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The data of it all!

Show widgets

Theme 3: Data visualization – The flipped classroom

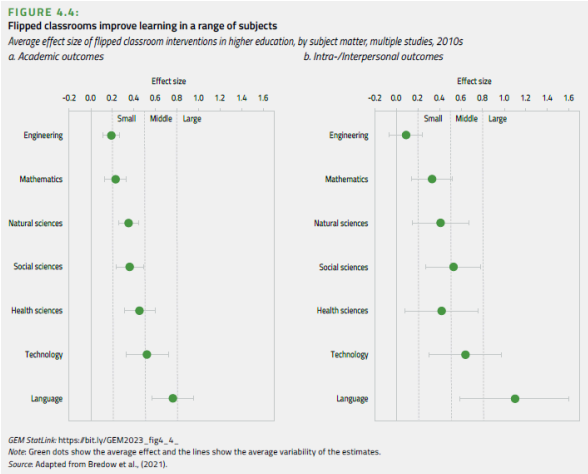
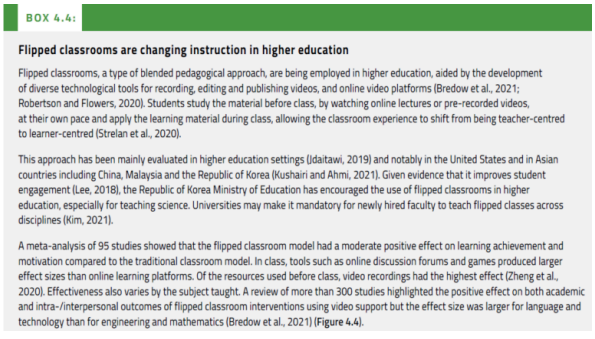


FIGURE 4.4:
Flipped classrooms improve learning in a range of subjects
Average effect size of flipped classroom interventions in higher education, by subject matter, multiple studies, 2010s
a. Academic outcomes *b. Intra-/interpersonal outcomes*

Effect size
-0.2 0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6
Small Middle Large
Engineering
Mathematics
Natural sciences
Social sciences
Health sciences
Technology
Language

GEM StatLink: https://bit.ly/GEM2023_fig4_4_
Note: Green dots show the average effect and the lines show the average variability of the estimates.
Source: Adapted from Bredow et al., (2021).



BOX 4.4:

Flipped classrooms are changing instruction in higher education

Flipped classrooms, a type of blended pedagogical approach, are being employed in higher education, aided by the development of diverse technological tools for recording, editing and publishing videos, and online video platforms (Bredow et al., 2021; Robertson and Flowers, 2020). Students study the material before class, by watching online lectures or pre-recorded videos, at their own pace and apply the learning material during class, allowing the classroom experience to shift from being teacher-centred to learner-centred (Strelan et al., 2020).

This approach has been mainly evaluated in higher education settings (Idaitawi, 2019) and notably in the United States and in Asian countries including China, Malaysia and the Republic of Korea (Kushairi and Ahmi, 2021). Given evidence that it improves student engagement (Lee, 2018), the Republic of Korea Ministry of Education has encouraged the use of flipped classrooms in higher education, especially for teaching science. Universities may make it mandatory for newly hired faculty to teach flipped classes across disciplines (Kim, 2021).

A meta-analysis of 95 studies showed that the flipped classroom model had a moderate positive effect on learning achievement and motivation compared to the traditional classroom model. In class, tools such as online discussion forums and games produced larger effect sizes than online learning platforms. Of the resources used before class, video recordings had the highest effect (Zheng et al., 2020). Effectiveness also varies by the subject taught. A review of more than 300 studies highlighted the positive effect on both academic and intra-/interpersonal outcomes of flipped classroom interventions using video support but the effect size was larger for language and technology than for engineering and mathematics (Bredow et al., 2021) (**Figure 4.4**).

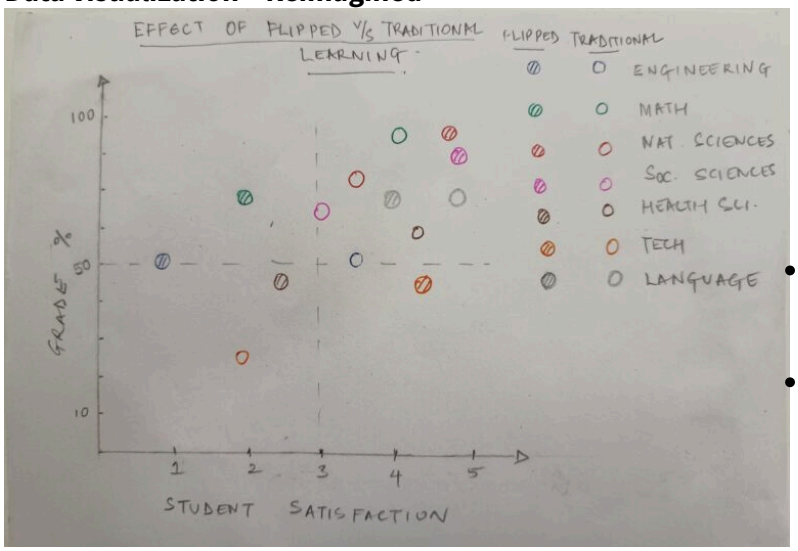
Background: This visualization forms part of the the Global Education Monitoring report 2023 on Technology in Education available on the UNESCO website. I selected the flipped classroom as it forms a large part of my work. The figure showcases the effect of flipped learning on academic and intra/interpersonal outcomes for

higher education. Overall, the visualization is a shout out to higher education institutes to adopt flipped learning over traditional learning, by showcasing that this learning methodology has positive effects in a range of subjects.

Brief review and analysis: A review of the of pictorial, numerical and verbal elements of the data visualizations left several questions unanswered.

1. For a start, there is no contextual or temporal data in the figure or the narrative giving it a sense of universality (Mikhaylova and Pettersson, 2024). We only know that the figure is a compilation of data from multiple studies (in or since?) the 2010s. At one instance it says that the figure is meta-analysis of 95 studies, and at another it mentions a review of more than 300 studies. Information on *how* each individual study was conducted is missing, and it is unclear whether there was an alignment in the methodology across studies.
2. It is unclear how effect size is calculated and on what basis the small medium and large buckets were decided. The broad effects on academic outcomes and inter/intrapersonal outcomes have been depicted, but there is no explanation of what exactly these outcomes refer to and *how* they were measured. Moreover, are the effects are positive or negative? (we are left to assume that they are positive).
3. No details about the data source e.g. student demographics, digital tools, platforms and modalities, type of institutions, access to technology, teacher experience and training are shared. To avoid bias, it is important to know these details and also whether data was sourced from EdTech platforms and apps versus surveying the end users i.e. students as well as teachers involved in flipped learning (Pangrazio, 2024).
4. The title states strongly that that the flipped classroom is '**changing instruction in higher education**'. The narrative states that the effect of flipped learning is '**Moderate**'. However, the visualization shows that the effect is '**Small**' for most subjects. The narrative mentions a comparison with traditional learning, but the visual shows no comparison between the effect of flipped learning and traditional learning.

Data visualization – Reimagined



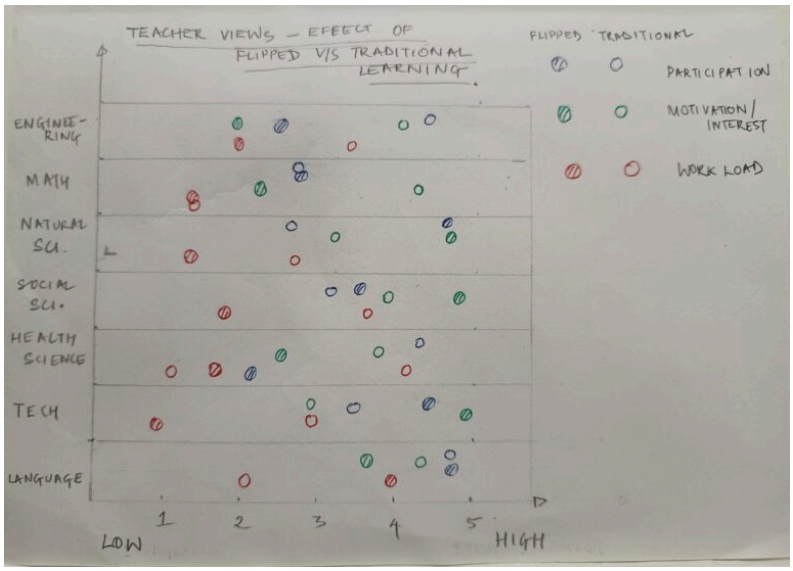
It would be clearer if flipped learning and traditional learning were compared for each subject area, including parameters such as student grades, student satisfaction ratings and teacher survey results.
Note:

- The study should be conducted in institutions with similar access to the internet and digital devices.
- A/B testing should be done where Traditional learning and Flipped learning are tested within the same institute with the same teacher.

This graph exemplifies how plotting grades and student satisfaction ratings could be a good indicator of the success or failure of flipped learning i.e. a good grades + high student satisfaction ratings with flipped learning would be a clear positive effect for the methodology in that specific subject – e.g. Natural Sciences (red, stripes).

In this figure, teacher survey results (using Likert scales from 1-5) on student participation and motivation are plotted along with the teacher work load to ensure that this is factored into the equation when taking decisions on moving away from the traditional teaching (Pangrazio, 2024).
If work load is high, but participation and motivation are low in the flipped classroom, then the effort may not be worth it; similarly, a low workload but low participation and motivation also indicates that the flipped model does not have clear positive effects for teaching and learning (e.g. Engineering). What we want is a low workload and high participation and motivation which would be a clear indicator of the success of a model in that context (e.g. Natural science).

Please note that data in the visualizations are purely imaginary.



References:

1. Mikhaylova, T, and Pettersson, D (2024) 'The timeless beauty of data: inventing educational pasts, presents and futures through data visualisation', *Critical Studies in Education., pp.1-17.*
2. Pangrazio, L. (2024)'Data Harms: The Evidence Against Education Data', *Postdigital Science and Education* 6, pp., 1049–1054.