XYZ* UNIVERSITY UNDERGRADUATE RESEARCH CENTER

Undergraduate and graduate training and in particular, research-based education experience of work-force has long been recognized as one of the critical factors facilitating ongoing nano-technological revolution, emerging global industrial order, and national and international competitiveness. To support leading role of the U.S. economy further into the 21-st century, the U.S. universities have to establish and support novel approaches to education as an integral product of teaching and research. **Expending collaboration, experience and facilities, and enhancing capacity, infrastructure and commitment of the partners**, **the XYZ Undergraduate Research Center project** brings together several departments and units of western Kentucky University (WKU), local schools, governmental laboratories and collaborating high education institutions to **establish a scalable, Integrated Research-Based, industry-friendly Educational Model (IRBEM)** for undergraduate education in chemistry and chemical sciences. An ultimate goal of the IRBEM is to increase chemistry/chemical sciences undergraduate student enrolment via diversification research, student base, education opportunities and career choices.

The key features of the XYZ project are its (i) **inclusiveness of student recruitment** via diversification of the recruitment motivations, sources, methods and goals; (ii) **scalability and sustainability** derived from development of a research-based educational model applicable to mid-size and small universities and colleges that constitute the majority of the U.S. undergraduate education force; (iii) **effective collaboration** between **the project partners and center management** via integrated infrastructure and goals; (iv) innovative curriculum development and smooth **integration of research into curriculum**; (v) innovative and objective **project evaluation** methods.

The aims and objectives of the IRBEM model include the following items.

- **Development of the undergraduate research and education infrastructure** via the use of novel research/education equipment and facilities (such as an ion-beam line of a 2.5-MeV Van de Graaff particle accelerator, PIXE End Station, Beowulf Linux cluster, etc.).
- Based on existing strength of WKU and partners, **development of an interdepartmental, consolidated undergraduate research program** in the areas of materials, physical and environmental chemistry and chemical physics broadly understood. The major research directions include: (i) **experimental synthesis and studies of nano- and sub-nanostructured materials** (such as thin semiconductor films and nanoheterostructures, silica and alumina membranes, particulate systems, ceramics, etc.); (ii) **theoretical and computational studies, and the corresponding software development** in the areas of sub-nanostructured semiconductor materials, artificial atoms and molecules, quantum dots (QDs), etc. with pre-designed electro- and magneto-optical properties; (iii) **experimental environmental chemistry** studies of surfactants and sorbents for the use in karst aquifer systems; studies of transport of heavy metals in such systems.
- **Development of a scalable, research-based education environment with the corresponding research-based curriculum for undergraduate chemistry and chemical sciences students** built upon flexible, module-structured, hands-on (i) laboratory courses, (ii) quantum theoretical and computational courses, and (iii) courses in visualization, data management and data communication methods, unified and interlinked by (iv) integrated into the curriculum research program leading to development of 5-year based BS and MS degree programs featuring “industrial stream-line” training, and (v) complemented by a 1-year science preparatory program designed for college students to meet requirements of enrollment to XYZ’s partner institutions.
- **Development of industrial and international components of the IRBEM**, including (i) close ties with international and industrial organizations; (ii) information and faculty/student exchange between the domestic academic and international and industrial partners.

The structure of the XYZ project is designed to **enhance the quality of undergraduate research**, make the **best use of available and gain new research-based education capabilities, ensure professional growth opportunities** for students and mentors, and **rise the numbers and demographic inclusiveness** of students and mentors.

* The name of the University was changed to XYZ for customer information protection.