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Summer School in Cyprus

Lead Beneficiary: UCY

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For the Lead Beneficiary	Reviewed by Work package Leader	Approved by Coordinator
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CO	Confidential, only for Beneficiaries of the A-CINCH project	

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EXECUTIVE SUMMARY

The purpose of this report is to summarize activities related to the second delivery of A-CINCH Summer School on Nuclear Chemistry & Radiochemistry: Theory and Applications from June 12 to 16 2023 at the Department of Chemistry, University of Cyprus, and its evaluation.

A summer school was initially developed and delivered within the A-CINCH project by the University of Leeds (Lois Tovey) in July 2022. The present one was organized jointly by University of Cyprus (Ioannis Paschalidis), NNL (Paul Scully) and the University of Leeds (Lois Tovey) and has been delivered at the premises of the University of Cyprus. The summer school program included lectures on basic concepts and applications of Nuclear Chemistry and Radiochemistry (decommissioning of nuclear reactors, recycling and management of nuclear material, radio-ecology, radionuclides and applications of radioactive sources in industrial processes, and radionuclides in diagnosis and treatment), as well as various activities such as participation in γ- and α-spectroscopy measurements and data evaluation, virtual reality labs (VR-Labs) and measurements of ionizing radiation and exit games. The Summer School was a unique educational opportunity for high school students and undergraduate university students from eight different countries. In this year's School, 25 students participated from Cyprus (8), Britain (5), Germany (4), Slovenia (4), Czech Republic (2), Bolivia (1), Finland (1), Greece (1), and 16 professors and experienced scientists from eight (8) different Universities/Research Centers (University of Helsinki, University of Oslo, Leibniz University Hannover, University of Leeds, Chalmers University of Technology, University of Cyprus, Jožef Stefan Institute, National Nuclear Laboratory) taught/helped to conduct the experiments and activities).

The aim of the School was to introduce and familiarize the students with the basic concepts and modern applications of Nuclear Chemistry and Radiochemistry, as well as employment opportunities in this scientific field.

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1 INTRODUCTION

The aim of the School was to introduce and familiarize the students with the basic concepts and modern applications of nuclear chemistry and radiochemistry, as well as employment opportunities in this scientific field, which will remain relevant throughout time. Nuclear chemistry and radiochemistry training and associated know-how transfer to the next generation is a key priority of the EU, because radioactive material/waste management will remain one of the most pressing problems of modern societies.

1.1 Dissemination of Call and Application Process

The Summer School was planned for delivery in June 2023 (M33) at the premises of the Chemistry Department of the University of Cyprus in Nicosia, Cyprus (Flyer, Annex I). The Summer School was announced on 21.4.2023 with application deadline 12.5.2023. 44 applicants from different countries had applied for the Summer School until deadline (Annex II). The maximum number of course participants to allow high-quality delivery of the school activities was set to 26, and 26 participants were selected to participate in the Summer School. The selection criteria were based on the level of education (basically high school and undergraduate university students), diversity and motivation of the participants provided in the application form. The selected minors had to provide parental and photographic consent prior their participation (Annex III).

1.2 Intervention Phase

As it can be seen from the daily attendance sheets, only one of the invited participants did not appear for the Summer School and two others were present only the first day. Although an email was sent to the first applicant, we did not receive any answer, and the other two replied that they could not participate the following days on personal grounds.

The other 23 students have been present during the whole week and were very conscientious students, carefully following the lectures, asking questions, and effectively interacting during the various activities. Even, during the breaks there was a friendly and productive interaction among the participants of different nationality.

2 SCHOOL PROGRAM- THEMATIC SESSIONS

The School program (Figure 2) was developed based on previous summer schools delivered within MEET-CINCH (in Larnaca, Cyprus, 2-6 March 2020) and A-CINCH (in Leeds, 10-14 July 2022) and was now upgraded with VR-applications and practical activities, including participation in α- and γ-spectrometric analysis.

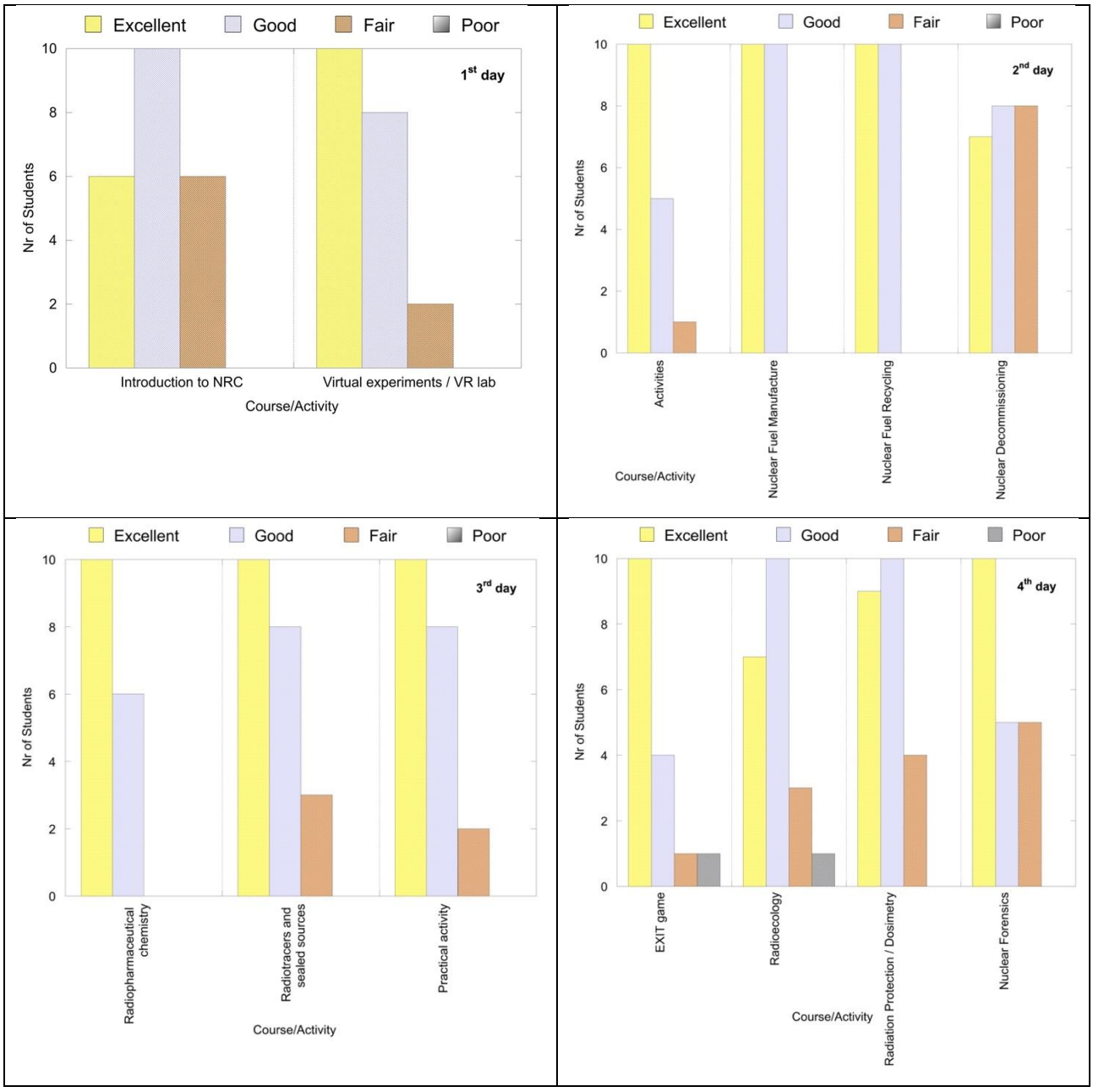
	Monday	Tuesday	Wednesday	Thursday	Friday
	Session NRC basics	**Session Applications of NRC 1**	**Session Applications of NRC 2**	**Session Applications of NRC 3**	
09:30	Registration and Practical Infos	Nuclear Fuel Manufacture NNL - Daniel Shepherd	Radiopharmaceutical Chemistry University of Helsinki - Surachet Imlimthan	Radioecology JSI - Marko Strok	Lab Tour
10:30	**Break**	**Break**	**Break**	**Break**	**Break**
10:50	Welcome & Introduction Natiional Nuclear Laboratory UK - Paul	Nuclear Fuel Recycling CHALMERS - Stefan Allard	Radiotracers and Sealed Sources University of Oslo - Tor Bjornstad	Radiation Protection / Dosimetry Leibniz University Hannover - Vivien	General Discussion / Q&A
12:20	**Lunch**	**Lunch**	**Lunch**	**Lunch**	**Lunch and End of School**
13:30	Introduction to Nuclear and Radiochemistry University of Leeds - Bruce Hanson	Nuclear Decommissioning University of Leeds - Bruce Hanson	Practical Activities	The Exit game Leibniz University Hannover - Vivien and Tobias	
15:00	**Break**	**Break**	Alpha Spec / Gamma Spec VR	**Break**	
15:20	Virtual experiments / VR lab Leibniz University Hannover - Vivien and Tobias	Medical Isotopes National Nuclear Laboratory UK - Cicily and Frances	University of Oslo - Tor Bjornstad University of Cyprus Leibniz University Hannover	Nuclear Forensics Leibniz University Hannover - Tobias	
16:50	**End of Day 1**	**End of Day 2**		**End of Day 4**	
			Excursion to Larnaca		

Figure 2: Summer School program

SCHEDULE	
Day 1:	• Introduction and practical infos – registration, bags and badges (Annex VI and VI) • Welcome by the vice rector of Academic Affairs of UCY • Welcome and General Introduction by Paul (NNL) • Introduction to Nuclear and Radiochemistry by Bruce (UNIVLEEDS) • VR Lab by Vivien and Tobias (LUH)
Day 2:	• Nuclear Fuel Manufacture by Dan (NNL) • Nuclear Fuel Recycling by Stefan (CHALMERS) • Nuclear Decommissioning by Bruce (UNIVLEEDS) • Medical Isotopes by Cicily and Frances (NNL)
Day 3:	• Radiopharmaceutical Chemistry by Surachet (UH) • Radiotracers and Sealed Sources by Tor (UiO) • Practical Activity (3 parallel activities/rotating groups): alpha-Lab, gamma-Lab and VR Lab) by Tor, Gennaro and Leonard (UiO), by Ioannis_I (UCY), and by Vivien and Tobias (LUH). • *Excursion to Larnaca*
Day 4:	• Radioecology by Marko (JSI) • Radiation Protection / Dosimetry by Vivien (LUH) • The Exit game by Vivien and Tobias (LUH) • Nuclear Forensics by Tobias (LUH)
Day 5:	• Lab Tour (single crystal and powder X-ray diffraction Lab; NMR Lab and HPLC and CE separation Lab, and Library) by Ioannis_I and Ioannis_P (UCY) • General Discussion / Q&A and awarding of certificates (Annex V) • End of the Summer School

3 FEEDBACK QUESTIONNAIRE- ASSESSMENT OF RESULTS AND IMPACT ON THE FIELD

Evaluation of the Summer School delivery was carried out with the help of feedback questionnaire (Annex V) with the aim to collect participants' feedback on different topics presented and the various activities. 24 responses have been received (most probably one of the graduate assistants was participating in the feedback questionnaire.) However, there were questions, which had not been answered by few students. The evaluation of the different courses/activities delivered each day is graphically presented in the following Figure (Figure 3).



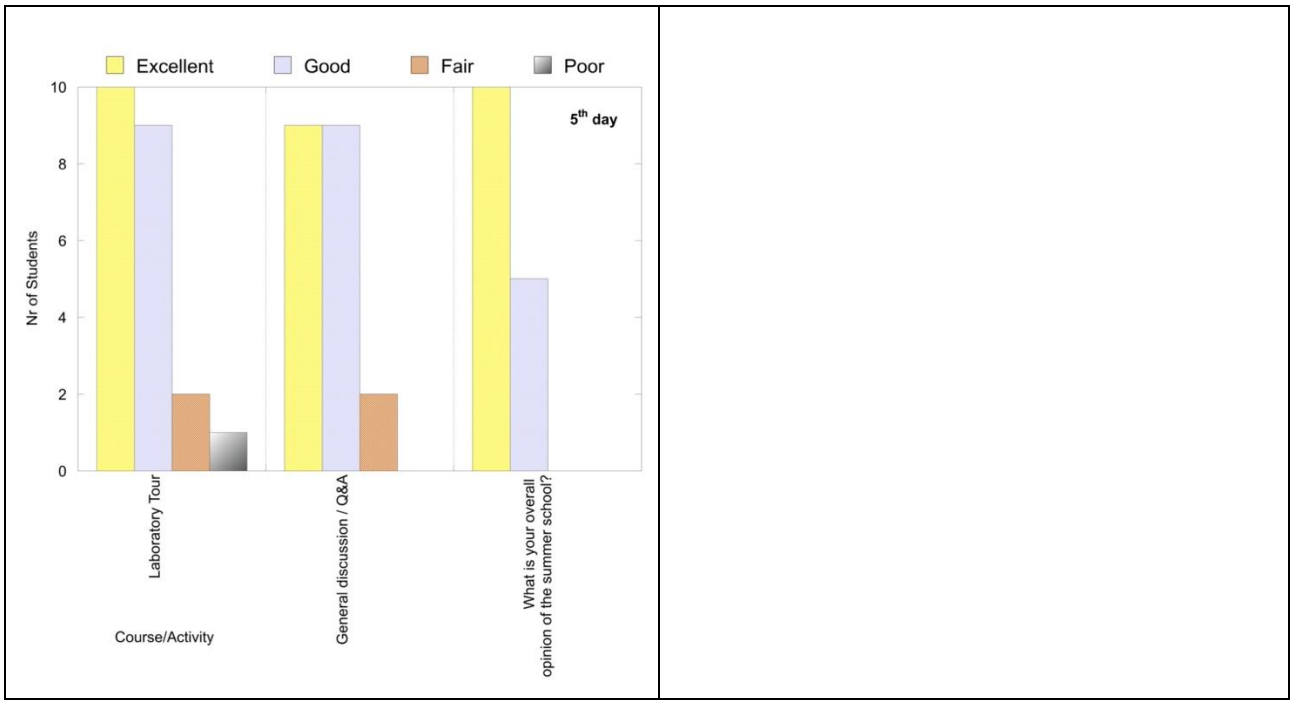


Figure 3 Evaluation of the courses/activities delivered each day during the Summer School

Generally, all topics presented and activities performed have been evaluated very positive and the overall opinion of the students regarding the Summer School was very positive. According to Figure 5, which summarizes the impact of the Summer School on the NRC-related awarainess and career choice of the students, it is clear that the Summer School increased the awareness of the participants in the NRC field. The impact on the career choice was also significant and could be increased by including a separate course on employment options in the NRC field. Almost 50% of the participants has been persuated to follow a career in the NRC field. The answer to the final question was basically yes, because most of the students had already before the school decided to study at a university and about 50% of the participants are already university students.

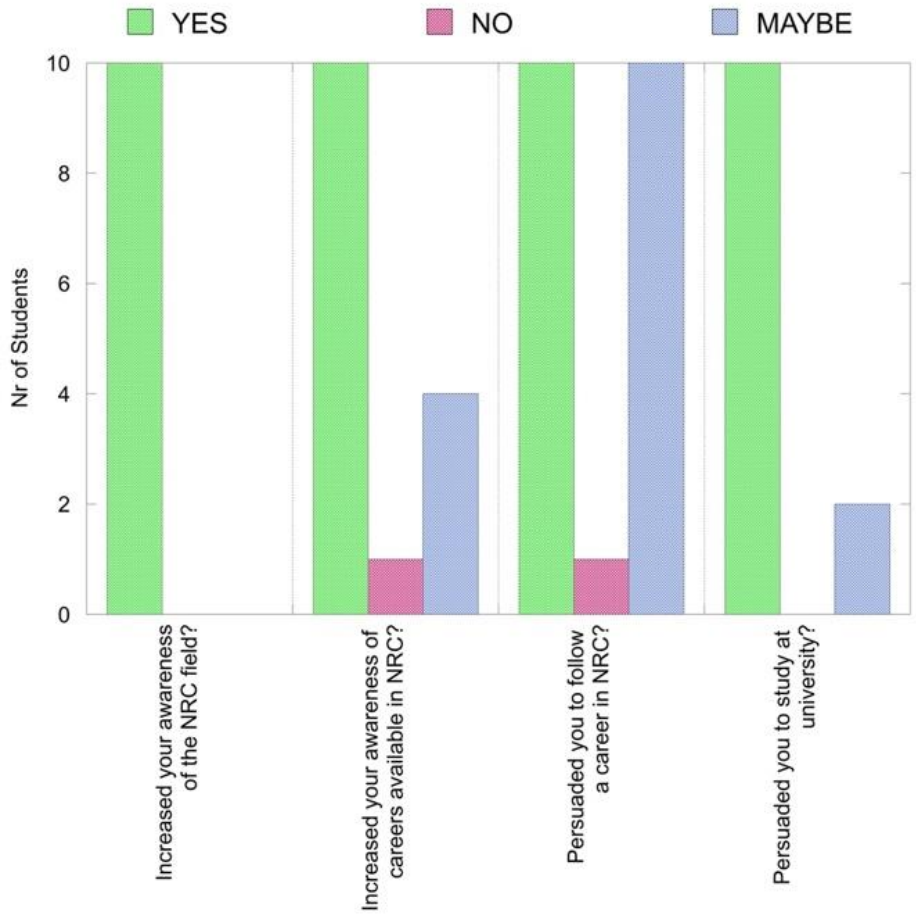


Figure 4 Impact of the School on NRC-related awareness and carrier choice of the students

The questionnaire included a freeform field for additional comments and extracts from the student responses are included below:

1. It was really hard for me to understand Prof. Hanson, and it was such pity, because I had no details about his presentation. Otherwise it was quite nice hear. University student
2. To improve, the lectures could have been broken down with activities to main focus. It would also be helpful to have a list of links to possible careers/jobs within the industry. University student
3. More lectures should include some form of activity at the end. University student
4. Would have been perhaps more productive if there was a more limited age range or more similar levels of understanding the topic at hand. Overall great experience, very interesting, can absolutely say it has given me a punch to pursue nuclear chemistry in the future. University student
5. Thank you for inviting me! If you were to do an excursion again, do it on a free day. University student
6. Please present yourselves at the start, I never knew who was who or how to address them. Only Ioannis. The rest was perfect. University student

7. Please present yourselves at the start, I never knew who was who or how to address them. Only Ioannis. The rest was perfect. University student
    a. (+ve) nice mixture of theory and practical activities
    b. (-ve) some topics repeated over and over. University student
8. More days instead of too many hours each day. University student
9. There could be even more content on the career opportunities, but I really liked that, some of the lecturers were from NNL, and talked about their careers. University student
10. I especially liked the interactive parts of the lectures. I remember these parts of the lectures best. Finished high school.
11. Thank you for the great experience! Highschool student
12. It was an excellent week. Thank you for the experience. The radioecology course sounded interesting, but because I was not familiar with the topic. I had a hard time understanding. Highschool student
13. We also very liked the trip to Larnaca. Highschool student
14. Amazing people, amazing place. I will miss everything. (Maybe not the heat.) I loved the human-like approach and patient explanations. Refreshments also amazing. I hope that I will get to see Cyprus again in the future. Thank you! Highschool student
15. I had a wonderful time, and I am very appreciate to everyone here who look the time to tell us about their fields. Thank you.

4 CONCLUSIONS

- The Summer School was especially significant in achieving a high impact for the A-CINCH project among high school students and undergraduate university students from 8 different countries. The evaluation of the questionnaire and extracts of the comments above testify to the highly positive evaluations by students of the program.
- Both lectures and activities were appreciated by the students and each day saw extensive interactions between participating speakers/assistants and students. It is expected that the Summer School will significantly affect future career planning of the participants.
- It would be useful to distribute reading material (e.g., presentations) to the students before the school.
- The experience gained and the suggestions could be considered in future NRC Summer Schools.

ANNEXES

Annex I: Flyer of the Summer School

Target group

This training course aims at delivering the basics of Nuclear Chemistry and Radiochemistry and Radionuclide/Radioactivity Applications in a modern society.

Participants should have interests in Natural Sciences, Radiochemistry, Nuclear Medicine and a basic knowledge of radioactive decay and radionuclides.

This Summer School targets high school / college students through to bachelor students

Objectives

- to get familiar with the basics and gain understanding of basic principles of Nuclear Chemistry and Radiochemistry
- to get familiar with radioactivity and radionuclides and their application in medicine, industry and environmental protection
- to be able to understand hazards associated with radiation and basic protection skills
- to gain information on different issues associated with nuclear energy and radiation and future needs .....

AUGMENTED CINCH

http://www.cinch-project.eu

A-CINCH is a HORIZON 2020 EU Framework Program project aiming to improve and evolve nuclear chemistry education and training in Europe.

The project closely collaborates with the European Network on Nuclear Chemistry Education and Training aiming to shift the education and training in nuclear chemistry to a new level.

UNIVERSITY OF LEEDS — NATIONAL NUCLEAR LABORATORY — University of Cyprus

AUGMENTED CINCH

Summer School on Nuclear Chemistry and Radiochemistry: Theory and Applications

Nicosia
12-16 June 2023

This project receives funding from the EURATOM Research and Training programme under grant agreement No 945301 and from the Norwegian Research Council under grant agreement No 313053.

ORGANIZATION

The course is organised by the A-CINCH Consortium and it consists of lectures and practical activities/games.

The Summer School will take place at the University of Cyprus (New Campus), Department of Chemistry.

All teaching will be in English.

LOCATION

University of Cyprus (New Campus)
Department of Chemistry
Leoforos Panepistimiou 1
2109 Nicosia (Aglantzia)
Cyprus

REGISTRATION

For detailed information, please visit the A-CINCH web page to download the application form (https://www.cinch-project.eu/). Send the completed form to Ioannis Paschalidis (paschalidis.ioannis@ucy.ac.cy).

No course fee will be charged to the participants and a budget exists to support travel and accommodation expenditure of the participants (A-CINCH Travel Fund Handbook).

Application deadline is 12 May, 2023.

TRAVEL INFORMATIONS
https://www.rome2rio.com/s/Nicosia/Larnaca-Airport-LCA

https://www.cyprusbybus.com/University_of_Cyprus_123.aspx

Practical Activities: Radiation Detection and Measurement

Virtual Experiments: Virtual experiments / VR lab

Games:

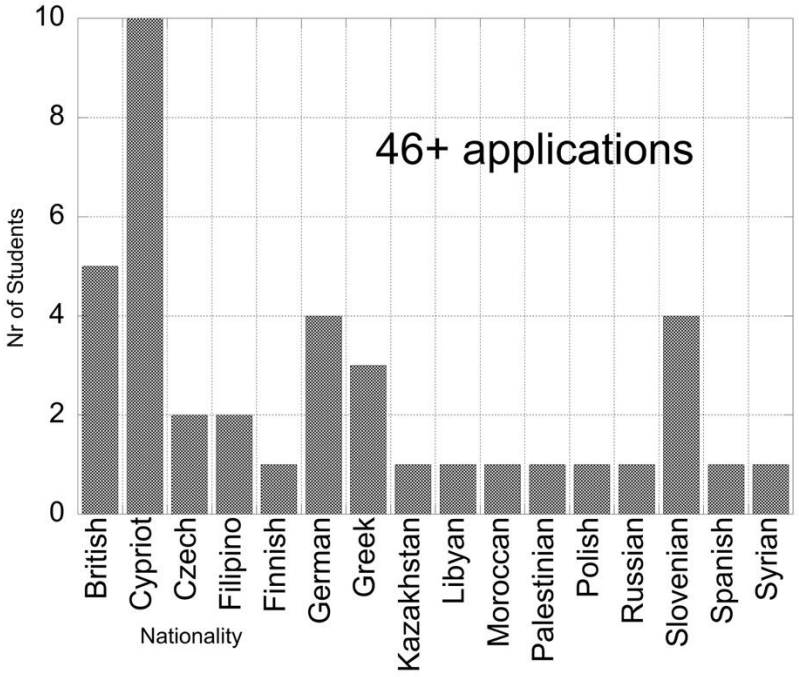
EXIT GAME

Lectures: 12-16.6.2023

The lectures sessions will include:

- Introduction to nuclear and radiochemistry
- Nuclear Fuel Manufacture, Fuel Recycling and Nuclear Decommissioning
- Radiopharmaceutical chemistry and Radiopharmaceuticals in Diagnostics and Therapy
- Radiotracers and Sealed Sources
- Radioecology
- Radiation Protection and Dosimetry

Annex II: Applicants and Nationality



Annex III: Parental and Photographic Consent _templates

Summer School on

"Nuclear Chemistry & Radiochemistry : *Theory and Applications*"

Department of Chemistry, University of Cyprus

Nicosia, 12-16 June 2023

Parental Consent Form

I confirm that I …….am the parent/legal guardian of

…….

I hereby consent to the above child participating in the Summer School on **"Nuclear Chemistry & Radiochemistry : *Theory and Applications*"**. I have provided contact details below and undertake to inform the organisers of any changes to this information. I confirm that all details are correct and I am able to give parental consent for my child to participate in the above mentioned summer school.

I acknowledge that the organizers are not responsible for providing adult supervision for my child except for their safety / safeguarding whilst on timetable / university premises.

Name:

Signature

Contact Details

Child Name

Parent's Mobile Phone Nr.

Photographic Consent

I consent to the below mentioned child being included in photographic material, which may be used for the purpose of internal project reporting.

Name:

Age: 16

Signature:

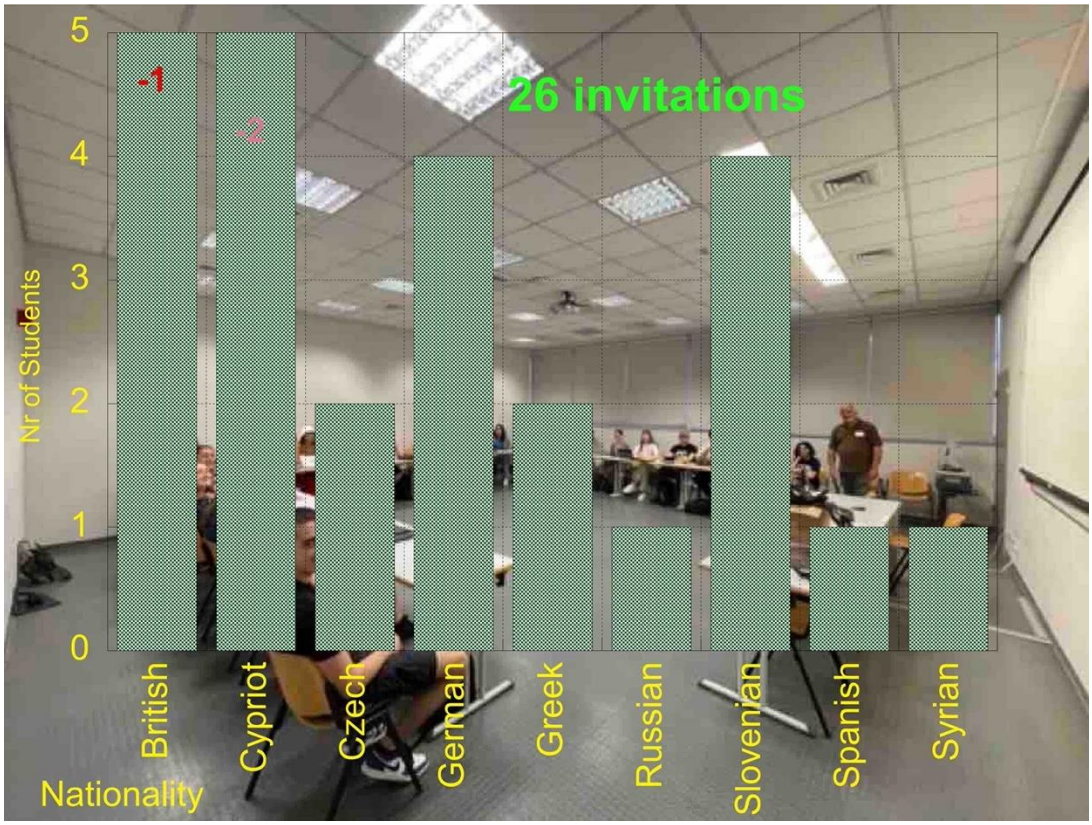
Date:

Print Name:

State Relationship to child:

Phone No.

Annex IV: : Summer School participants and nationality



Annex V: Feedback Questionnaire

Feedback questionnaire

Summer School on "**Nuclear Chemistry & Radiochemistry : *Theory and Applications***"

Department of Chemistry, University of Cyprus, Nicosia, 12-16 June 2023

Course content	Excellent	Good	Fair	Poor
Introduction to NRC				
Icebreaker – EXIT game				
Activities				
Nuclear Fuel Manufacture				
Nuclear Fuel Recycling				
Nuclear Decommissioning				
Radiopharmaceutical chemistry				
Radiotracers and sealed sources				
Practical activity				
Radioecology				
Radiation Protection / Dosimetry				
Virtual experiments / VR lab				
Nuclear Forensics				
Tour of NRC laboratory				
General discussion / Q&A				
What is your overall opinion of the summer school?				

General

Has the summer school:

	Yes	No	Maybe
Increased your awareness of the nuclear and radiochemistry (NRC) field?			
Increased your awareness of careers available in NRC?			
Persuaded you to follow a career in NRC?			
Persuaded you to study at university?			

Additional comments

Please add any additional comments below

This project receives funding from the EURATOM Research and Training programme under grant agreement N° 945301 and from the Norwegian Research Council under grant agreement N° 313053.

Annex VI: Certificate sample

Annex VII: badge and bag sample