WHAT STUDENTS LIKE

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Abstract

I analyse students' assessment of tutorial classes supplementing my lecture course and wish to share some observations on what students like in mathematics tutorials. I hope my observations could be useful to my university colleagues around the world. However, this is not a proper sociological study (in particular, no statistics is used), just expression of my personal opinion.

1. *What was the question?*

For many years, I have been teaching a large freshmen course (I will call it "the Course") in mathematics for Engineering students, 300+ students (last year it was 400), in a big British university. Twelve PhD students teach weekly tutorial classes in the Course, 25 to 30 students in each class. I do not teach a tutorial class myself, but I observe the classes every week and ask my tutorial teachers to run simple short feedback questionnaires in their classes, with three questions to students.

(1) *Lectures: content, delivery, pace. Learning materials: notes, example sheets, solutions, podcasts. What can be improved?*
(2) *What did you like most about your tutorial class teacher's approach to teaching?*
(3) *Please provide us with details of what you think could be improved in the tutorial classes in the Course.*

I ask my tutorial teachers to pass to me students' answers to the first two questions, but cut the answers to the third one off the questionnaires and keep them for themselves.

In this short note, I comment on students' responses to Question 2:

> **What did you like most about your tutorial class teacher's approach to teaching?**

Students' answers provide fascinating insights into students *themselves*. This becomes especially obvious when we analyse them at a much wider background.

2. *Emotive words in students' responses*

I compared words frequently occurring in answers to Question 2 with the dataset of words and pairs of words used in 14 million reviews from RateMyProfessor.com compiled by Ben Schmidt[†].

Playing with the dataset, I instantly discovered that quality of teaching in different academic subjects is described in different words. For mathematics teaching, the difference has very significant implications – and even more so for my course, as we shall soon see.

I will show you three diagrams summarising the use of words **clear**, **explains**, **engages** (often used by the students in the course) in *positive* RateMyProfessor.com reviews. Figure 1 shows a scatter plot for the word **clear** and Figure 2 for **explains**. In comparison with 24 other academic subjects covered by the dataset, these words are most frequently used in relation to teaching mathematics.
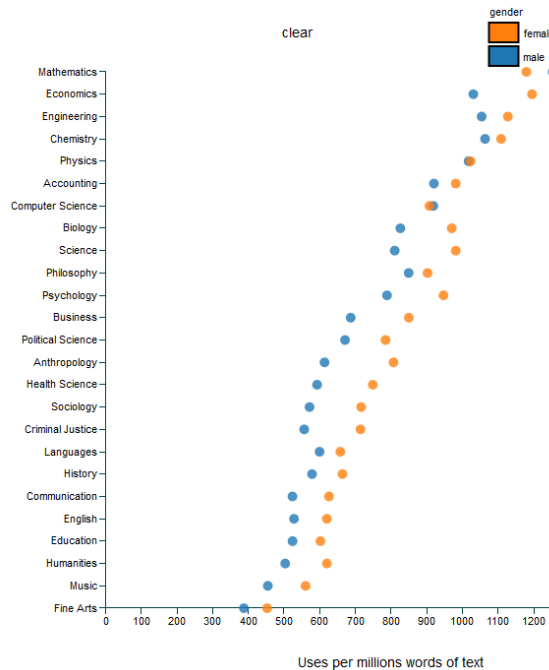

FIGURE 1. *Scatter plot for the word* **clear**. *Source: B. Schmidt,* `benschmidt.org/profGender/`.

The third scatter plot, Figure 3, is for the word **engages**, where the situation is diametrically opposite, mathematics is at the bottom.

As you can see, the words **clear** and **explains** are frequently used in positive assessment of mathematics teaching – and more frequently than in other subjects – while the word **engages** appears to be irrelevant, in students' eyes, to description of good mathematics teaching. Let us look at how this paradox plays in tutorial classes in the Course.

[†]B. Schmidt, *Gendered Language in Teacher Reviews*, `benschmidt.org/profGender/`.
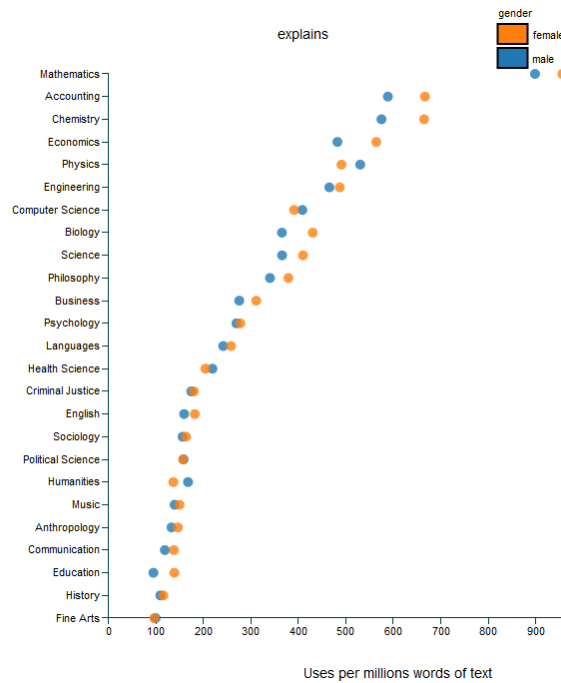
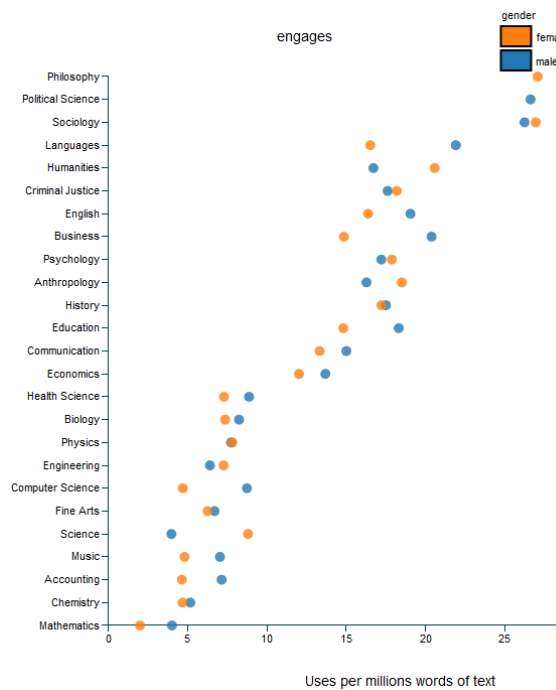FIGURE 2. *Scatter plot for the word* **explains**. *Source: B. Schmidt,* `benschmidt.org/profGender/`.

FIGURE 3. *Scatter plot for the word* **engages**. *Source: B. Schmidt,* `benschmidt.org/profGender/`.

In students' responses to Question 2, you will frequently find the "mathematical" key words

> **clear, explains, fast, simple, understandable, thorough, pace, takes time, in detail, makes sense, speed**

which have rank 1 among the 25 academic subjects in Schmidt's dataset.

And here are other "mathematical" keywords from responses in questionnaires to tutorial classes in my course:

clarity, patience, perfect, can teach, goes through, goes over, different approaches:	rank 2
confident, gives examples, various approaches, answers questions:	rank 3
concise, helpful, systematic, go through:	rank 4
understanding, precise:	rank 5

The use of this group of keywords by students in the course indicates that they value when their tutors have good subject knowledge, can use it with confidence, and use it to help students – varying, for example, approaches to solving a problem, or answering an unexpected question by producing, on the hoof, a simple example which addresses exactly the point that the student was missing.

But what I find very remarkable and am very pleased to see in the responses from many students – is the abundance of terms not normally used in positive assessment of mathematics teaching around the anglophone world where RateMyProfessor.com operates:

friendly, laidback, no pressure (rank 17 out of 25 subjects); **easy, funny** (18); **relaxed** (19); **invites, approachable, direct** (20); **open, class involved** (22); **enthusiasm, focused, everyone involved, not boring** (23); **no stress, insight, emphasis, lively** (24); **interactive, involved, focus, relevant, engages** (25 out of 25).

These are mostly words describing human, interpersonal aspects of teaching and learning, something that millions of students around the world do not expect to find in their mathematics classes.

And you would perhaps agree that students' answers to Question 2 (where – I emphasise that – all these words are actually taken from) show that students very much value being treated as human beings by **friendly** human beings, being able to build their mathematical skills – and, which is even more important, their confidence – in a **secure, no pressure, no stress,** and **not boring**, learning environment where everyone is **involved** and **engaged** in an **interactive direct** dialogue.

You would perhaps also agree that students in the Course appear to be happy (and perhaps surprised) to find elements of such supportive environment in the tutorial classes – and I could not be more grateful to my tutorial class teachers who made this possible.

3. *Discussion*

Without Ben Schmidt's dataset, it would never cross my mind that perhaps PhD students who teach tutorial classes in the Course were beating the world in the game of teaching mathematics in a human way.

3.1.   *Why is the difference from RateMyProfessor.com?*

In my view, tutorial class teachers in the Course are de-facto volunteers who do an hour or two of classes a week mostly because they find teaching interesting. They are bright, they have full knowledge of relatively simple freshmen mathematics. The Course takes place in the first semester, and students come fresh from high school. It appears that perhaps many of them not so frequently met teachers who

> *"can answer any question!"*

PhD students in my large research-led School of Mathematics are a big and happy family – for example, they have their own secret seminar, where they give talks about their research to other PhD students, with "grown-ups" not allowed to attend. Perhaps this helps them to project a happy image of themselves in the class.

I also have a conjecture that statistics of RateMyProfessor.com is dominated by lesser (but numerous) American universities (not Ivy League), and that these sometimes are less happy places.

So I do not want to make any wide ranging generalisations on the basis of my cursory observations, but I am confident that questionnaires show what *students* like and dislike:

> **students' responses to questionnaires sometimes reveal more about students than about teachers.**

3.2.   *Student evaluations of teaching*

As we see, informal students' feedback could be informative and useful. However, I think that students' feedback and student evaluations of teaching, whether they are formal or informal, have to be used with great care.

To start with, Ben Schmidt used his data tool to demonstrate that male and female teachers are frequently described, by their students, by different words. His findings are an indication that student evaluations of teaching could be gender biased.[†]

A recent sociological study by Boring et al.[‡] carried out in the USA and France, is more assertive in its conclusions:

> Student evaluations of teaching (SET) are widely used in academic personnel decisions as a measure of teaching effectiveness. We show:
>
> - SET are biased against female instructors by an amount that is large and statistically significant.
> - The bias affects how students rate even putatively objective aspects of teaching, such as how promptly assignments are graded.
> - The bias varies by discipline and by student gender, among other things.

[†]I am happy to say that I could not detect any signs of gender bias in tutorial questionnaires – on the contrary, students' evaluations of all female tutorial teachers were glorious.

[‡]Boring et al. *Student evaluations of teaching (mostly) do not measure teaching effectiveness*, ScienceOpen Research 2016. DOI: 10.14293/S2199-1006.1.SOR-EDU.AETBZC.v1.

- It is not possible to adjust for the bias, because it depends on so many factors.
- SET are more sensitive to students' gender bias and grade expectations than they are to teaching effectiveness.
- Gender biases can be large enough to cause more effective instructors to get lower SET than less effective instructors.

My modest observations on the use of words in students' responses are consistent with the warning made by Boring et al.:

> SET appear to measure student satisfaction and grade expectations more than they measure teaching effectiveness [4,7].[†] While student satisfaction may contribute to teaching effectiveness, it is not itself teaching effectiveness. Students may be satisfied or dissatisfied with courses for reasons unrelated to learning outcomes [...]

As we can see, it is all about students' *positive expectations*, about their *emotional wellbeing*. Positive expectations contribute to what is known now as the *"quality of student experience"*, but we also hope that they contribute to better learning.

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Disclaimer

The views expressed do not necessarily represent the position of my employer or any other person, organisation, or institution.

About the Author

Alexandre Borovik's principal research interests belong to algebra, model theory, and combinatorics. He also has an interest in cognitive aspects of mathematical practice and recently published a book *Mathematics under the Microscope*[‡] which explains a mathematician's outlook at psychophisiological and cognitive issues in mathematics. Some of his papers on mathematics education can be found in his personal online journal/blog *Selected Passages From Correspondence With Friends*[§].

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[†]Boring et al. refer to V. E. Johnson, *Grade inflation: a crisis in college education*. New York: Springer-Verlag, 2003; and P. B. Stark and R. Freishtat, *An evaluation of course evaluations*. Sci Open Res. 2014:1-7. DOI:10.14293/S2199-1006.1.-.AOFRQA.v1.

[‡]A. V. Borovik, *Mathematics under the Microscope: Notes on Cognitive Aspects of Mathematical Practice*. Amer. Math. Soc., Providence, RI. 2010. 317 pp. ISBN-10: 0-8218-4761-9. ISBN-13: 978-0-8218-4761-9. http://www.ams.org/bookstore-getitem/item=mbk-71.

[§]Selected Passages From Correspondence With Friends. ISSN 2054–7145. http://www.borovik.net/selecta/.