

Quantifying Teaching Workload

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1 Introduction

In order to accurately quantify faculty teaching workload we must take into account that some teaching effort is a function of how many students are enrolled in a course and other effort is not. For example, the work associated with preparing and delivering lessons to the class as a group is largely fixed and independent of how many students are in the course. On the other hand, work associated with reading and grading student work varies with course enrollment. Here a measure of faculty teaching workload is presented that takes both of these factors into account. This measure is calculated for each course using two course-dependent weighting factors and readily available data, namely the number of students enrolled in the course and the number of credits the course is worth. Importantly, this measure can be written in terms of student credit hours (the product of number of students and credit hours) so it can be connected with faculty output. In addition, it has the natural units of hours per week so its validity can be gauged by comparing calculated values to reasonable expectations for weekly effort.

2 Weighting Factors

2.1 *HPC*

Hours of effort per credit (*HPC*) represents the fixed amount of effort required to teach a given course regardless of how many students enroll in the course divided by the number of credits a course is worth. Among other factors, this ratio includes class preparation time and contact hours, that is, the

number of hours spent meeting with the entire class in the classroom, studio, or laboratory each week. For example, let's say Dr. McWorkload is teaching a four credit laboratory course that meets for three one-hour lectures and one three-hour lab each week for a total of six contact hours. For each hour of class, Dr. McWorkload does 0.33 hours of prep work. Therefore, she does a total of 8 hours of work each week for this 4 credit course regardless of the number of students enrolled. This yields a *HPC* of 2 hours/credit/week.

2.2 *HPS*

Hours of effort per student (*HPS*) represents the variable amount of effort required to teach a given course due to differences in enrollment divided by the number of students enrolled in the course. Stated a different way, this is the incremental increase in time spent on the course due to each additional student enrolled. Among other factors, this ratio depends on how much time is spent reading and grading student work and how much time is spent interacting with individual students outside of class meetings. For example, let's say that Dr. McWorkload is teaching a course that has about two assignments each week that each require on average 0.1 hours to grade. This yields a *HPS* of 0.2 hours/student/week.

2.3 Estimating Weighting Factors

It remains for the faculty to determine a reasonable range of values for *HPC* and *HPS* for different types of courses. The utilization of natural units of effort, that is, hours/credit and hours/student, should make this possible. A value for *HPC* in the range of 1.75 to 2.00 hours/credit seems reasonable for laboratory science classes. A value of 1.25 to 1.50 hours/credit seems reasonable for other types of classes. A value for *HPS* in the range of 0.1 to 0.2 hours/student seems reasonable for laboratory science classes but a value in a higher range seems reasonable for writing, project-based, or capstone classes. Importantly, the use of standard units will also allow for direct comparison across class types and disciplines.

3 The Formula

3.1 Hours of Teaching Effort Per Course

The amount of time a faculty member devotes to a given course is a function of HPC and HPS ,

$$\text{Time} = (C \times HPC) + (S \times HPS), \quad (1)$$

where C is the number of credits the course is worth and S is the number of students enrolled in the course. Importantly, this formula can be written in terms of the product of S and C , what is referred to as “student credit hours” or SCH by the administration. This is done in two steps below. First, each term is multiplied by a ratio equal to one then the expression is factored.

$$\text{Time} = \left(S \times C \times \frac{HPC}{S} \right) + \left(S \times C \times \frac{HPS}{C} \right) \quad (2)$$

$$\text{Time} = S \times C \times \left(\frac{HPC}{S} + \frac{HPS}{C} \right) \quad (3)$$

Finally, the product of S and C can be replaced by SCH ,

$$\text{Time} = SCH \times \left(\frac{HPC}{S} + \frac{HPS}{C} \right) \quad (4)$$

Let’s apply this formula to the example of Dr. McWorkload. Her 4-credit course has a HPC of 2 hours/credit/week and a HPS of 0.2 hours/student/week. If this course has an enrollment of 20 students than $SCH = 80$ and

$$\begin{aligned} \text{Time} &= 80 \times \left(\frac{2}{20} + \frac{0.2}{4} \right) = 80 \times (0.10 + 0.05) \\ &= 8 \text{ hours/week} + 4 \text{ hours/week} = 12 \text{ hours/week} \end{aligned} \quad (5)$$

It is interesting to note that the formula captures the fact that more fixed time is spent delivering the course (8 hours/week) than variable time due to the number of students (4 hours/week). If Dr. McWorkload had only half the number of students enrolled in the course, her total teaching effort would only be 17% less (a total of 10 hours/week), not 50% less.

3.2 Total Hours of Teaching Effort

The total amount of teaching effort for a faculty member in a given semester is calculated by summing the result of Eq. 4 for all courses taught by that faculty member.

4 Conclusions

A significant advantage of the metric presented here over other weighting schemes is that it is easier to accurately estimate HPC and HPS because these values connect directly with experience. For example, I know it takes me about 0.5 hours to grade a physics exam, and I know I spend about an hour on lab setup each week. This method also takes into account that some work associated with teaching depends on the number of students enrolled in a course while other effort does not.

Another benefit of this metric is that the units of the result are natural units of effort, hours/week. If a calculation yield a very small number for hours/week or a very large number then this indicates an incorrect choice for FHC and/or VHS . This ability to qualitatively validate results is important.

Because the metric can be formulated to includes SCH , it is useful for studying the efficiency versus the intensity of teaching effort. For example, the ratios for HPC/S and HPS/C are both measures of hours of effort per SCH , or hours of effort per unit output. However, the first represents the hours of effort per unit output that gets smaller as the number of students enrolled in a course gets larger. The second represents the hours of effort per unit output that is fixed regardless of the number of students in the course. In other words, this is related to the amount of effort needed to deliver a unit of output, that is, serve a specific student. Even though this value does not change as the number of students enrolled in the course increases or decreases, it is impacted by pedagogy and class format. If HPC/S is large, moving toward larger enrollment in the course might be beneficial. On the other hand if HPS/C is large, this justifies limiting the number of students allowed to enroll in a course.