



Figure 3. Graphical representation of the evolution of Studio and the flipped classroom at CSM. White squares: Studio classes. Heavy shaded ovals: Flipped classes. Light shaded squares: Both. Arrows indicate classes that worked in close consultation with other classes. Asterisks indicate classes that piloted a technique in only some of the sections taught. All classes shown remain in these formats as of 2014, including several classes not listed scheduled to use these formats in the fall of 2014.

DISCUSSION AND CONCLUSIONS

In summary, over the last seventeen years, Studio at CSM has gone from a single pilot section of Physics I to three core courses and a host of mid- to upper-level courses. The progression was roughly as follows:

- 1) One or two faculty adopted the method and championed it, with little support, and with attention to collecting data. The major obstacles to be overcome included finding quality studio space and faculty willing and able to propagate the method for longer than a typical course assignment (here, one to three years).

- 2) Studio persisted long enough and was demonstrably successful enough for the method to affect space allocation and hiring, leading to permanent facilities and Studio-friendly young faculty.

- 3) Nearly all of the students at CSM experienced Studio through these courses, and the instructors of these courses and the department head made deliberate efforts to publicize the method on campus and abroad through talks, seminars, and publications.

- 4) Due to (3), several administrators, department heads, and faculty from across the institution became overtly interested in Studio, leading to a rapid and generally well-funded expansion across campus.

- 5) Studio being broadly accepted led to the fusion of Studio with other methods that had gained popularity independently, in particular the flipped classroom.

Figure 3 indicates this progression graphically.

One ongoing goal at CSM has been to develop some kind of model for how to reliably guide a new implementation of Studio [see, for example, ref. 7]. At this point, it is no longer clear to us to what extent such a model can exist. Much of what has happened here has depended significantly on local conditions and on the personalities and efforts of a relatively small number of people. Generally, however, it is our opinion that a new implementation of Studio can succeed as long as there are faculty willing to support it long-term, publicize its effects using data-driven arguments, and be flexible

regarding Studio classroom space until such time as a local opportunity presents itself. Given that, it is at least possible for Studio to become ubiquitous at an institution that was not a primary developer of the method.

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