



DropTES: Master the Microgravity Path, “DropTES Webinar”

UNOOSA

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1. How did you get to know about the opportunity?

FA: Through the Deanship Office of Student Affairs at the German Jordanian University, in which they knew about the opportunity through the Royal Jordanian Geographic Centre.

2. Why did you apply to DropTES? Why was the project needed or how did the project originate?

FA: The idea of the project was about investigating whether a tuned mass damper can be used in order to reduce the unwanted instabilities of an electrodynamic tether, which is a long conductor wire that is attached to the satellite, it can act as a generator or motor, from its motion through the earth's magnetic field. Since the satellite experiences “free fall”, the microgravity environment was needed in order to test the experimental outcome.

3. How has participating in DropTES changed the environment around you?

FA: After our participation and completion of the DropTES program, we gave a small talk at the Jordanian Astronomical Society and we heard that there were other teams from Jordan that were interested in participating in the program.

3. How has participating in DropTES changed the environment around you? Cont'd (2)

NA: As a result of our participation in DropTES in 2014 I pursued various UNOOSA activities. In March 2016 I was invited to the United Nations/Costa Rica Workshop on Human Space Technology. At that meeting I was introduced to the clinostat device. In Feb. 2017 I was elected to be the President of the American University of Madaba (AUM) in Jordan.

I started that month with the Innovation project for AUM students and for high school students in Jordan at large.

3. How has participating in DropTES changed the environment around you? Cont'd (3)

NA: We had to manufacture a 3D clinostat device in our workshops. Now we use it to carry out various experiments in botany, biology among other fields to study the effect of microgravity on specific phenomena in these fields. We recently published a paper in: npj Microgravity, (2020) 6:6 ; <https://doi.org/10.1038/s41526-020-0096-x> titled:

“Effect of simulated microgravity on the antidiabetic properties of wheatgrass (*Triticum aestivum*) in streptozotocin-induced diabetic rats”.

3. How has participating in DropTES changed the environment around you? Cont'd (4)

NA: Two teams of high school students were sponsored on projects related to the clinostat. In May 2018 one team was selected by the Jordanian Ministry of Education during a National Scientific Fair in Feb. 2018 to participate in the ISEF 2018 in USA. The team achieved third place in the Space Sciences category in the ISEF Fair.

In Dec. 2018, I was invited to UNOOSA Meeting in Vienna, “Providing Access to Space” where I presented the paper:

“Innovation Initiative at the American University of Madaba”

4. Hopes for the future

NA: A strategic plan is drafted to launch various projects for AUM researchers and students to get involved in microgravity experiments. In addition AUM will reach out to more high school students for outer space awareness and to mentor them on forming teams and get involved in the effect of microgravity on specific phenomena that the students may propose to study.

Discussion themes:

1- Issues and obstacles during the programme (both technical and administrative)

NA: The team started designing and executing the project at GJU in 2014. The free fall time in ZARM drop tower is around 4.5 seconds. So the tuned mass damper should act within this time frame. However the best time we were able to reach was of the order of 50 seconds due to friction issues with our local used components. We communicated this fact to Prof. Thorben Koenemann of ZARM who immediately helped us with practical solutions and sent a whole new setup at ZARM expense, with very low friction which reduced the time to the order of 4 seconds.

2- Success stories (development, partnerships, fundraising, awareness raising, etc.)

FA: I personally was so much interested in the ZARM institute that after one year of DropTES, I have applied for an internship for my studies because I wanted to engage in more research that is related to space applications. I spent around 6 months and I am very grateful for this opportunity that led to having the chance to work side by side with their engineering teams.

2- Success stories (development, partnerships, fundraising, awareness raising, etc.) Cont'd (2)

NA:

1- Construction of the Clinostat device in AUM workshops.

2- Mentoring and advising teams of high school students in Madaba and Amman on outer space technologies and awareness.

3- The success of several teams, who were advised, mentored and trained by AUM faculty members, in winning the National competitions in Science and Technology Fairs.



2- Success stories (development, partnerships, fundraising, awareness raising, etc.) Cont'd (3)

4- A team of three female students won the third prize in the Space Sciences Category in the International Science and Engineering Fair held in May 2018 in the USA.

5- Forming a team of AUM faculty members to research in the effect of microgravity on certain phenomena, and publishing research papers in internationally refereed journals.

6- Approval of funding for proposals involving the effect of microgravity.



AUM Innovation



A team of three students worked on the clinostat. The microgravity environment during space-flight has long been reflected on plant growth and its contents; the goal of our study is to look into the effect of simulated microgravity on root length, antioxidant activity and total antioxidant metabolites contents of germinated *Triticum aestivum* extract, compared to the control under normal condition.



3D- Clinostat constructed at AUM

A black and white close-up portrait of Nelson Mandela, showing his face from the nose up. He has a slight smile and is looking directly at the camera. The background is dark and out of focus.

“Education is the most powerful weapon which you can use to change the world.”

- Nelson Mandela

Thank you