Mentoring Undergraduate Student Research

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Dr. Zhifu Xie believes that mentoring students is one of the most rewarding aspects of his career. He has involved undergraduate students in research projects and assisted them in publishing their findings in professional journals and in presenting the results in local or national conferences. He has enjoyed working with undergraduate students in different research projects over the past years. The students are listed below with dates of research.

1. Mervin Woodlin (Spring and Summer of 2009)

   In 2008, Zhifu Xie was awarded a Research Initial Grant (Code 2137) of Virginia State University, which supported him to mentor undergraduates to do some research. Mervin woodlin was hired as a research assistant in the spring and summer of 2009. The co-authored paper "Collinear Central Configurations in the n-body Problem with General Homogeneous Potential"was published in the *Journal of Mathematical Physics* 50, (2009), 102901.

2. Michael Westbrook (2009-2010)

   In 2009, Zhifu Xie was awarded a Mini-Grant by the National Science Foundation (NSF) (DMS 0636648) and Brigham Young University via the Center for Undergraduate Research in Mathematics (CURM). The CURM promotes undergraduate research in mathematics throughout the United States by providing funds to professors at various institutions across the United States to assist them financially, instructionally, and organizationally in operating successful undergraduate research groups at their own institutions during the academic year. Michael Westbrook worked as a research assistant in the academic year 2009-2010. Michael was supervised to investigate a new phenomenon about central configurations of N-body Problem. Michael presented the resulting paper "Super Central Configurations of the n-body Problem with the Inverse Cubic Law and the Inverse Law"in the 2010 CURM Conference at Brigham Young University and he got $500 award for his presentation. He was successfully accepted by a graduate program in Norfork State University.

3. Krystolyn Henderson and Kenyaita Taylor-Hodge (2010-2011)

   In 2010, it was a great honor for Zhifu Xie to be awarded again a Mini-Grant by CURM. Krystolyn Henderson and Kenyaita Taylor-Hodge were chosen to conduct research in the research group supervised by Zhifu during the academic year 2010-2011. The research results have been presented by Kenyaita Taylor-Hodge in the 2011 Emerging Research National (ERN) conference where near five hundred and she was awarded the first-place prize in the oral mathematics presentation. Students presented the research results in the 2011 CURM Conference at Brigham Young University and they submitted their research reports to Center of Undergraduate Research in Mathematics at Brigham Young University in May 2011. The

resulting paper "Super Central Configurations of the Three-body Problem under the Inverse Integer Power Law" has been published in the Journal of Mathematical Physics.

4. Erica Still and Candra Gross (Summer 2013)

   In the Summer 2012, Zhifu Xie proposed an undergraduate research topic on the predator-prey food chain model. This project was supported by a summer research grant from Virginia State University. Zhifu Xie co-mentored the undergraduate research projects with Dr. Dawit Haile and Dr. Jing Zhang. Students did an oral presentation in the Undergraduate Research Conference at Virginia State University in the April, 2014. Students also wrote a research paper as the final report.

5. Brandi Massey, Arrieyana Cartier, Jasmine Blocker,Monique Duru (Summer 2014)

   A summer research grant supports Drs. Zhifu Xie, Yongjin Lu, and Jing Zhang to investigate a cooperative game model which describe the possible best collaborations among companies, universities, and government. After we introduced some basic concepts and examples of game theory. Students are asked to read a game theory textbook and they also did a power point presentation on a specific game theory topic. Impressively, one group constructed a game model to describe the students' behavior in a group project and another group apply game theory to analyze the price negotiation between two dominated companies for example, Coco Cola and Pepsi.

6. James Finnie, Joilah James, Robert Benson, Imani Wood, Janelle Williams, Janay Joseph (Summer 2014)

   This project explored the core concepts of differential equations about equilibrium and its linear stability. Students are divided into two groups and they are supervised by Drs. Dawit Haile and Zhifu Xie. One group (Imani Wood, Janelle Williams, Janay Joseph) investigated a three-species food chain model with a general predator and a specialist predator. Another group (James Finnie, Joilah James, Robert Benson) investigated a three-species food chain model with two specialist predators. This project is supported by NREUP whose fund is provided by the National Science Foundation's Division of Mathematical Sciences and the National Security Agency. The Mathematical Association of America (MAA), through its Strengthening Underrepresented Minority Mathematics Achievement (SUMMA) program, supports the participation of mathematics undergraduates from underrepresented groups in focused and challenging research experiences to increase their interest in advanced degrees and careers in mathematics. Both groups submitted a final research paper and they also give oral presentations.

Zhifu Xie will continue to devote himself to mentoring the undergraduate students, incorporating them into various aspects of the research project, encouraging the students to take part in activities of professional societies, and advising students on their presentations in conferences. He will continue to seek some external fund such as NSF grants to support undergraduate research activities.