

# Learning Analytics and Survey Data Integration in Workload Research

Studentischer Workload: Definition, Messung und Einflüsse  
QUANTEL, 23 June 2016

# Problem Definition: Why Workload?

Workload as an essential component of teaching effectiveness (KEMBER, 2004; MARSH, 2001)

- fit between student effort and the course task (COPE & STAEHR, 2005)
- excessive workload is associated with surface learning (BACHMAN & BACHMAN, 2006) and lack of success (COPE & STAEHR, 2005)



# Problem Definition: Why Workload?

## European Credit Transfer System (ECTS)

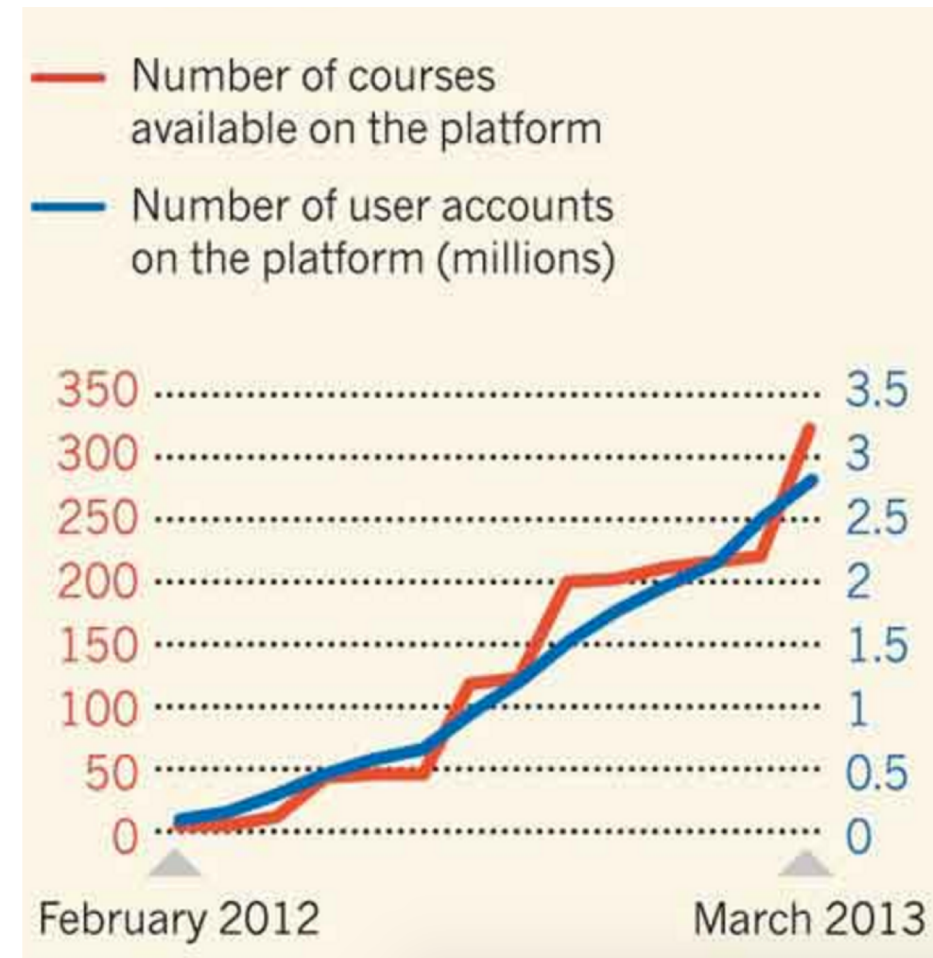
- workload as a a common “currency”
- workload defined as **time** an individual student needs to spend on all learning activities within class as well as outside of class (i.e., internship and individual study time)



# Problem Definition: Why Workload?

## Workload in online learning

- workload as a “control check”: is an online class as demanding as a traditional class?
- workload as a predictor of dropout in online learning (BOWYER, 2012; ASHBY, 2004)



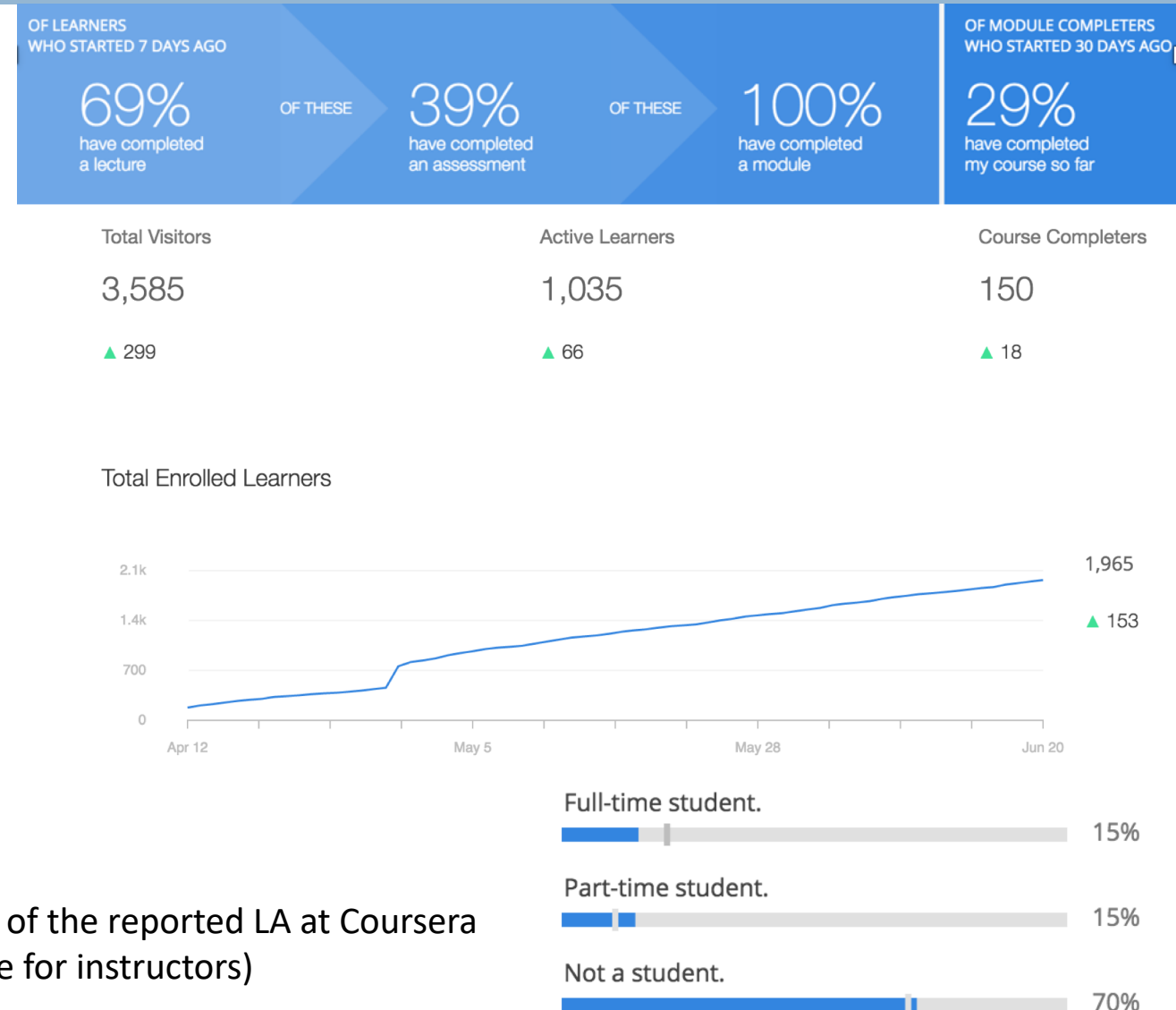
Coursera (2013)

# Problem Definition: Why LA?

## Learning Analytics (LA)

- includes the measurement, collection, analysis, and reporting of learners' data.
- Is used for the “purposes of understanding and optimising learning and the environments in which it occurs” (FERGUSON, 2012, p. 305).
- is usually used for predicting disengagement and dropouts, but not yet used for the measurements of workload

Example of the reported LA at Coursera  
(available for instructors)



# Problem Definition: Why LA?

## Survey Data

+ common way of measuring workload

BUT

- additional task of recall and estimation
- could be a sensitive question: social desirability bias
- nonresponse and missing data

## LA Data

+ low burden for respondents

+ no problem with nonresponse

+ less prone to social desirability bias

BUT

- new (not well researched) method of measuring workload
- cannot capture subjective states such as beliefs, attitudes, and satisfaction
- incomplete

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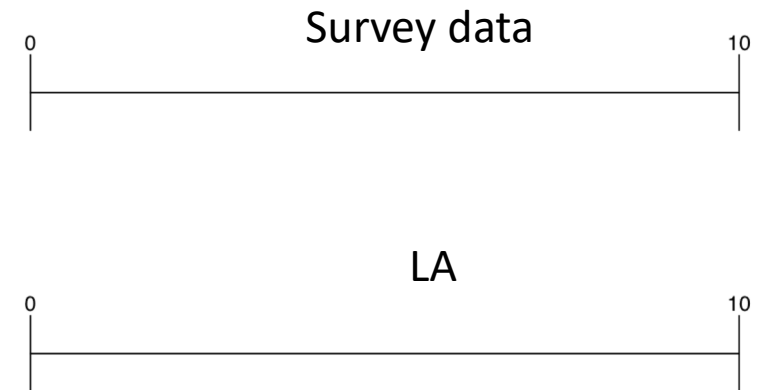
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Measurement Error

# Pilot Study: Goals

- Compare two different methods of workload measurement – survey data collection and LA
- Workload defined as time an individual spends on learning activities
- LA is not “Validation data”: it is NOT error-free
- Instead: Criterion Validity (Basic sanity check)

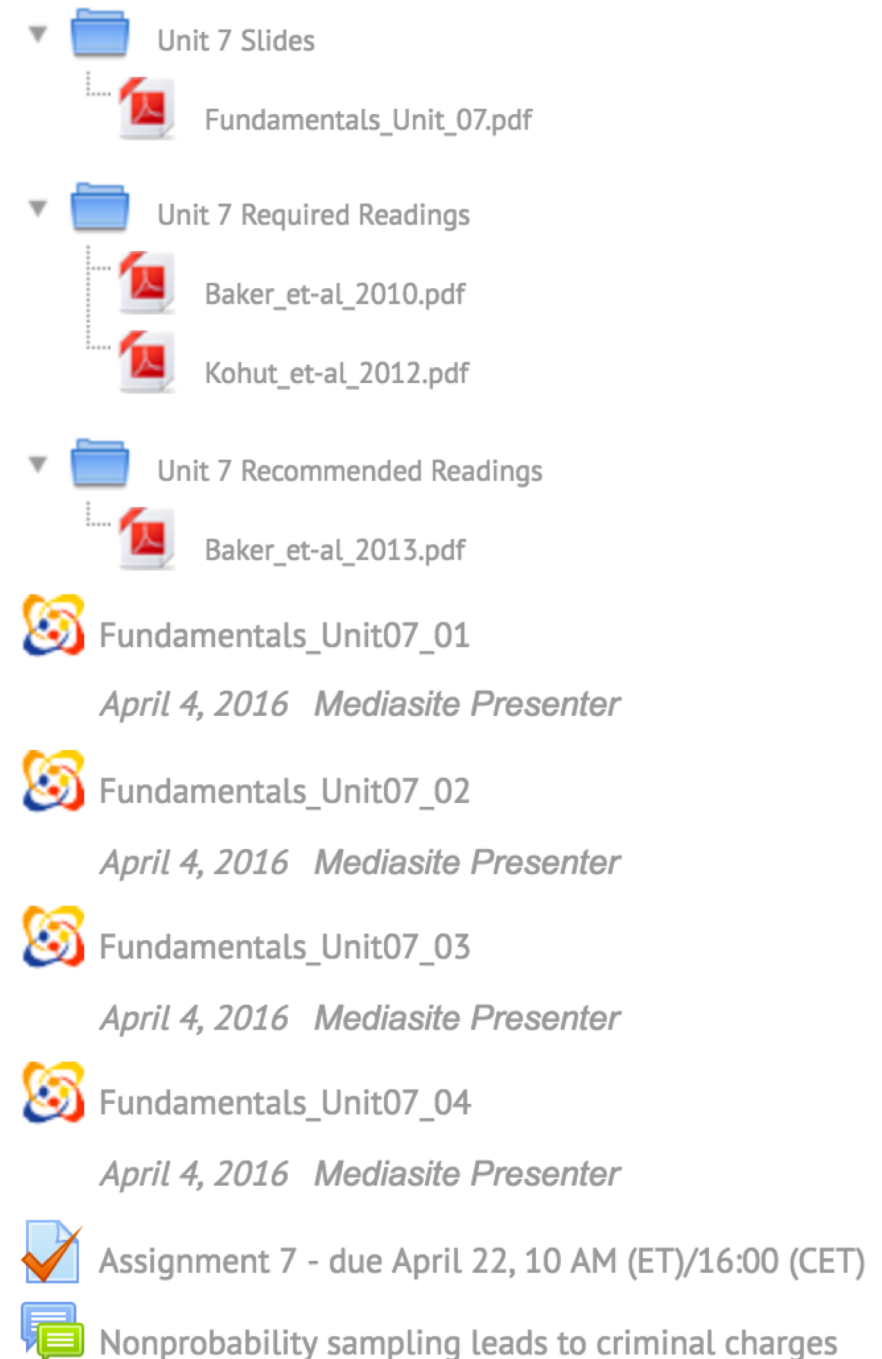
During the past week, how much time did you spend (in hours) on watching pre-recorded lecture-videos?





# Pilot Study: Methodology

- 12 weeks of an online course “Fundamentals of Survey and Data Science” (February and May 2016)
- Required course within International Program in Survey and Data Science (IPSDS)
- Course Components: pre-recorded video lectures, weekly online assignments, weekly required and recommended readings, and synchronous meetings via the online video conferencing system *BlueJeans*



Unit 7 Slides

- Fundamentals\_Unit\_07.pdf

Unit 7 Required Readings

- Baker\_et-al\_2010.pdf
- Kohut\_et-al\_2012.pdf

Unit 7 Recommended Readings

- Baker\_et-al\_2013.pdf

Fundamentals\_Unit07\_01  
April 4, 2016 Mediasite Presenter

Fundamentals\_Unit07\_02  
April 4, 2016 Mediasite Presenter

Fundamentals\_Unit07\_03  
April 4, 2016 Mediasite Presenter

Fundamentals\_Unit07\_04  
April 4, 2016 Mediasite Presenter

Assignment 7 - due April 22, 10 AM (ET)/16:00 (CET)

Nonprobability sampling leads to criminal charges

# Pilot Study: Methodology

- 16 participants  
(all working professionals)
- median age 29.5
- 10 women, 6 men
- 2 students were located  
outside of Europe

	mean/%	median	<u>sd</u>
Working hours (week)	40.75	41	12.19
First online course	56 %		
Hours/week expected to spend on the course	8.69	8	3.02
Familiarity with the subject taught in the course:			
-Not at all familiar	0		
-A little familiar	25 %		
-Somewhat familiar	44 %		
-Very familiar	31 %		

# Data Source #1: Learning Analytics

- was meaningful only for watching pre-recorded video lectures
- collected via *mediasite* software
- students could watch videos only via streaming, no downloading allowed
- videos allowed for pausing, moving forward and backward by jumping to a specific point, rewatching (parts) of the video, and changing the speed of the video

**Example for a 10 minute video B**

Participant	Views	Total time watching	Time covered	% Watched
A	1	00:14:00	00:10:00	100%

# Data Source #2: Survey Data

**During the past week, how much time did you spend (in hours) on the activities below?**

If you don't know precisely, then please provide your best estimate.

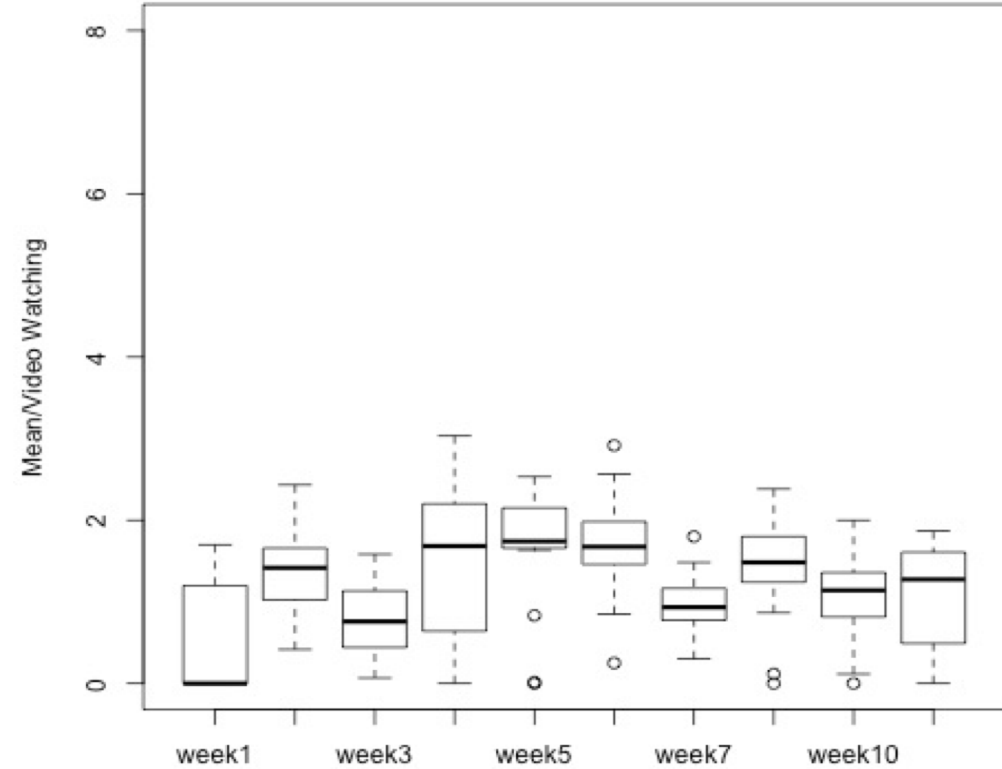
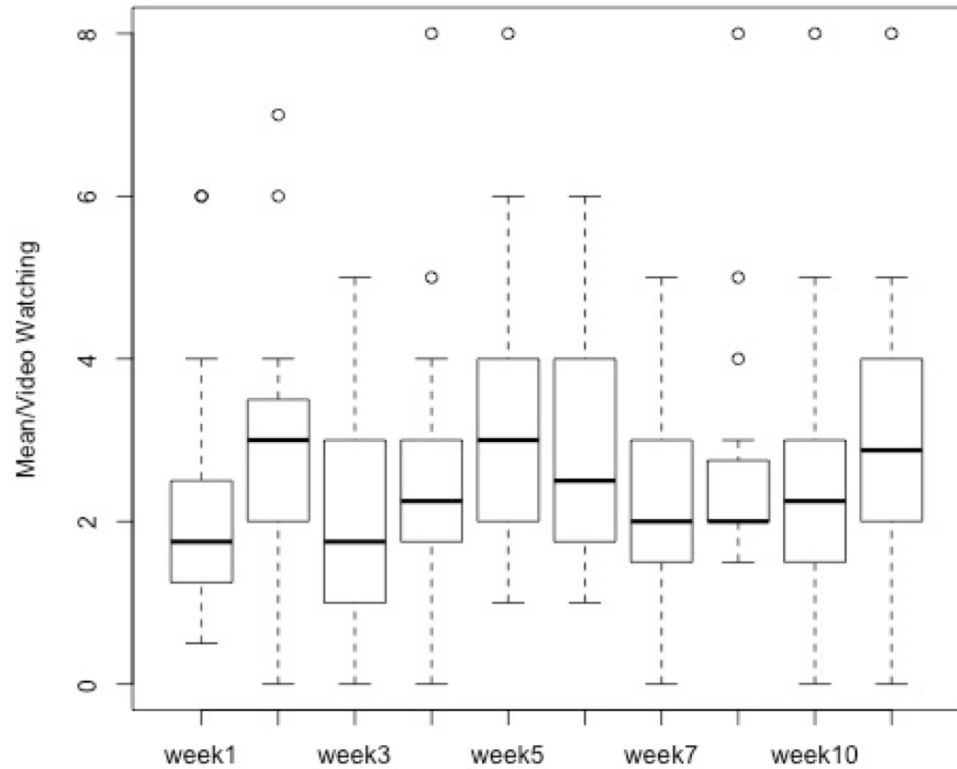
Watching pre-recorded lecture videos	<input type="text"/>
Doing required readings	<input type="text"/>
Doing recommended readings	<input type="text"/>
Completing course assignments	<input type="text"/>
Discussing course topics with other participants outside of the BlueJeans meetings	<input type="text"/>
Other course-related work	<input type="text"/>
Paid Work	<input type="text"/>
Household chores	<input type="text"/>
Child care	<input type="text"/>
Leisure	<input type="text"/>

- 12 weekly web-based surveys programmed in unipark EFS survey software version EFS 10.9
- Questions: time-use including, three items from the ARCS motivation scale by Keller (2009), satisfaction with the learning materials of a week, and perceived level of stress in the respective week
- Survey invitations were sent to students every Friday evening after the deadline for the submission of the weekly assignment

# Workload (in hours) by the data source used

	Mean	Median	sd
<b>Time (in hours) spent on watching videos (all 12 weeks)</b>			
LA	1.19	1.32	0.48
Survey	2.67	2.15	1.32
<b>Other Survey Workload Items</b>			
Time (in hours) spent on completing assignment	1.60	1.45	0.68
Doing Readings (both required and recommended)	3.51	2.83	1.57
Discussing Course topics (outside of weekly online meetings)	0.05	0	0.11
Other course-related work	0.74	0.6	0.57
Time (in hours) spent on completing assignment	1.19	1.32	0.48

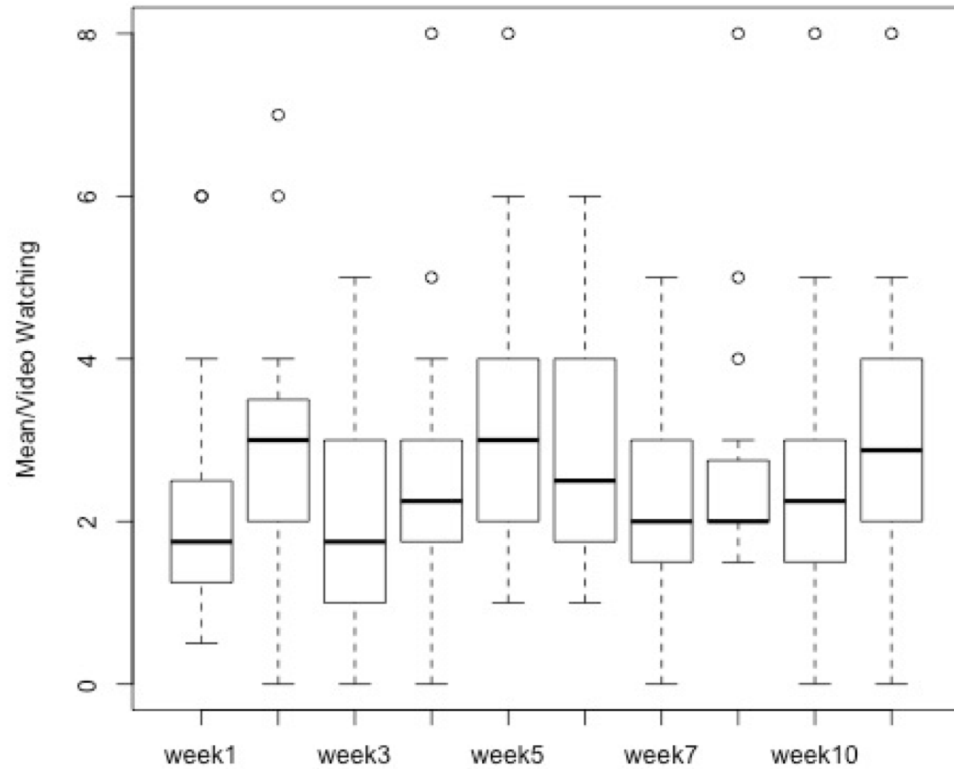
# Video watching (in hours) by the data source used



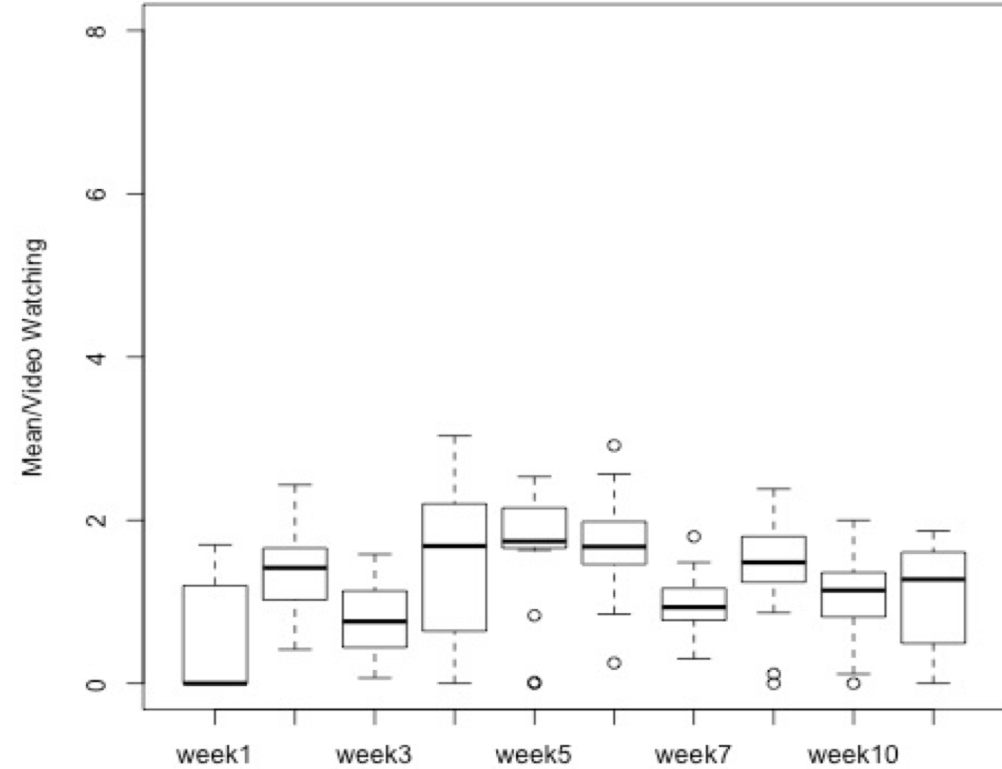
# Video watching (in hours) by the data source used

$\text{cor}(\text{Survey VW}, \text{LA VW})=0.16$

Survey Data

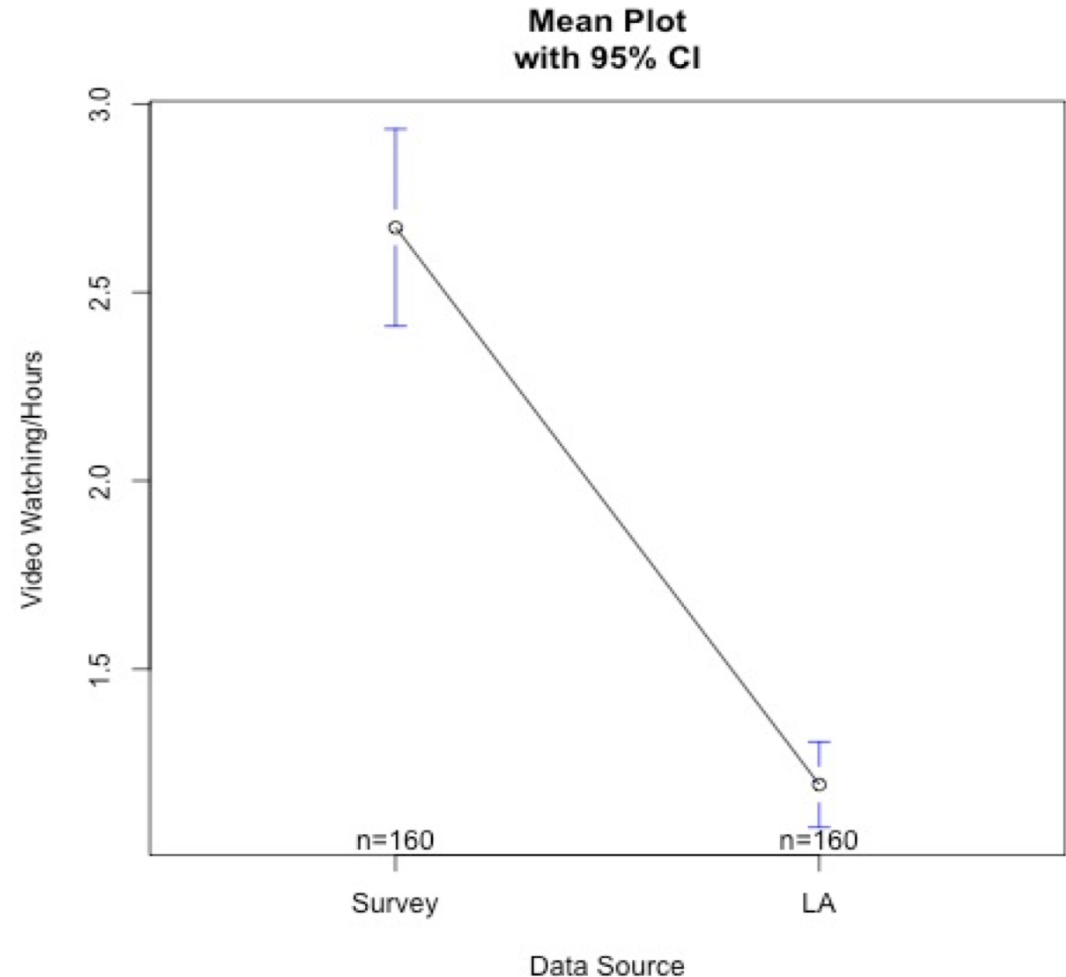


LA Data



# Mean Plot of the survey and LA measures of video watching (in hours)

- Factorial repeated-measures ANOVA:  
Data Source & Weeks
- Eta-squared: significant modest effect of the data source (0.269,  $p < 0.05$ )
- Very small effect of the week (0.006,  $p < 0.05$ ).
- Very small effect of the interaction (0.008,  $p > 0.05$ ).





# „Sanity Check“: Correlations with other variables

Data Source	Grades for weekly assignments	Satisfaction with the weekly units	Self-reported time spend on assignments
Survey	0.18	0.30	0.30
LA	0.53	0.07	-0.51

# Conclusion

- The two methods not only provide different average estimates for the time spent on watching prerecorded lecture videos (with a difference of 1.5 hours), but also seem to have different relationships with other variables
- Further investigation is needed to identify what exactly causes the difference (e.g. cognitive interviews).
- In both cases, the average workload is below the designed workload of 12 hours per week. Is average workload appropriate for assessing the effectiveness of the teaching? In the further education for professionals heterogeneity of learners' background is an issue. An alternative approach could be to create different typologies of the learners and their workload.
- The two data sources provide us with more information than we would have yielded based on LA or the survey data alone

# Did we learn anything new?

## Survey Data

+ Common way of measuring workload

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Measurement Error

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LA Data

Measurement Error

#1 Regulations on data privacy in Germany

#2 A notable time investment at the stage of data management

Thank you!