

## *Got Inquiry?*

# The infusion of “Teams & Streams” independent investigations throughout a biology curriculum.

D.B. Luckie and J.J. Maleszewski; Lyman Briggs School of Science, Michigan State University

In 1999 our faculty began asking the question: “Are undergraduate science laboratories teaching students the art and trade of science or simply leaving them with a memory of trivial experiments done for unknown reasons? From our conversations with students in biology, it certainly appeared as though the latter was the consensus. Students used words like: “boring”, “restrictive”, “pointless”, and so on, to describe the biology laboratory. In fact, very few of our students characterized the lab to be a good learning experience. Even our ‘best and brightest’ students agreed that while our new cutting-edge DNA genomics labs were fun, structured labs really didn’t help them learn. In fact, they indicated that they often didn’t really understand what they were doing until the week **after** completing the experiment, when they wrote the lab report.

"I never thought about what I was doing in lab - I just did what the manual said."

-Former Student

In an effort to remedy this, we began a long-term redesign of the biology sequence in the Lyman Briggs School of Science at Michigan State University. Combining what educational experts have found about active and cooperative learning and challenging our own biology faculty to make the lab as realistic as possible, the lab curriculum departed from numerous 3-hour traditional labs that each student performed on their own, to what we now term "Teams and Streams." Now we use student research teams to **pose** a scientific question/hypothesis, **propose** an experimental design to set about gathering evidence for support of said hypothesis, **perform** multi-week investigations and then **present** their findings in various forms (web sites, interviews, and multiple drafts of a scientific manuscript along the way).



For example, in Stream I, student research teams work for 8 weeks to produce and submit their final manuscript. In the first week they are introduced to the lab and it is then that they develop their research question(s) and plan. While they are then trained in various lab techniques and assays during weeks 2, 4, and 6 (by performing very structured traditional labs), during weeks 3, 5, and 7 groups pursue their independent research projects by re-applying and extending the range of different assays they learned in structured labs to answer their own questions in their independent investigations.

The groups each have a designated space in the laboratory classroom (a lab bench) that is fully equipped with computers and scientific equipment to help them in their novel studies. In addition, students are allowed to return to lab as often as they wish to complete their research --they reserve open benches online. Since they create their own methods, we find students can better explain how and why the equipment is used to complete their project. The response to this classroom laboratory design has been overwhelmingly positive. As students once dreaded the 3 hours per week that they were in lab, we now find them signing up for additional lab time to where they are even exceeding 10 hours/week in lab! Not only are these students getting a real taste for what science really is, but they are finding, even in this short time, how much they enjoy it.