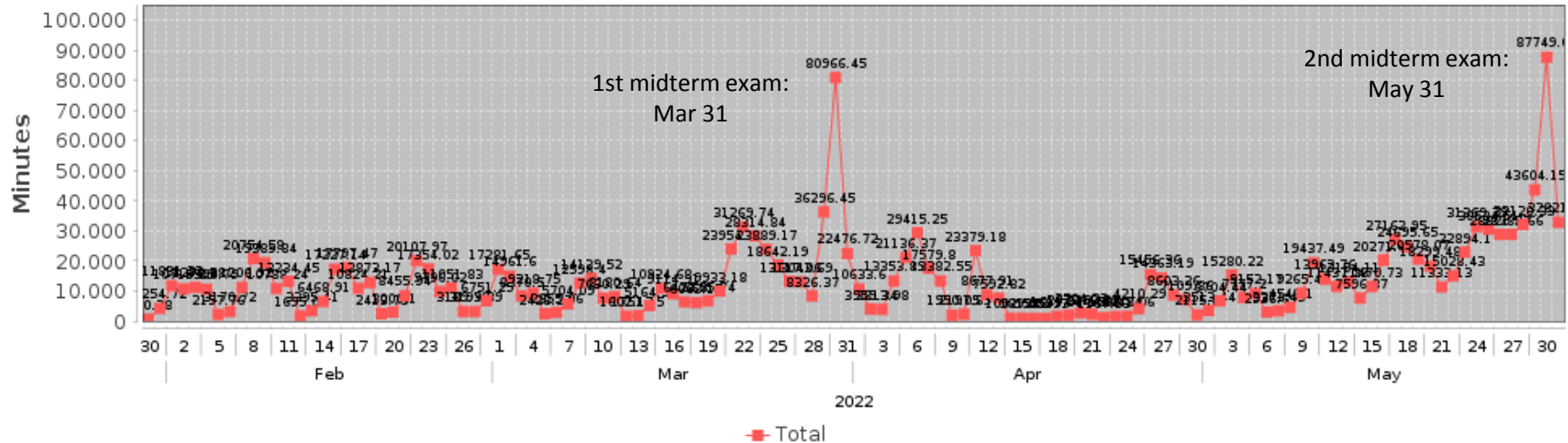
Date range: Sep 6, 2021 - Jan 13, 2022

User selection type: Role

Role selected: Student

Report generated: Jun 2, 2022 4:07 PM CEST

Date	Duration (min.)
Jan 9, 2022	2120,1
Sep 21, 2021	1115,7
Dec 20, 2021	958,2
Nov 25, 2021	936,4
Sep 9, 2021	931,9
Dec 2, 2021	885,1
Oct 28, 2021	868,9
Dec 14, 2021	835,5
Sep 16, 2021	816,7
Oct 6, 2021	806,8



Site: "Tecnología de computadores GII" (GRA\_11544\_2021)

Activity type: Presence Time

Date range: Jan 30, 2022 - May 31, 2022

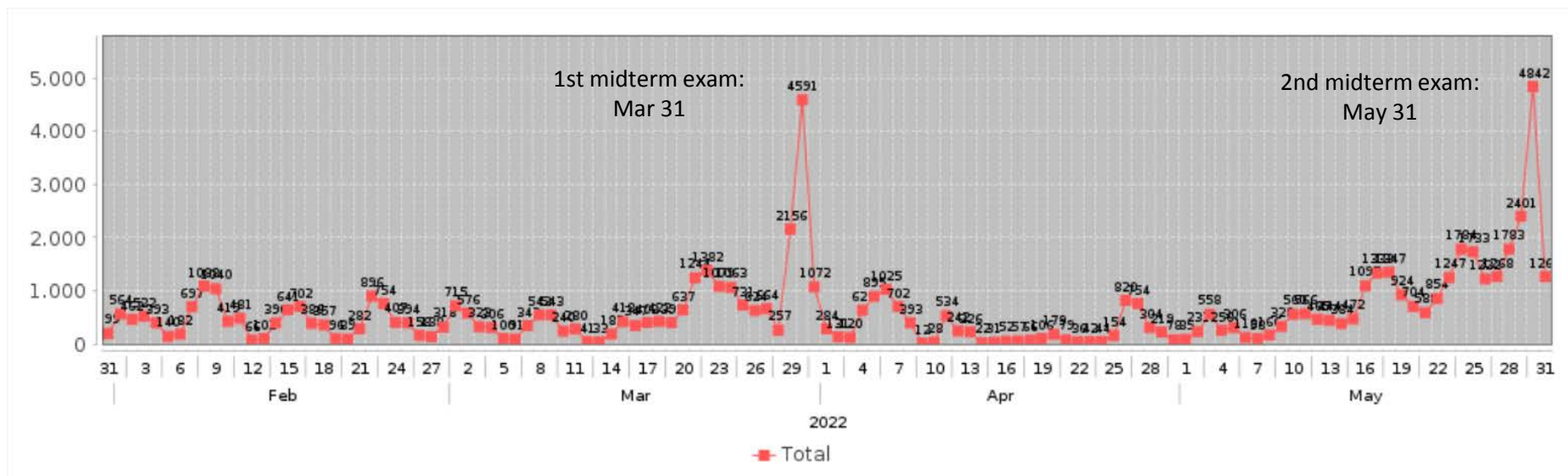
User selection type: Role

Role selected: Student

Report generated: Jun 02, 2022 4:25 PM CEST

Date	Duration (min.)
May 30, 2022	87749,1
Mar 30, 2022	80966,4
May 29, 2022	43604,1
Mar 29, 2022	36296,5
May 31, 2022	32821,8
May 28, 2022	32120,3
May 24, 2022	31369,8
Mar 22, 2022	31269,7
May 25, 2022	30534,5
Apr 6, 2022	29415,2





Site: "Tecnología de computadores GII" (GRA\_11544\_2021)

Activity type: Events (Select by tool)

Tools selected: Resources

Date range: Jan 30, 2022 - May 31, 2022

User selection type: Role

Role selected: Student

Report generated: Jun 2, 2022 4:45 PM CEST

Date	Total
May 30, 2022	4842
Mar 30, 2022	4591
May 29, 2022	2401
Mar 29, 2022	2156
May 24, 2022	1784
May 28, 2022	1783
May 25, 2022	1733
Mar 22, 2022	1382
May 18, 2022	1347
May 17, 2022	1333

# Example 1. Course Signals (Purdue Univ.)

Aims to help students understand their progress at a course level

Data sources:

- ✓ Student performance
- ✓ Engagement (interaction with the LMS)
- ✓ Past performance and students characteristics

These components are weighted and fed into a predictive algorithm to produce a 'traffic light' showing how at risk each student is considered to be.

A range of interventions can be taken by the instructor.

Arnold, K. E., & Pistilli, M. D. (2012). Course signals at Purdue. *Proceedings of the 2nd Int. Conf. on Learning Analytics and Knowledge*, 267–270. <https://doi.org/10.1145/2330601.2330666>





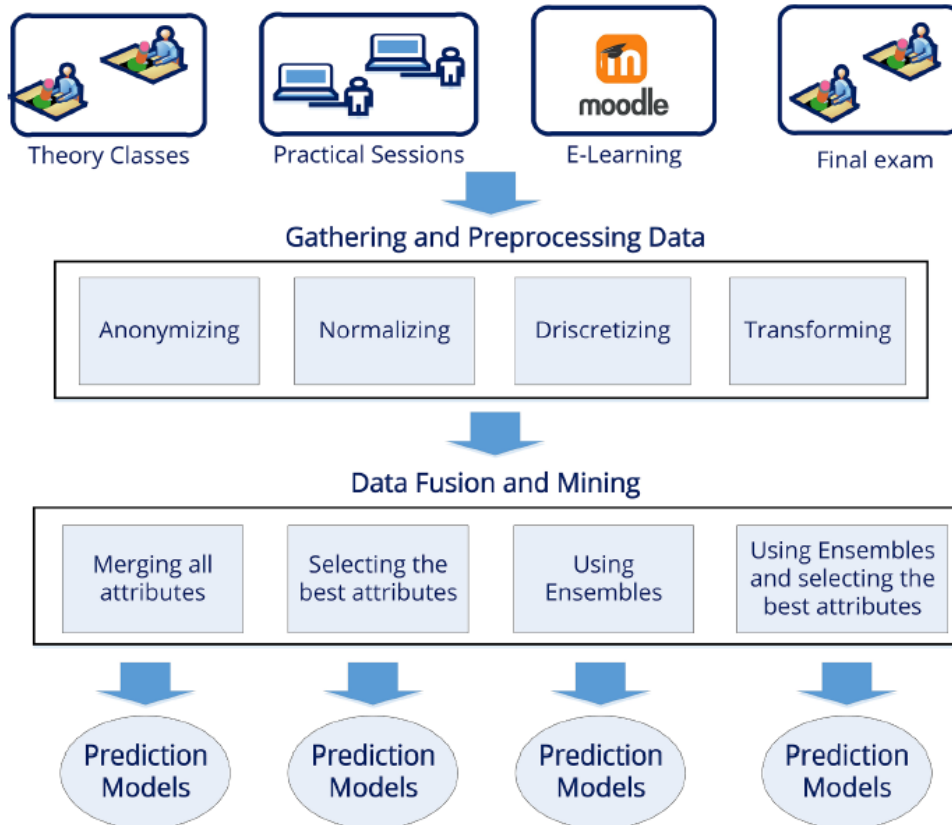
## Example 2. Multimodal LA

Aims to predict the final academic performance using multiple-source and multimodal data from blended learning environments.

Data sources:

- ✓ Theory classes (data extracted from videos)
  - Attendance / Location / Attention / TakeNotes
- ✓ Practical sessions
  - Attendance / Score
- ✓ Online Moodle sessions
  - ✓ Quiz scores / Forum actions / Tasks uploaded / Time spent
- ✓ Final exam mark

Chango, W., Cerezo, R., & Romero, C. (2021). Multi-source and multimodal data fusion for predicting academic performance in blended learning university courses. *Computers & Electrical Engineering*, 89, 106908. <https://doi.org/10.1016/J.COMPELECENG.2020.106908>



*“The best prediction models show us that the level of attention in theory classes, scores in Moodle quizzes, and the level of activity in Moodle forums are the best set of attributes for predicting students’ final performance in our courses.”*

# Current topics of interest of LA research

- ✓ Collaborative learning and teamwork group
- ✓ Dashboards and visual learning analytics
- ✓ Early warning systems
- ✓ Measuring self-regulated learning
- ✓ Game learning analytics
- ✓ Multimodal learning analytics
- ✓ Providing personalized feedback
- ✓ Writing analytics

...

Romero, C., & Ventura, S. (2020). Educational data mining and learning analytics: An updated survey. *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, 10(3). <https://doi.org/10.1002/WIDM.1355>

# Conclusions

According to the conclusions of a recent study about LA in European HE:

*Teaching and support staff are found to be the main users of LA...*

*In contrast, there is little evidence of active engagement with students or using LA to develop self-regulated learning skills. We highlight the importance of grounding LA in learning sciences and including students as a key stakeholder in the design and implementation of LA.*

Tsai, Y. S., Rates, D., Moreno-Marcos, P. M., Muñoz-Merino, P. J., Jivet, I., Scheffel, M., Drachsler, H., Delgado Kloos, C., & Gašević, D. (2020). Learning analytics in European higher education—Trends and barriers. *Computers & Education*, 155, 103933.  
<https://doi.org/10.1016/J.COMPEDU.2020.103933>

An invitation to work together (instructors, administrators, data scientists, learning scientists and why not, students).

# THANK YOU

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