1 Individuals Proposing Topic

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2 Overview of Topic

The use of active learning techniques in the university classroom is a proven and widely accepted strategy to improve learning outcomes and increase student engagement. Although relatively new to higher education pedagogy, active learning has been adopted by several faculty members at SHSU, from such seemingly distinct fields as mathematics, English, and philosophy. This proposed initiative seeks to expand the use of this evidence-based teaching strategy across the rest of our campus.

The positive effects of active learning have been observed both nationwide[2],[3] and on our campus. An initiative on our campus which encourages, fosters, and rewards more active learning in our classrooms has the potential to not only improve the learning outcomes and engagement of our students, but also to contribute to the body of evidence on the effects of these teaching methods.

While the use of active learning techniques in the university classroom has become more widespread across the country, it has also been met with skepticism and trepidation by many faculty members. However, recent results from education researchers indicate that these techniques increase both learning outcomes and student engagement. These increases – some of which are referenced below – are seen particularly in struggling students, and consequently can have profound effects on students at regional, comprehensive public universities such as ours.

The use of active learning takes on many forms in the university classroom, although all share the common characteristic of avoiding a traditional classroom lecture from an instructor. Rather than simply transferring information from a lecturer to the students, active learning techniques require the students to be actively involved in the learning process. These learning techniques have been partially categorized in education literature as collaborative, cooperative, or project-based learning [1]. Whether these techniques have taken the form of flipped classrooms, peer-led team
learning, or inquiry-based learning, they have already seen success across our campus in classrooms as varied as chemistry, history, mathematics, english, and philosophy.

In the sciences there are two student-centered methods of active learning used primarily in mathematics and the physical sciences (chemistry, in particular). While these methods – Inquiry-Based Learning (IBL) and Process-Oriented Guided Inquiry Learning (POGIL) – have not yet been universally adopted in mathematics or science classrooms, several recent studies have provided evidence of the benefits of these versions of active learning, particularly with those students who attend universities similar to SHSU.

Inquiry-based Learning (IBL) is a method of teaching which places the student – as opposed to an instructor – at the center of the learning process. Whereas lecture-based classrooms require students to passively listen while the instructor verbally or visually transfers knowledge to students, an IBL classroom asks students to actively discover the content through carefully written and tested course notes. Ideally suited for use in mathematics courses, the course notes used in an IBL classroom provide a method for students to think creatively and independently in order to solve problems, make conjectures and prove theorems. The classroom environment – in which students regularly present their work to their classmates – allows students to communicate their solutions and proofs to their peers, as well as actively critically evaluate the concepts which are presented to them by their classmates, something inherently absent from the lecture-based environment.

Often called discovery-based learning or the modified Moore method of teaching (named for University of Texas mathematician R.L. Moore), the IBL method of teaching requires not only more from students, but also more from instructors. Implementing this method can be a daunting task, even for a veteran instructor. Fortunately, there are resources available for the interested instructor; they are described more fully below in Section 5.

Also student-centered, POGIL is a teaching technique already used in many chemistry and biology classrooms across the country. According to the Science Education Resource Center\(^1\), the Process-Oriented component of POGIL requires students to develop process skills important for the development of future scientists (such as developing written or oral communication skills) while at the same time explicitly enhancing the analytical and critical thinking skills of each student. Rather than spending much more of their time in lecture than in a lab, students instead spend much more time discovering the physical and biological properties in a supportive, guided learning environment.

The use of active learning is not restricted to science and mathematics classrooms. Inaugurated by our CHSS in 2010, the Ethics, Western Civilization, and American Traditions (EWCAT) model is an undergraduate curriculum designed to enhance critical thinking and basic research skills, to promote good writing, good verbal communication, and to enhance the ability to problem solve in groups. There is an increasing number of courses throughout CHSS already designed in the sequence, each of which encourages student ownership of learning and engagement with original texts. A new minor in Applied Ethics and Critical Thinking (THNK) was recently approved, consisting of both new first-year and capstone courses as well as EWCAT versions of existing courses in CHSS.

A EWCAT classroom differs from a traditional classroom in three ways, each of which meet the three characteristics of active learning referenced above. First, EWCAT courses employ small group learning and peer-led team learning (PLTL) techniques to teach students that enhanced skills for small group learning are themselves important outcomes. Second, EWCAT courses seek to cultivate peer teaching assistants who work from within a current course or return as veterans of a previous course to lead active small groups. Third, EWCAT courses review traditional texts in diverse humanities and social sciences fields, while dedicating equal time to other documentary sources to empower other voices. The combined, strong emphasis on peer-led learning and problem-based teaching techniques promotes critical thinking skills, group problem solving, and increased

\(^{1}\url{http://serc.carleton.edu/sp/pkal/pogil/index.html}
reflection among students. Changing the classroom in these ways has become the key to helping students engage with newly discovered ideas and to cultivate a reflective intellectual life.

Peer-Led Team Learning (PLTL) discussion groups consist of small, break-out sessions. Approximately every two weeks over the course of a given term, students gather in small groups rather than attend a general class. Each PLTL discussion group utilizes question sets prepared in advance by the principal instructor of the class, enhancing session structure; however, the principal instructor remains wholly absent from the scene of the PLTL discussion to allow the students more freedom in their responses. In addition, EWCAT courses emphasize writing as the principle means of reporting results. EWCAT students produce reflective essays, critical analysis essays, and test in written (rather than standardized or multiple-choice) format. Students also engage in peer-editing and grading of each other’s written products. The combined focus on reading original works and writing about them ensures enhanced student performance with the art of written communication.

The evidence collected so far (and cited below) is encouraging: active learning in the classroom is better for our students at SHSU than traditional lectures. Its use particularly by newer faculty just out of graduate school is encouraging. However, all SHSU faculty can benefit from knowing more about active learning. With enough proper training and encouragement of faculty, the benefits from active learning which have so far been limited to a few classrooms can be broadly extended to benefit all students across our campus.

3 Recent Research and/or Best Practices

There is evidence both nationally and on our campus that active learning techniques provide benefits to learning outcomes and student engagement. In addition to providing our students these documented benefits, this campus initiative can also to contribute to the growing body of evidence on the positive effects of these teaching methods.

A comprehensive study of IBL at four large institutions [4] and a collection of data from multiple studies of POGIL [5],[6],[7] provide convincing evidence that using these methods at regional comprehensive universities such as SHSU can increase both student learning outcomes and STEM retention rates. In addition, there have been some recent studies performed on the benefits of adapting POGIL for use in engineering courses [8]. The emerging field of engineering technology could benefit the most from these innovative teaching methods.

The IBL study mentioned above is particularly relevant to SHSU and similar institutions, in that the students who received the largest benefit from the IBL technique were women and students who began their semester underprepared. In particular, there was no evidence of harm done to students deemed high-achieving at the start of the semesters, and previously low-achieving students saw striking improvements, particularly those students planning on becoming teachers. These results indicate that expanded use of the IBL method at regional, comprehensive universities similar to SHSU can have a drastic and lasting effect on the STEM culture, from students planning on graduate study in STEM to those planning on teaching future STEM students.

 Several SHSU faculty in the departments of mathematics & statistics (Doleshal, Loft, Martin, Malandro, Garcia, Garcia-Puente) and chemistry (Thompson, Williams) have successfully implemented IBL, POGIL, or other active learning methods into their classrooms. Courses at SHSU in which these methods have been implemented are either single-section, upper-level majors-only courses (abstract algebra, introduction to proof, chemical quantitative analysis) or a single section of a course that has several sections (calculus, either semester of general or organic chemistry).

In addition, there is documented evidence of the efficacy of active learning on our campus through the EWCAT curriculum. Over the academic years 2012, 2013, and 2014 the College of Humanities and Social Sciences at SHSU conducted a study in the efficacy of EWCAT-style courses versus similar courses delivered by traditional methods. Classes of freshman English Composition comprised the sampling pool. Students in both EWCAT sections and traditional sections used
as controls were asked to participate in three specific instruments of assessment: compositional skills pre/post testing; the Critical Thinking Motivational Scale (CTMS); and the Service Learning Benefits Scale (SELEB). Additionally, the EWCAT and control sections were compared for outcomes in the usual instructor evaluation (done at SHSU with the IDEA system) and in attendance. The study found that in 2012 and 2013, EWCAT sections showed markedly improved performance by all measures. Students reported greater motivation to engage in critical thinking, saw more relevance in their studies for civic life, rated their instructors higher (even for instructors teaching in both kinds of sections), and showed less absenteeism. Perhaps most importantly, students in EWCAT sections showed pronounced improvement in compositional skills, while students taking traditional sections showed little or no improvement at all (nationally a common outcome for freshman composition courses). By 2014, enthusiasm as measured by the CTMS and SELEB had waned to equivalent with traditional control sections. However, compositional learning outcomes and attendance in EWCAT sections continued to outpace traditional sections. This particular result was very important in that it suggested improved learning outcomes in EWCAT sections occur consistently across the tides of student emotional response to the course.

4 Institutional Data

On our campus, data is collected each year measuring the level of academic engagement of our students. This data indicates there is considerable room for improvement.

The National Survey of Student Engagement (NSSE) is an instrument designed to assess two features of quality education: the amount of time and effort students put into their studies and how institutional commitment facilitates student participation. NSSE surveys first-year and senior students to assess their levels of engagement and related information about their experience at our institution. Because active learning techniques share the common goal of engaging students as active participants in the learning process, the NSSE is an obvious tool for assessing its efficacy.

Of the ten Engagement Indicators on the 2016 NSSE, first year students at SHSU in 2016 scored below the THECB average on seven of them, and above the THECB average on none of the ten indicators. Responses from senior SHSU students are only slightly more encouraging: on nine of ten indicators there was no significant difference measured when compared to THECB seniors (only one indicator, Quality of Interactions, was significantly higher than the THECB average). These 2016 results indicate that our current instructional efforts are increasing student engagement somewhat, but to levels not higher than the THECB average.

5 Resources Needed for Implementation

There is no shortage of evidence that active learning methods benefit higher education classrooms, particularly for students who attend institutions such as SHSU. There is also no shortage of materials available to faculty who are interested in learning more about implementing these methods in their classrooms. For example, the Educational Advancement Foundation (EAF) and the POGIL Project provide funding and training workshops for faculty interested in the implementation of IBL or POGIL in their classrooms. In addition, there are dozens of sets of extensively edited and tested course notes freely available from resources such as the Journal of Inquiry-based Learning in Mathematics (JIBLM) and the POGIL Project. The annual Legacy of R.L. Moore meeting hosts a conference each summer, at which hundreds of participants share their experiences with active learning. The EWCAT model is already in use in four departments in our own CHSS. The next step is expanding the use of these methods throughout all departments on our campus.

What is lacking at larger, comprehensive public institutions such as ours – in which faculty teach three or even four courses each semester in addition to developing a research program – are the support structures required to give faculty the means to develop these innovative and often
challenging teaching methods. This initiative will provide funds, workshops, and mentoring in order to train, encourage, and foster the use of more and better active learning techniques in all departments across our campus. Resources necessary for the expansion of these active learning techniques may include

- local workshops hosted for educating and training faculty on the benefits, development, and use of active learning in the classroom,
- summer stipends for the development of curricular materials,
- funds available for undergraduate teaching assistants and peer-led team learning discussion,
- conferences held to disseminate the knowledge obtained,
- travel funds available to faculty to attend training and professional development workshops.

6 Institutional Participants

Every faculty member (tenured, tenure-track and full-time instructional faculty) will be encouraged to learn more about and use active learning techniques in their classrooms. Resources will be available to either encourage the use of classroom-tested course materials (by first-time users of active learning) or for the development of new materials to be used in traditionally lecture-based classrooms (by faculty who are already using active learning). A faculty committee will prioritize the use of these resources, ensuring that departments with less exposure to active learning will receive enough of these benefits to develop a change in culture among the faculty in that department.

Talented undergraduate students will serve as teaching assistants for peer-led team learning. In fact, using pre-service teachers interested in secondary certification will expose the benefits of these teaching methods to the next generation of educators. After proper pre-semester training by experienced faculty, these teaching assistants will be assigned to one particular section of an active learning course, attend class meetings, and possibly assist with assessment of daily assignments.

7 Possible Outcomes and Challenges

There are several ways to measure the effects of active learning, and thus several areas of expected impact. The following is a list of some desired goals and means to assessing their achievement.

- Student Engagement will increase. Currently our efforts regarding increasing student engagement (as measured by the NSSE) only bring us to the THECB average. This initiative will result in the scores of at least 5 of the 10 Engagement Indicators on the NSSE to be significantly higher than the THECB average.

- Students who experience active learning in a first-semester course (Calculus I, History I) will be more likely to receive an A or B in the corresponding sequel course (Calculus II, History II). For example, each semester the performance of students in second-semester courses who completed an active learning first-semester course will be favorably compared to the performance of the students who completed a traditionally taught first-semester course.

- The rate of students either dropping the course or receiving a grade of D or F will be lower in active learning courses than in the traditional lecture environment. For example, the current D/F/W rate for first-semester calculus and chemistry courses ranges between 45% and 55%. This rate will decrease to an average of at most 30% throughout IBL/POGIL sections over the funding period, and remain at this level.

Improving student ownership of learning in all disciplines beginning with each students’ first semester on our campus ensures the academic engagement of each student increases from current levels and is sustained throughout their university career. Consequently, this initiative will result in fewer students from adjusting their career plans because of a lack of interest in a particular course, effectively increasing the graduation rates of students in their original choice of major.
References


