

SD-IGERT Annual Assessment Report May 2012
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Overview

The IGERT program currently serves 12 doctoral students at 3 universities within the state of South Dakota: South Dakota State University (3 students), South Dakota School of Mines and Technology (3 students), and the University of South Dakota (3 students). This assessment report includes coverage from the June 2011 South Dakota IGERT conference as well as interviews in April 2012 with 8 of the active IGERT students. Since last June, only one student has graduated and one student has dropped the program.

IGERT Conference

All but one of the IGERT students, who has now dropped the program, participated in the IGERT conference. Conference format was poster sessions both on proposed outreach activities and on technical aspects of current research. A number of the IGERT students presented more than one technical poster session. Posters exemplified format and rigor that one might expect at a professional conference. Without exception, the students were eager to share in their work with colleagues, faculty mentors, and with the program evaluator. Particularly noteworthy is that while the students were technically competent, almost without exception, they were able to discuss their individual research at a more general level and seemed to be able to readily adapt to the expertise of the individual audience member. An example of one of the technical posters is shown in Figures 1 below.

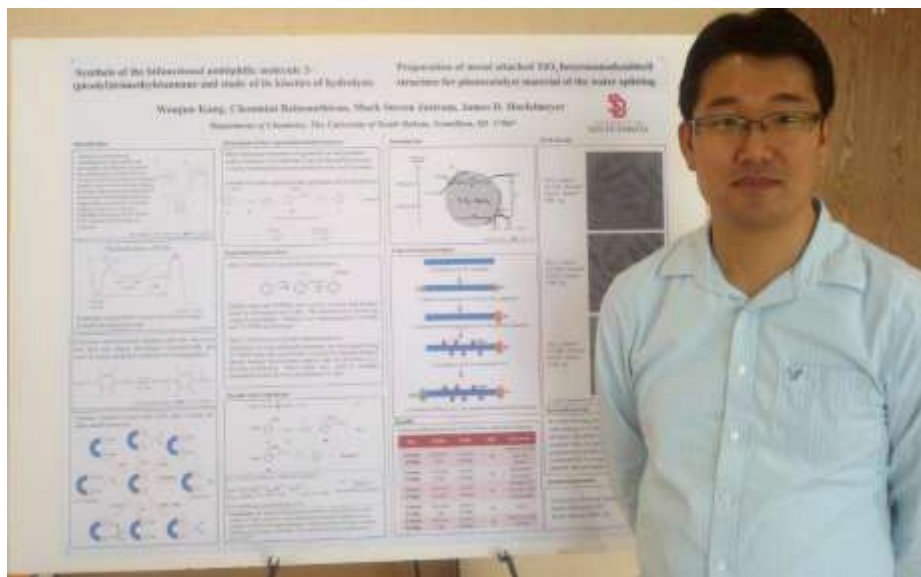


Figure 1. Technical Poster Presentation on “Synthesis of Bifunctional Ambiphilic Molecule 2-(picolyl) Trimethylstannane and Study of Its Kinetics of Hydrolysis”

In addition, students presented poster sessions on proposed outreach activities, which is a requirement of the program. While posters demonstrated limited knowledge of pedagogy appropriate to the age level, proposed outreach activities demonstrated a relatively rich variety of activities and venues. All proposed activities demonstrated a genuine attempt at legitimate outreach and interest on the part of the IGERT student. Upon questioning, most students were surprisingly enthusiastic about proposed outreach activities. A K-12 educator with expertise in curriculum and instruction provided students guidance and suggestions for modifying activities. A number of the activities have been accomplished since the IGERT conference in June. More will be mentioned of this in a later section. Samples of poster sessions of proposed outreach activities are shown in Figures 2 and 3 below.

Outreach: Alternative Energy Workshop
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Objective: Help students to learn how alternative energy could provide ready source of renewable energy and solve energy-related environmental problems. Outreach focus on solar energy due to its large potential energy generation.

Types of Alternative Energy

1. Wind
2. Solar
3. Geothermal
4. Hydro
5. Biofuels

Energy Storage

1. Kinetic
2. Photo
3. Thermal
4. Potential
5. Chemical

Energy Conversion
Transfer of one type of energy medium to another useful type

Outreach Laboratory Activities

1. Design Computational models for dyes
Design and model electron transfer in DSSCs
2. Develop Green Chemistry
Use ionic liquids in DSSCs
3. Build DSSCs using green reagents
Use sol-gel prepared TiO_2 , raspberry juice, and green porphyrin.

Operational Principles of DSSC

Outreach Goals

1. Students think critically about energy policies
2. Learn about alternative energy in solving world's energy demands
3. Pursue career in alternative energy

References:
Attached handout

Acknowledgements
Dr. Parvati, Chemistry, USD

Figure 2. Sample for a Proposed Outreach Activity

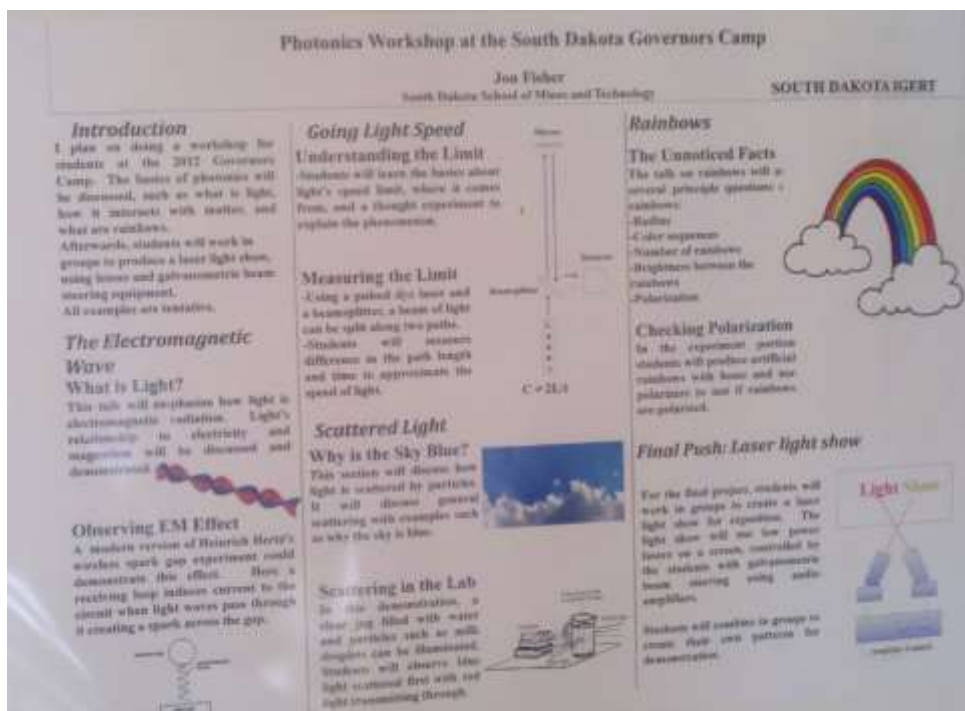


Figure 2. Sample for a Proposed Outreach Activity

Access Grid Courses

Currently, most of the students have had one or more courses in the access grid room. In addition, a number of the students have had the opportunity to participate in multi-institutional classrooms through an older polycom delivery system. While most students prefer the structure of an onsite classroom, without exception, students noted that the advantage of a greater breadth of course offerings through the collaboration of SDSU, USD, and SDSMT far outweighed the traditional structure of the onsite classroom. Indeed, students that had the opportunity to experience multi-institutional classrooms via access grid and an older technology, readily admitted that not only did the access grid classroom offer enhanced graphics and capabilities but with the ability for real time access to ask questions and class discussions they noted that the differences between the traditional onsite structure and that of the access grid classroom were relatively minimal. At the IGERT conference in June 2011, some students indicated a slight concern over courses offered through access grid, but at the time of this assessment report these concerns have largely disappeared. **A strength of the IGERT program is the use of the access grid and planned course rotations from the three participating universities to provide greater breadth of courses not previously available to students.** The one relatively minor concern noted by some students is that, like any technology, some faculty members are comfortable with the technology and others seem less so. In particular, a few students noted that disorganization or language skills seem to be enhanced through distance technology, even in the access grid room. This is not uncommon with any distance technology but may be something the IGERT faculty members wish to be aware of.

Seminars

A second strength of the program is the multi-disciplinary nature of the seminar programs.

Generally, the students seemed to enjoy the seminar programs. Although they can interrupt work flow to attend, students generally felt that the seminars provided a breadth of topics not available at a single university. They also present an additional opportunity to search out collaborations. All seminars are held in the access grid room. Students also see the seminars as a potential to see researchers and/or other IGERT students with whom they may be able to collaborate, which has led to at least two selections for campus rotations. Several students particularly noted that recent presentations on nano-fabrication at the University of Minnesota and on NanoPhotonic Devices by Dr. Alexander at the University of Nebraska, Lincoln provided some insight for possible directions of their own work. While the perceived usefulness of the seminars varied, all students commented on the importance that the multi-disciplinary component the seminars bring to the program.

Research Training and Development

The first and primary goal of the program is to ensure South Dakota's capacity for meaningful contribution to research and workforce development in next generation solar cells and related technologies. Students in the program should produce at least six journal articles and journal publications per year in nationally recognized outlets for nanostructured solar cells, materials, process, and devices. **Research training and development seems to be a strength of the program.** As the external evaluator it is difficult at times to obtain all of the relevant contributions from the program much less to assess the quality of research being generated. Nevertheless, metrics in this area seem well above the stated goal of six journal publications. Specifically, all IGERT students are required to participate in the IGERT conference through poster presentations. In addition to the IGERT conference, IGERT students contacted have collectively presented over eight technical presentations, four poster sessions, and three publications with an additional four under review and at least two in progress.

Rotations

At the time of the 2011 South Dakota IGERT conference, only one of the students had completed a campus rotation. Currently four of the students had completed or were currently completing campus rotations. One of the students indicated the rotation was interesting but was not particularly helpful for the planned research and in some ways, slowed progress on planned research. The other 3 students interviewed indicated the rotations were enormously beneficial. Not only do the rotations provide access to research equipment that may not be available on the home campus, but the collaborative work with other student colleagues and availability of diverse faculty expertise is a strength of the program. One student indicated that consideration should be given to longer or multiple rotations.

Outreach

Students are making progress related to outreach activities. At the 2011 IGERT conference, only one of the students had completed an outreach activity but all of the student attendees had proposed outreach activities at the time of this conference (see Figures 2 and 3 for example). Currently, outreach activities included presentations at the Youth Engineering Adventure camp at SDSU in 2011 and 2012 (60-90 students), an introduction to the molecular world for SDSU's kindergarten campus (20 students), and a two day science workshop in 2011 at Sinte Gleska University (20 Native American students), and an introduction to chemistry summer course at Mt. Marty University in Yankton. A cohort of 5 IGERT students has developed a five day workshop at Nebraska Indian Community College in Sioux City, Iowa, May 14-18, 2012.

General Comments

Students participating in the IGERT program are universally positive on the IGERT program and the research opportunity it provides. They consider the multi-disciplinary aspect of the program through the three university consortium to be a strength of the program rather than a limitation. It provides greater access to research equipment, greater breadth of courses, and a broader exposure to research within the general field of nanostructured solar cells. A few students commented on a desire for additional information on the web site regarding faculty expertise and possible areas for research collaborations and/or rotations. In addition a few of the students indicated that they would like to see students take a bit more ownership primarily with regard to seminar programs but also with potential research collaborations.

Future Assessment Activities

Beginning with the 2012 IGERT conference, we will begin assessment of student attitudes, typologies, ethics, and cognitive development. Students will be asked to participate in an online assessment of the Herrmann Brain Dominance Inventory (HBDI) with the possibility of a short seminar workshop to expose the students to diversity in problem solving. In addition, students will be asked to complete a modification to the SALG REU survey to gauge student attitudes and perceptions of gains related to scientific reasoning. Assessments for ethical reasoning and cognitive development are planned for Fall 2012.