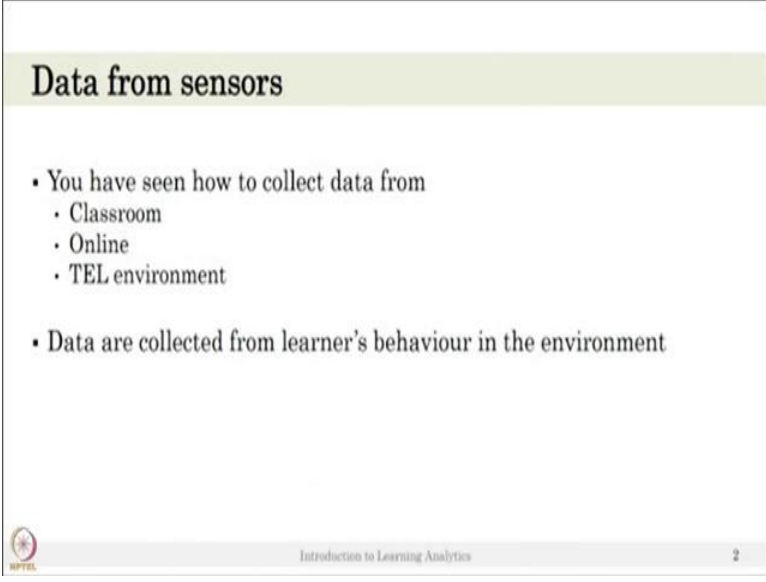


Introduction to Learning Analytics
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Lecture-08
Multichannel data

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Data from sensors

- You have seen how to collect data from
 - Classroom
 - Online
 - TEL environment
- Data are collected from learner's behaviour in the environment

 Introduction to Learning Analytics 2

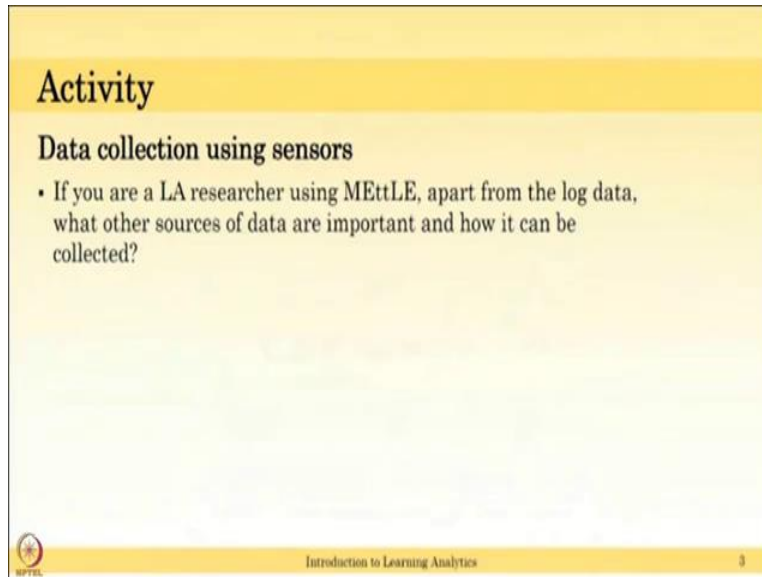
In the last three learning dialogues, you have seen how to collect data from classroom environment, online environment and TEL environment. We discussed how to collect this data also. Like in a classroom environment you can use the students' behavior by human observers or the students' interaction with the systems like Moodle or a test performance all this information.

In a second, in online environment you can track all the user's behavior all the click stream data in the online data has to be collected and we can write a script to convert that raw data into an events or actions. In a TEL environment, it is the environment you developed. So, you have access to what kind of information you want to collect, what kind of information you are interested in. Based on that you can write your own script.

However, we have seen this three types of data collection, all the data collected from learners behavior in the environment such as what the students interacting with the system. We have no idea what student doing, we are not observing a student's behavior instead we are trying to understand students' behavior in the system. Except in the classroom system, I mentioned that you can have the human observers to measure, student's motivation and affective states; all other information is based on student's behavior in the environment.

In today's class we are talking about what is data collection, what kind of data you can collect in different environments and what data we need ok.


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Activity

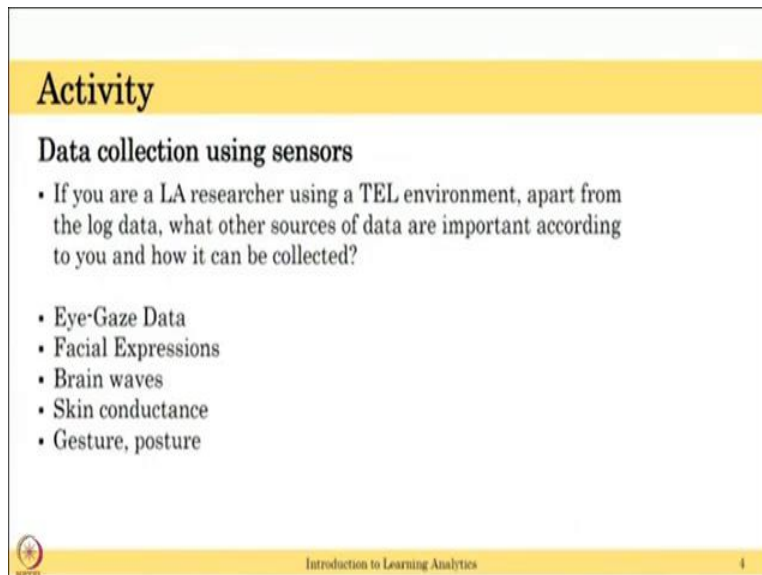
Data collection using sensors

- If you are a LA researcher using MEttLE, apart from the log data, what other sources of data are important and how it can be collected?

 Introduction to Learning Analytics 3

Let us begin with activity. If you are a learning analytic researcher and you are using mettle to run a study, apart from the log data that is we discussed a log data of mettle in last class; what other sources of data are important, how it can be collect? Based on your ideas what other sources can be collected, when the student is interacting with MEttLE? You can pause this video, write down your answers. After completing the task, please resume the video to continue.

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Activity

Data collection using sensors

- If you are a LA researcher using a TEL environment, apart from the log data, what other sources of data are important according to you and how it can be collected?

- Eye-Gaze Data
- Facial Expressions
- Brain waves
- Skin conductance
- Gesture, posture

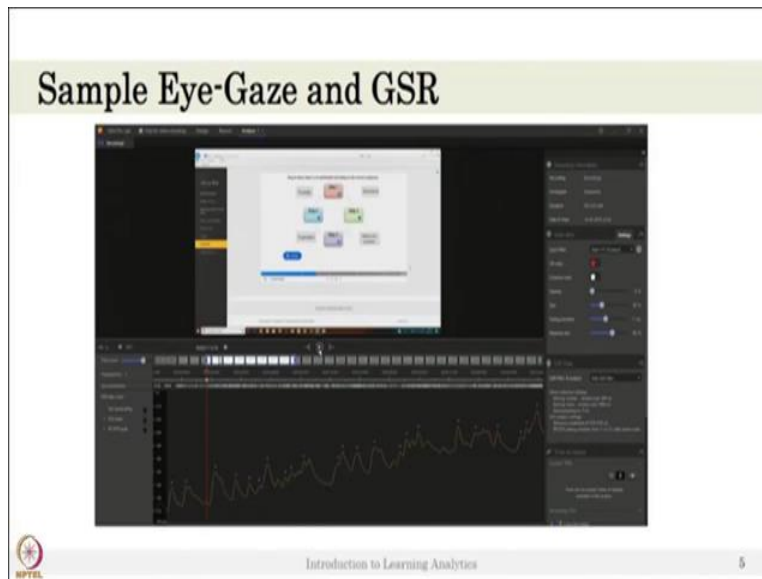
 Introduction to Learning Analytics 4

Data collection using sensors: if you are a learning analytic researcher using TEL environment, we asked what kind of data you would like to collect apart from the log data you can collect data such as eye gaze information, facial expressions, brain waves, skin conductance, gesture and posture. How it can be collected? For eye gaze data, we can collect using eye trackers. There are

portable eye trackers available. It can be attached to laptop to get accurate students eye gaze or simply you can use web camera of the laptop to collect the eye-gaze information.

For facial expressions you can record student's facial expressions using web camera in your laptop or an external webcam. For brain wave and skin conductance, you can use modular portable devices to collect these signals; however, this may not be cost effective and not scalable to a large class. For gesture and posture, you can have an external video camera recording the student's gestures and posture and code it. You manually code it after the study or you can have a pressure sensitive chairs, pressure sensitive mouse, keyboards to collect gesture and posture.

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Here is the sample Eye-Gaze and GSR data that is collected on a TEL environment. Student is looking at the eye gaze and it is students looking at a different parts of the environment and you can see the eye gaze is overlaid on the video below, the students GSR data.

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Multi-Modal Learning Analytics

- Processing data from multiple channels is challenging
- Align data based on timestamp
- Data with different granular size
 - Eye-gaze 60hz to 1500hz
 - Facial expressions – based on number of frames in videos



You can collect data from multiple channels; however, processing data from multiple channels is challenging because we need to align the data from each channel based on timestamp. And data from each channel will have a different granular size.

For example, we can have eye gaze for a 60 Hertz to 1500 Hertz. There are eye trackers which can record students' eye gaze up to 1500 Hertz. What it means? If the eye gaze is collected at 60 Hertz speed, which means the eye tracker is collecting 60 signals per second, which is roughly 15 milliseconds per eye gaze data. You will have 60 data per second.

Similarly, for facial expressions, it is based on a number of frames in the video you use. If I want to use 25 frames in the video, I will have 25 pictures; then each picture can be converted to analyze the facial expressions. So, you will have facial expressions vary at every 40 milliseconds. So, the facial expression varies at every 40 milliseconds, the eye gaze data varies at every 15 milliseconds.

Now aligning these two different granular size data is challenging. Analyzing this multi-level data for learning analytics is beyond the scope of this course [music].