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## **Professional Development and Education: Central Asia University Partnership Program (UniCEN) between Iowa State University and Tashkent Institute of Irrigation and Agricultural Mechanization Engineers and TIAME Bukhara Branch**

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**ABSTRACT.** Iowa State University has been awarded two grants focused on professional development and education. The grants are part of the U.S. Department of State and the American Councils for International Education programming for the UniCEN platform. UniCEN focuses on increasing sustainable collaborations between U.S. and Central Asia higher education partners. Twenty-two of the partnerships in the UniCEN network are in Uzbekistan, located in the heart of Central Asia. The Iowa State University partnership builds on two project grants. One grant, entitled *Enhancing the Reputation of Research in Uzbekistan through Professional Development*, focuses on faculty research and workforce development. The second grant, entitled, *Advanced Agricultural Machinery Partnership Between Iowa State and TIAME*, focuses on partnership development and agricultural machinery systems engineering training. To date, both projects are developing and delivering online webinars based on needs assessments conducted in 2020. The planned project grant outcomes are: (i) one oral research presentation per Uzbek participant, (ii) one academic writing artifact (paper, poster, grant proposal, or similar) per Uzbek participant, and (iii) improvement of Uzbek participants' research knowledge and practices (evaluated by the pre-post testing and/or interviews). The planned small faculty project outcomes are: (i) greater common understanding of agricultural machinery systems in the U.S. Midwestern and the Uzbekistan agricultural contexts, (ii) broader development of relationships between the respective agricultural machinery faculty and students at Iowa State and TIAME, and (iii) a strategy for developing a formal and sustainable partnership between the institutions. This project supports broader economic impact by advancing research initiatives on par with developed countries. Such initiatives, particularly in agriculture and engineering, could lead to new products, processes, or other innovations that propel industry efforts. Social impacts can be felt when research initiatives lead to improved environmental sustainability. This conference paper will present an overview of the education, outreach, and professional development opportunities in Central Asia via the UniCEN program and the developing partnership between Iowa State University and the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers in Tashkent and the Bukhara Branch.

**Keywords.** *Higher education, international development, outreach, research, TIAME-Bukhara Branch, Uzbekistan.*

Developing nations often seek partnerships with developed countries to aid in development. Uzbekistan is one such developing nation that has experienced rapid change and expansion after Shavkat Mirziyoyev became president in 2016 (Khan, 2019). The government has an interest in expanding partnerships with the United States, in particular, and in all sectors, including higher education. The UniCEN division of American Councils for International Education, in collaboration with the United States Department of State, provides several grant opportunities to support partnerships between Central Asian and U.S. higher education institutions. According to UniCEN's website, "UniCEN builds expertise in the areas of strategic planning, administration, faculty policies and practices, student mobility, curriculum development, and alumni relations to advance the development of mutually beneficial partnerships" ([unicen.americancouncils.org](http://unicen.americancouncils.org)).

Agriculture is of particular interest for partnerships in curriculum and faculty development at Uzbek universities. Indeed, agriculture is one of the main sectors of Uzbekistan's economy. Fifty percent of the population live in rural areas and 28.2% of 2020 GDP was derived from agriculture, forestry, and fisheries (Stat.uz, 2020). Agriculture equipment suppliers in Uzbekistan shifted from the 1990s, when farmers started using Case IH tractors and harvesters, to today, when farmers use machinery from John Deere, Case New Holland, Claas, Lemken, and LS Mtron, among others. With these changes, it is very important for agriculture mechanization engineers and other agriculture specialists to develop collaborations with knowledgeable partners in the United States.

This paper describes two such collaborations, emphasizing agriculture and biosystems engineering professional development and outreach. Professors Koziel and Coffelt were former Fulbrighters in Uzbekistan and Professor Koziel had previous research collaborations with scientists in Kazakhstan and Uzbekistan. Professor Steward has a strong reputation in agriculture machinery and was invited by TIAME-Tashkent to collaborate. Professors Sabirov and Amonov recognized the similarities between their universities and Iowa State University, particularly around agricultural engineering. As such, all authors had experience and motivation to nurture and sustain education, outreach, and professional development projects.

## Collaboration 1

### Enhancing the Reputation of Research in Uzbekistan through Professional Development

#### *Overview*

This grant fulfills two goals of the Uzbek partner, TIAME-BB, specifically (a) training professors to conduct high-quality research and publish research results in peer-reviewed, scientific journals and apply for grants and (b) use best practices to develop research capacity and sustain a partnership with Iowa State University. The partnership between TIAME-BB and Iowa State University was facilitated by a two-part application and matching process. First, TIAME-BB applied to be a partner institution. They submitted an application to UniCEN describing their goals and objectives. UniCEN approved applications from higher education institutions in Uzbekistan and provided those to U.S. institutions who wanted to apply for a partnership grant. As former Fulbright Scholars in Uzbekistan, Professors Koziel and Coffelt were interested in maintaining scholarly connections in Uzbekistan. In particular, each had interests in enhancing research methods and publication practices and recognized an instant connection with TIAME-BB after reading their application.

#### *Grant Activity*

The grant provided research-related professional development to faculty members at TIAME-BB. Seminars were developed using Canvas Free for Teacher as the platform for virtual delivery. Seminar topics were selected after conducting a needs analysis. The needs analysis involved a Zoom meeting with Koziel, Coffelt, and Sabirov and other selected administrators at TIAME-BB. Sample questions asked during the needs analysis included (a) what outcomes do you hope to see for faculty, (b) what outcomes will faculty hope for, (c) what are research and publication expectations, (d) what kind of preparation do faculty members receive to help them conduct research, (e) what kind of preparation do faculty receive to help them write research, (f) what do faculty need assistance with to improve their research, (g) what do faculty do well in their research endeavors, and (h) what topics do you hope we cover?

Koziel and Coffelt then analyzed the responses from the meeting and finalized a list of topics. These topics were organized into modules called overview, identifying your discipline and specialization, applying ethical standards, designing a research project, writing, finding and applying for grants, and presenting and submitting research. Each module had additional

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subtopics. For example, the applying ethical standards module contained three segments called research ethics, writing ethical information into the project, and referencing. Originally planned for face-to-face delivery at TIIAME-BB in January, international travel restrictions required shifting content delivery to a virtual format. As a result, the content was delivered over three months instead of one week.

The virtual presentations were prepared with the support of Iowa State University's Engineering-Liberal Arts & Sciences Online (ELO) department. This unit is a collaboration between the two colleges to provide technological support for online delivery of courses and other initiatives. ELO assigned an instructional designer to guide Coffelt and Koziel through the development of online content delivery. To that end, a professional PowerPoint template was developed to provide continuity throughout the program. Two cover slides were repeated in every presentation to recognize the partner universities and the funding agency, as well as give credit to Coffelt and Koziel for content development. PowerPoint files were prepared and then reviewed by a graduate assistant at ELO. The review evaluated clarity of ideas, slide layout, and consistent application of formatting standards, among other elements. The review also ensured that universal design principles were applied, thereby making the program accessible.

The PowerPoint files were then ready for audio and video enhancements. Using Studio in Canvas, Coffelt or Koziel video-recorded presentations while going through the PowerPoint presentations. Presentations ranged in length from 5 to 40 minutes. ELO staff evaluated the production and sound quality, commenting on background colors, lighting, and orientation within the recording area. When the video and audio were deemed ready, ELO used voice-to-text software to add subtitles to the presentations. While designed for accessibility purposes, subtitles benefitted grant participants who had varying levels of English proficiency. ELO further prepared pdf files of each PowerPoint and transcripts for each presentation. ELO staff uploaded all documents to Canvas Free for Teacher. Coffelt uploaded files such as the syllabus and schedule and programmed the dates for module release. Each module contained an overview page, links to presentations, a discussion forum, and an assignment. The presentations contained the content for the project.

Assignments were another dominant feature of the grant project. These ungraded activities facilitated the incremental development of a research and writing project. Participants built their project and paper in small segments, received feedback, then added more content to the paper. At the commencement of the project, participants selected either a journal submission, conference submission, grant proposal, or research proposal for their individual writing project. From there, participants worked incrementally on the paper. Their assignments coincided with the content delivery. Participants also took a pre and post-test to measure knowledge acquisition. Individual writing consultations were added after the grant began. These virtual sessions between the faculty at Iowa State and the grant participants at TIIAME-BB personalized the program for the participants while giving them richer feedback on their projects than type-written feedback can do.

#### *Outcomes*

The program began with 62 participants. By the end of the program, 24 wrote some form of a paper. The post-test will be administered in June, so the change in scores is not yet available. Participants will be recognized at three levels: certificate of participation, certificate of completion (with \$75 stipend), and certificate of completion with distinction (with a \$99 stipend). Those recognized for distinction write with the quality expected for submission to the top tier, high-impact conferences or journals. Travel to Bukhara, Uzbekistan for face-to-face meetings and writing consultations are scheduled for the end of May. Future research and collaborative projects are anticipated, such as repeating this program, developing an intensive English language program, hosting a scholar-in-residence at Iowa State, hosting a delegation of administrators at Iowa State, and collaborative research projects with ABE faculty at Iowa State and TIIAME-BB. Certainly, participation in such a significant international project was a step towards improving scientific work on an international scale, when the requirements of the higher education system of the Republic of Uzbekistan coincide with the requirements and standards of international education.

#### *Challenges*

The program presented some noticeable challenges, which can be overcome with further discussion and new outreach initiatives. A critical challenge in the program was the language differences. Most Uzbeks speak two of three languages: Uzbek, Russian, or English, Coffelt speaks English, and Koziel speaks English and some Russian. Uzbeks who speak English have highly variable proficiency levels with few speaking or writing at the level expected for publication in top-tier, high impact journals. Nearly all participants relied on colleagues to translate their writing into English. Cultural values and practices complicated the interactions, as well. The low retention of participants is likely a result of the language differences as well as the time and motivation to complete a research/writing project in one semester. Teaching expectations are highly variable in Uzbekistan, and some faculty had high teaching loads that hindered participation. The participants thought tasks were quite difficult, which could be a result of several factors that need further investigation. Additionally, the travel restrictions in place early in the program required a shift from face-to-face to virtual content delivery. It would have been much more useful and easier if the participants had the opportunity to meet face-to-face more often during the period of work to discuss issues and the progress of the project. Despite the challenges, Iowa State will continue its outreach efforts to offer professional development in myriad forms—such as repetition of this program, faculty exchanges, or collaborative research projects—to TIIAME-BB faculty, administrators, and students.

## Collaboration 2

### Advanced Agricultural Machinery Partnership Between Iowa State and TIAME

#### *Overview*

Agricultural machinery is an integral component of productive agricultural production systems, which drives a need for agricultural machinery expertise, particularly about machinery systems' interactions with crop production environments. However, in many parts of the world, the capacity to develop this expertise has declined. With increasing pressure on agricultural production systems to meet the food needs of the growing global population, the advancement of agricultural machinery technology continues to be a very important component to meet these needs. Thus, this project addressed a significant need and is relevant to specific agricultural production systems in both Uzbekistan and Iowa.

The project objectives were to (1) build a partnership between Iowa State University and the Tashkent Institute of Irrigation and Agricultural Mechanization Engineers (TIAME) around the topic area of advanced agricultural machinery systems engineering and (2) provide agricultural machinery systems engineering training for TIAME faculty and graduate students.

Iowa State's ABE Department is globally recognized as the leading academic department in the area of agricultural machinery system engineering with its highly-ranked undergraduate and graduate programs. With close collaborations with the agricultural machinery industry, it has a long history of innovations that have improved the productivity and sustainability of agriculture. The department is well supported through its public and private stakeholders. With recent large industrial gifts, major agricultural machinery testing facilities are being developed to advance teaching, research, and industrial outreach. For example, the Danfoss Fluid Power teaching laboratory, established in 2014, is a world-class lab used to provide fluid power training to over 200 students annually. Similarly, the Soil-Machine Dynamics Lab was established in 2019 with capability to test ground-engaging tool performance and wear as well as traction system performance. Additionally, the Off-Highway Vehicle Chassis Dynamometer Laboratory is under construction and features a large roller dyno for whole vehicle powertrain testing for a wide variety of vehicle platforms and power levels.

TIAME is the principal training institution in Uzbekistan for agricultural mechanization, granting BS, MS, and doctoral degrees. It has successfully transitioned from the Soviet era with dramatic changes in student numbers and demographics. TIAME is now seeking to develop collaborations with universities around the world and to internationalize research and teaching programs. TIAME was the #2 ranked university in Uzbekistan in 2019 and was also ranked by QS in the 301-350 range of Eastern Europe and Central Asia universities.

This project represents some first steps in establishing a partnership between Iowa State and TIAME to enhance machinery testing and research expertise. The project focuses on the exchange of knowledge despite the COVID pandemic. As COVID eases, both institutions anticipate an exchange of people to advance this partnership.

#### *Grant Activity*

Steward served as the point of contact at Iowa State by leading the development of webinars. Amonov served as the point of contact at TIAME and organized participants in the project activities. Amonov also translated online meetings and webinars into the Uzbek language. To broaden the impact of the project, TIAME faculty invited early-career faculty members from TIAME branch campuses in the Bukhara and Kashkadarya regions as well as those from Tashkent State Agrarian University and Tashkent State Technical University to participate in the webinars.

To meet the grant objectives, several activities were carried out. After in-depth planning at the beginning of the project, monthly webinars were organized during the fall 2020 and spring 2021 semesters to develop relationships and exchange information. Out of the initial discussions, a list of webinar topics was made, which included topics such as: agricultural machine systems research at Iowa State, Iowa State international programs, ABE undergraduate and graduate programs and supporting curricula, and publishing in international peer-reviewed journals. This initial planning was followed by a survey to participants about their interest in webinar topics.

In fall 2021, Dr. Steward plans to travel to Tashkent for one week, teaching and developing collaborative activities that build on the work done through the webinars. The in-person course in Uzbekistan is planned to be about modeling and simulating machine systems agricultural machinery topics. If COVID-19 disallows travel in 2021, an online course format similar to that of the first project will be used. At project end, an overall project evaluation will be completed and a final report will be written with recommendations for the next steps.

#### *Outcomes*

The project is ongoing, but thus far, eight monthly webinars have been presented. The number of participants consists of 30 to 45 faculty and graduate students from TIAME and the other Uzbek institutions. Working relationships and collaborations are developing through virtual discussions. Several conference papers are being co-authored, and discussions about future exchanges are being planned.

TIAME faculty are working to internationalize research and teaching programs. As recently as 4–5 years ago, research results were mainly published in local journals. However, since 2019 the number of publications in English has significantly increased. For example, in 2018, there were 5 publications by TIAME faculty in Scopus. In 2019, there were 45 and by

2020, there were 274 (Scopus.com). Unfortunately, the majority of TIAME faculty have poor knowledge and experience of publishing in international journals. Further, a significant number of publications were discontinued in Scopus. The proliferation of potentially predatory journals may have impacted Uzbekistan as it has in neighboring Kazakhstan (Marina and Sterligov, 2021). For these reasons, faculty and graduate students at TIAME found the webinar about publishing in peer-reviewed journals to be very useful. Additionally, many faculty members have continuously revised their syllabi and teaching materials after viewing webinars on agricultural machine systems research and electronics used in modern machinery. TIAME administrators expect that teaching quality will increase as a result of the webinars. TIAME further anticipates an increase of international students in the near future after learning about exchange opportunities in international programs. Many participants were impressed with the professionalism in presenting materials and the openness to answering questions.

### *Challenges*

It has been a challenge to develop an international collaboration during a global pandemic. While the interactions fostered through the webinars have been good with substantial time spent on questions and answers, it has been a challenge to broaden the relationships beyond those of the project leaders. Language has been a barrier with many interactions needing translation to facilitate.

## **Conclusion**

Certainly, 2020–21 has been a difficult time to attempt to initiate international, outreach projects. Yet, the individuals involved in these grant programs learned about various technologies and were able to analyze what works and what does not work to meet the respective project goals. The technology certainly enabled the U.S. and Uzbek partners to bridge distance gaps despite the COVID-19 pandemic. However, the travel restrictions limited opportunities to develop strong personal relationships that may be needed to mentor the academic writing and publishing processes. The lack of face-to-face interaction also made it challenging to understand the cultural and local context of the partners.

These two grant programs represent opportunities for ABE faculty to extend outreach initiatives to international audiences. The country of Uzbekistan is rapidly advancing all sectors of their society to be competitive in a global marketplace. Their needs for professional development are vast and their interest in elevating research is important. They recognize the value of agricultural engineering research initiatives, English language learning, and higher education opportunities in the United States and are eager to engage in professional development with U.S. institutions. U.S. faculty can expand their research agendas and test their theories or practices in different environments, such as Central Asia.

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