Measuring Active Learning in HE: A Multimoment Approach

3rd July 2018

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Overview

• Background to GSM London

• Active Learning at GSM

• Multimoment Analysis - Implementation and Results

• Next Steps
GSM London

- Career focussed degrees – Business/HRM/Oil and Gas mgmt.

- Approx. 6000 students - widening participation: 90% BME / 90% Mature

- Greenwich/Greenford Campuses - degrees awarded by University of Plymouth

- Active learning initiative commenced autumn 2016

- QAA recognition summer 2018
Rationale for Active Learning

• ‘Considerable evidence that teacher-focused, traditional approaches are ineffective for all but the most ‘academically’ motivated students’ (Hockings, Cooke and Bowl, 2007, p.724).

• ‘Active learning involves providing opportunities for students to meaningfully talk and listen, write, read and reflect on the content, ideas, issues, and concerns of an academic subject’ (Meyers & Jones, 1993, p.6).

• It is therefore more likely to result in ‘deep’ learners (Mathieson, 2015, p.66).

• Peer interaction may even be the most significant factor in predicting student engagement and outcomes (Moran and Gonyea, 2003, in Zepke and Leach, 2010).
Active Learning at GSM

3. Jigsaw Technique

Lead-In:
As with reading/listening tasks.

Read:
Choose 2-4 texts/sections of a text. Each pair/group gets a different one. Students read individually and make notes.

Compare Notes:
Students compare notes with others who have read the same text.

Materials Development / Experimentation

For further information & support please contact: drjnr@kensingtonln.ac.uk or siesta@kensingtonln.ac.uk
What is a Multimoment analysis?

- **Multimoment Analysis or Activity sampling** is the statistical technique for determining the proportion of time spent by workers in various defined categories of activity.

- It is a method of data collection through observations whereby you take samples of the occurrences, rather than a continuous observational study. It was developed by L.H.C. Tippett in 1927.
Features of a Multimoment Analysis

• Provides reliable data (better than participants providing data by means of a questionnaire, as participants might hide true facts from researchers, e.g., if the truth will make them look bad.)

• Quick to setup, flexible and statistically sound (with error or confidence intervals) and relatively low workload compared to other methods
Multimoment analysis in academic research

▪ Originally used to determine the standard time for a manual manufacturing tasks.
  • Flexible method that can be used when objects and activities are clearly categorised.

▪ Kelly (1964) investigated executive behaviour by using MMA and found that 90% of a manager’s time may be spent on communication

▪ Pelletier, D. and Duffield (2003) used MMA to discern nursing practice patterns.

▪ Davies et al. (2014) use MMA to sample the time spent by pharmacists with the key finding that a quarter of the time was spent labelling products.
How is MMA performed?

- Rather than doing a continuous observation, the researcher takes samples of activities at random intervals across several objects and notes what is occurring at that time.
- Normally taken over several days or weeks to reduce gaming behaviour of observed objects.
- A walking circuit needs to be defined to permit objects to be observed in regular intervals.
- A pilot study is recommended to get an initial idea on the observed activities and their occurrences.
What would an ‘active’ class look like?

Who would be talking?

What would students be doing?
## Activities and captured moments

<table>
<thead>
<tr>
<th>#</th>
<th>Moment</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teacher talking</td>
<td>679</td>
</tr>
<tr>
<td>2</td>
<td>Student talking</td>
<td>144</td>
</tr>
<tr>
<td>3</td>
<td>Students talking</td>
<td>149</td>
</tr>
<tr>
<td>4</td>
<td>No one talking</td>
<td>212</td>
</tr>
<tr>
<td>5</td>
<td>No student present</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Other</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1205</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#</th>
<th>Interpretational Moment</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Teacher giving instructions</td>
<td>416</td>
</tr>
<tr>
<td>2</td>
<td>Teacher interacting with students</td>
<td>177</td>
</tr>
<tr>
<td>3</td>
<td>Teacher writing on whiteboard</td>
<td>61</td>
</tr>
<tr>
<td>4</td>
<td>Teacher taking registers</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Student interacting with teacher</td>
<td>125</td>
</tr>
<tr>
<td>6</td>
<td>Student addressing class</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>Student giving presentation</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Pair or group activity</td>
<td>130</td>
</tr>
<tr>
<td>9</td>
<td>Online activity</td>
<td>22</td>
</tr>
<tr>
<td>10</td>
<td>Whole class activity (e.g. debate)</td>
<td>13</td>
</tr>
<tr>
<td>11</td>
<td>Group giving presentation</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>Individual reading task</td>
<td>39</td>
</tr>
<tr>
<td>13</td>
<td>Individual listening task (e.g. video)</td>
<td>22</td>
</tr>
<tr>
<td>14</td>
<td>Individual written</td>
<td>90</td>
</tr>
<tr>
<td>15</td>
<td>Individual computer-based task</td>
<td>23</td>
</tr>
<tr>
<td>16</td>
<td>Teacher working on PC (e.g. logging in)</td>
<td>23</td>
</tr>
<tr>
<td>17</td>
<td>Undefined</td>
<td>10</td>
</tr>
<tr>
<td>18</td>
<td>Break</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1205</td>
</tr>
</tbody>
</table>
Multimoment app

- To facilitate a quick turnaround taking notes when walking through classrooms a mobile app was developed
- It enabled researchers to walk on a predetermined route and pick a primary (auditory) moment and a secondary (interpretation) moment
- An option for notes and being unsure about the interpretation of the moment was added
What is a good sample size?

▪ To have an initial idea on the number of required moments for a given error

\[ N = \frac{p(1 - p)}{E^2} \]

▪ For example, to obtain an error of 5% for an activity that is presumed to take 20% of the time, we obtain:

\[ N = \frac{0.2 \times 0.8}{0.05^2} = 64 \]

▪ Note that for an error of 1%, we require 1600 moments! Thus it all depends on the goal of the study.
Duration and scope

- At GSM London there are 10 teaching weeks per term. MMA took place between weeks 3 and 8 to exclude revision or induction classes
- Four academics who are experienced in active learning were consulted in recognising and interpreting moments
- Staff and students were informed by email of the study and its purpose; however, they were not told when researchers will do their rounds
- Timing and days of the start of the rounds were randomised by random minute generator
Duration and scope

- A typical circuit involved observing around 20 classrooms across three floors (5 minutes straight walk).
- The first and last five minutes of each classroom session were ex post cut off the study to avoid a possible attrition bias.
- In total 1205 valid moments were collected and thus resulting for most categories a low error margin of less than 5%.
- The average time spent on the circuit across for a researchers was approximately 8 hours (2 hours per week).
Results of Unconditional Moments

Primary Moments (unconditional)

- Teacher talking: 56%
- Students talking: 12%
- No one talking: 18%
- Teacher giving instructions: 34.6% ± 2.7%
- Teacher interacting with students: 14.7% ± 2.2%
- Teacher writing on whiteboard: 5.1% ± 1.2%
- Teacher taking registers: 0.7% ± 0.5%
- Student interacting with teacher: 10.4% ± 1.7%
- Student addressing class: 0.3% ± 0.3%
- Student giving presentation: 0.4% ± 0.4%
- Pair or group activity: 10.8% ± 1.8%
- Online activity: 1.8% ± 0.8%
- Whole class activity (e.g. debate): 1.1% ± 0.6%
- Group giving presentation: 0.1% ± 0.2%
- Individual reading task: 3.2% ± 1%
- Individual listening task (e.g. video): 1.8% ± 0.8%
- Individual written: 7.5% ± 1.5%
- Individual computer-based task: 1.9% ± 0.8%
- Teacher working on PC (e.g. logging in): 1.9% ± 0.8%
- Undefined: 0.8% ± 0.5%
- Break: 2.9% ± 0.9%
Primary analysis

• Primary moment analysis indicates that around a quarter of the time spent in classrooms (24.4%) involves student interaction, i.e. students talking during a group exercise or pair work or students interacting with the teacher - confirmed by interpretational moment (24.9%)

• Interpretational moments suggest 39% of the class is ‘active’, with students spending an additional 14.9% of the time working on tasks individually

• The margins due to the sample size (instead of having observed the entire class) remain relatively low and around 2% at the 95% Confidence Interval.
Comparative Analysis

▪ Some larger modules allowed a sufficient sample size to be benchmarked against each other.

▪ Unsurprisingly, modules that were found to be particularly active were designed to be active. On the other hand, quantitative modules showed a lack of classroom activities.
Comparative Analysis

Another interesting aspect from a pedagogic perspective was to condition the dataset by certain criteria, such as, levels and class size.

<table>
<thead>
<tr>
<th>Level</th>
<th>Student/Students talking</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>21.2% ±4.7%</td>
</tr>
<tr>
<td>4</td>
<td>28.9% ±5.2%</td>
</tr>
<tr>
<td>5</td>
<td>27.2% ±5.1%</td>
</tr>
<tr>
<td>6</td>
<td>23% ±4.8%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Class Size</th>
<th>Student/Students talking</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 10</td>
<td>24.6% ±5.1%</td>
</tr>
<tr>
<td>11 to 20</td>
<td>22.5% ±4.9%</td>
</tr>
<tr>
<td>over 20</td>
<td>27.9% ±5.3%</td>
</tr>
</tbody>
</table>

Although the effect of class size on active learning is not statistically significant at the 95% level, there is a slight trend that will be further investigated in the following trends.
Next Steps

• General recommendations to staff based on the analysis, e.g. increased use of pair/group work and student presentations; greater use of active learning on numerical modules

• A focus on particular levels/modules, e.g. Level 3 has a lower level of active learning and a low retention rate.

• Preliminary results suggest that staff that received training (Active Learning workshops, PGCHEP) have on average 10% to 12% more activities in classrooms.

• Recommendations to be made to in-house training programmes, e.g. PGCHEP.

• Continued MMA in summer semester leading to further comparative and trend analysis, in particular, linking student achievement with active learning.
Any questions?

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References


