In the paper by Laursen, the authors conducted a large scale study to evaluate the effectiveness of the IBL(inquiry based learning) method compared to the non-IBL method, and documented their findings chiefly with respect to the student self-reported learning gains. They chose 4 private funded IBL learning centers and monitored 42 mathematics courses of various levels taught by different professors to math-track students or preservice elementary school teachers. In the meantime, the non-IBL classes were chosen as control groups. Classes were monitored using a real-time documentation protocol by trained observers throughout the semester. They evaluated the student outcome by a self-reported system on their learning gains and measured the change from pre- to post- courses, and compared other differences in classroom activities in terms of the time spent engaging the students with activities, etc. They also tried to compensate for the institutional or self-selection student body discrepancy in both groups using statistical software. Overall their data showed that the IBL method led to more, robust gains, and students were showing more leadership during classroom discussions, with longer term effect in taking more mathematics courses. When dividing the data by gender, they found that the increase is more significant among women in the IBL group. However, they argued it is not necessary that IBL led to increased learning gains among women, but rather the more accurate self-perception of their gains. They conclude that IBL lead to a equality between both genders evaluating their abilities. When concluding what might caused such benefits in the IBL method, they referenced student interviews and conjectured that individual learning and collaboration may have contributed to such gains, as well as the increase time spent on the essential mathematical activities.

In the paper by Burgan, the author tried to defend lecturing against the massive research and advocates focused on the student-centered teaching method. She proposed several possible reasons that lecturing could achieve education goals that are impossible otherwise. For example, when students have little knowledge prior to learning or even in situations in IBL, a lecture can put the students on the right track most effectively. Also, she referenced results from personal development studies and argued that college is the period for students to develop personal identities, when setting up an example of an intellectual individual is very important. Also, lecture allows the instructor to be able to react and adjust to students' expressions that could not be perceived through group discussion. She also pointed out that there could be a variation among teaching methods depending on the subjects, hence there might be other light shed upon the science education.

In the paper by Weber et al., the authors based their study on the assumption that mathematics should be taught in the way that is is generated among mathematicians, not in the way that is axiomatically derived, in which case they gave examples

in history education as well as the failure of "New Math" movement as illustration. Under this assumption, they examined the way mathematicians achieve conviction and drew the connection to the way students view evidence in mathematical education. They divided mathematical evidence in three categories: the authoritative evidence, the empirical evidence, and the deductive evidence. They examined mathematicians' treatment of evidence from these three categories: in the authoritative category, they found that mathematicians trust results from prestigious sources more often without checking them; in the empirical category, they conducted studies and concluded that mathematicians are partial to empirical data, even though in most cases it is not conclusive; in the deductive category, they argued that in most mathematical results there are gaps between steps in proofs, and mathematicians are not always able to fill in the gap as they assume, according to their experiment. As parallel to the mathematicians, they referenced studies to show that students do not value deductive proofs as evidence and are usually satisfied with empirical proof. However, they stated that mathematicians place importance on the epistemic knowledge, and are not satisfied with empirical evidence as a proof, even though they are somewhat convinced by it. They also gave some suggestions as application to teaching.

As I pointed out in both discussion board and in class, I am a bit worried that the self-reported system is more subjective than one hopes. It is nice to know there are long term effects among the IBL students, and as Laursen addressed in her skype meeting that these students just learned how to study, which is the most beneficial for them in the long run. I do believe that low-achieving students will benefit a lot from these methods, but that is more due to the lack of IBL in their earlier learning history, and I think IBL is utmost important in K-12 education (or even, in education prior to high school.) This will yield the best overall gains compared to pulling off IBL in their college years. On the other hand, I agree with Burgan's paper more than everyone seems to have expressed in class. Although a good teacher can achieve the best results despite the methods he chose, the shift or division among IBL/lecturing can be an issue up to the instructor. To defend the lecturing part of any class that takes the combination, lectures can be very clear in what the teacher is trying to convey, and I personally get my huge inspirations from faculty members in our department. Their ways of presenting also taught me how to give presentations, which is crucial in the academic world. I personally find the paper by Weber et al. very long and difficult to read. To me it is very intuitive that mathematicians use empirical results to convince themselves but are curious about epistemic knowledge as well, and their suggestion for pedagogical application is rather limited.