

## **Report on the 14<sup>th</sup> International German Summer School on Hydrology 09– 22 September 2020, Bochum**

### **14<sup>th</sup> "International German Summer School on Hydrology (IGSH 2020) – Groundwater and Energy"**

The fourteenth "International German Summer School on Hydrology (IGSH)" was held at Ruhr-Universität Bochum (RUB) from 9<sup>th</sup> to 22<sup>th</sup> September 2020 with this year's focus on "Groundwater and Energy". The aim of IGSH is to enhance the knowledge and technical capabilities of early career professionals and academics on hydrology-related environmental issues. Due to the COVID-19 pandemic, IGSH 2020 was held completely online in virtual classrooms and working groups.

The International German Summer School on Hydrology focuses on training international junior scientists and early professionals from the fields of water and the environment, engineering sciences, as well as from geography, hydrology, chemistry, etc. IGSH provides a program of hydrological training courses which vary each year. In 2020, 20 participants from 17 different countries were selected out of over 140 applicants (list of participants annexed). Most participants were from Asia and Africa. Usually, the number of applicants is increasing year after year and participants are selected on a competitive basis. But in 2020, the applications were below average, probably due to the pandemic. The selection criteria include: the quality of a statement of motivation, relevance of the course to the applicant's present career or research activities, and qualification of the applicants. Also age and gender aspects are taken into account.

Since its inception in 2007, the International German Summer School on Hydrology is held annually with the support of UNESCO. Starting in 2015, IGSH has additionally been sponsored by the German Academic Exchange Service (DAAD) as serial summer school on sustainable water management. The newly implemented DAAD full scholarships have increased the attractiveness of the Summer School course resulting in record numbers of applications.

The lecturers of the International German Summer School on Hydrology are from the Department of Applied Geology of Ruhr-Universität Bochum, invited high-level professionals from the private sector in Germany and international and national partner universities. The lectures included theoretical as well as practical lessons. Unfortunately, field trips, cultural trips and social events could not take place as the IGSH 2020 was fully digital. So the focus in 2020 was completely scientific.

The courses of the IGSH 2020 covered the following topics:

- Basics of hydrogeology, hydrogeochemistry and heat transport
- Transformation of the urban landscape Ruhr (environment, economy, demography)
- Hydrogeochemical modeling
- Tracer development and tracer tests
- Geothermal energy: shallow enthalpy systems, low enthalpy systems in mining and exploration and production in high enthalpy systems
- Acid mine drainage
- The energy sector under climate change
- Energy costs and groundwater usage in agriculture

The following lecturers were involved this year: Prof. Dr. Stefan Wohnlich (Ruhr-Universität Bochum, Hydrogeology), Prof. Dr. Tobias Licha (Ruhr-Universität Bochum, Hydrogeochemie), Prof. Dr. Steffen Bender (Climate Service Center, Hamburg), Prof. Dimitrij Rudakov (DUT, Ukraine), PD Dr. Andre Banning (Ruhr-Universität Bochum, Hydrogeology), Dr. Till Kasielke (Ruhr-Universität Bochum, Applied Physical Geography), Dr. Thomas Heinze (Ruhr-Universität Bochum, Hydrogeology), Dr. Rolf Schiffer (Ruhr-Universität Bochum, Hydrogeologie), Dr. Ali Mahdavi Mazdeh (Iman Khomeini International University Qazvin, Iran)

During the course, the participants also worked in small groups on questions relevant to their own projects with the help of the methods learned during IGSH. In this special year, a virtual classroom was created with *moodle* for the participants to work online on their group projects. At the end of the course, the participants were given the opportunity to evaluate and comment on the different aspects of the Summer School course (such as their expectations from the course, scientific competence of the lecturers and the organization of the course). We consider a suchlike quality control very important for successive optimization of the IGSH goals. Those who wanted to gain

four Credit Points to use in their study and doctoral programs were tested by means of a successful written final examination. Finally, participants were awarded with a certificate by Prof. Dr. Stefan Wohnlich and PD Dr. Andre Banning. Although the course was held completely online, the atmosphere was very friendly, cooperative and productive, which allowed the participants to establish contact to each other and to the lecturers as well. This opened opportunities for future collaboration to establish scientific cooperation and social networks, and to extend the IGSH scientific community. Generally, the Summer School course provided knowledge transfer and exchange on hydro(geo)logical processes relevant in energy production and management.

The IGSH organizers would like to thank the DAAD and the German IHP/HWRP National Committee of UNESCO for the financial and ideal support of IGSH.

**Lecturers and assistants:**

Prof. Dr. Stefan Wohnlich

Ruhr University Bochum, Applied Geology, Hydrogeologist

Prof. Dr. Tobias Licha

Ruhr University Bochum, Applied Geology, Hydrogeochemist

Prof. Dr. Steffen Bender

Climate Service Center, Natural Resources Department, Science officer, Hamburg

Prof Dr. Dimitrij Rudakov

DUT, Dnipro, Ukraine, Hydrogeologist and Engineering Geologist

PD Dr. Andre Banning

Ruhr University Bochum, Applied Geology, Hydrogeochemist

Dr. Till Kasielke

Ruhr University Bochum, Applied Physical Geography, Geographer

Dr. Thomas Heinze

Ruhr University Bochum, Applied Geology, Numerical modeler

Dr. Rolf Schiffer

Ruhr University Bochum, Applied Geology, Hydrogeologist

Dr. Ali Mahdavi Mazdeh

Imam Khomeini International University, Qazvin, Iran, Hydrogeologist

**Annexes:**

1. Course Program
2. List of Participants
3. Statistics of Participants
4. Statistical evaluation of questionnaire
5. Photos

## Annex-1: IGSB 2020 Course Program

### Programm der digitalen IGSB 2020 „Groundwater and Energy“, 09.-22.09.2020

Date	Time (MESZ)	Activities	Speakers/Lead
<b>Wednesday, 09-09-2020</b>	15:00	Meet & greet; Technical check (test of video conference connectivity for lecturers and participants)	All participants and lecturers
<b>Thursday, 10-09-2020</b>	09:00	Welcome video lecture: Brief introduction to the course, course organization, RUB introduction	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
	10:00	Welcome video lecture: The multiple transformations of the urban landscape Ruhr - physical environment, economy, demography	Dr. Till Kasielke, Applied Physical Geography, RUB
	11:00	Virtual workshop: Introduction of participants and short presentations by participants	All participants and lecturers
	13:15	Virtual workshop: Introduction of participants and short presentations by participants	All participants and lecturers
	17:00	Virtual City tour: eExcursion to the city of Bochum	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
<b>Friday, 11-09-2020</b>	09:00	Video Lecture/Exercise: Basics of Hydrogeology	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
	10:45	Video Lecture/Exercise: Basics of Hydrogeochemistry	Prof. Dr. Tobias Licha Hydrogeochemistry, RUB
	13:00	Video Lecture/Exercise: Basics of Heat transport	Dr. Thomas Heinze, Applied Geology, RUB
	14:45	Virtual workshop: Introduction to eLearning tools in IGSB 2020	Malte Poser, Ilka Hinzer Applied Geology, RUB
	15:15	Virtual workshop: Group forming and project discussion	All participants and group leaders

<b>Saturday, 12-09-2020</b>	Free day		
<b>Sunday, 13-09-2020</b>	Free day		
<b>Monday, 14-09-2020</b>	09:00	Video Lecture/Exercise: Introduction to Hydrogeochemical Modelling	PD Dr. Andre Banning, Applied Geology, RUB
	13:00	Video Lecture/Exercise: 1. Geothermal energy: shallow/low enthalpy geothermal systems  2. Geothermal energy: Low enthalpy systems in mining – systems and potentials	Dr. Rolf Schiffer, Applied Geology, RUB  Prof. Dr. Dimitrij Rudakov DUT, Dnipro, Ukraine
<b>Tuesday, 15-09-2020</b>	09:00	Video Lecture/Exercise: Tracer development 1	Prof. Dr. Tobias Licha Hydrogeochemistry, RUB
	13:00	Video Lecture/Exercise: Tracer tests: procedures and interpretation	Prof. Dr. Stefan Wohnlich, Applied Geology, RUB
<b>Wednesday, 16-09-2020</b>	09:00	Video Lecture series: 1. The geothermal energy market  2. Tracer development 2	Dr. Rolf Schiffer Applied Geology, RUB  Prof. Dr. Tobias Licha Hydrogeochemistry, RUB
	13:00	Energy costs and groundwater use in agriculture	Dr. Ali Mahdavi Visiting International Professor at RUB
	16:15	Virtual workshop: Discussions in working groups	All participants and group leaders

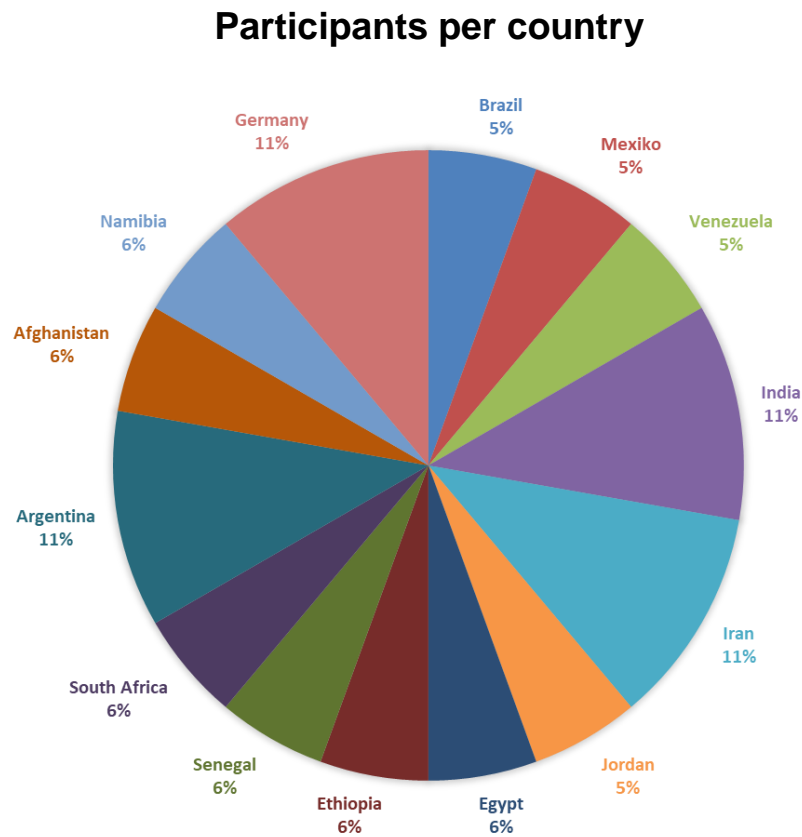
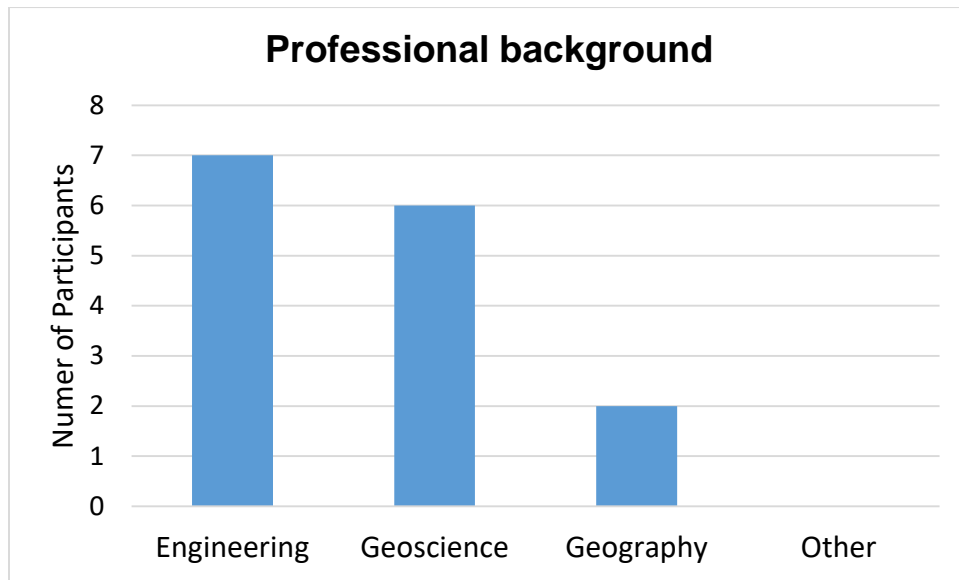
<b>Thursday, 17-09-2020</b>	09:00	Virtual Workshop  Discussion in working groups and evaluation of first results	All participants and group leaders
<b>Friday, 18-09-2020</b>	09:00	Virtual lab visit:	International Geothermal Centre
	13:00	Video Lecture/Exercise:  Geothermal energy: exploration and production in deep/high enthalpy geothermal systems	Prof. Dr. Stefan Wohnlich,  Applied Geology, RUB
<b>Saturday, 19-09-2020</b>	Free day		
<b>Sunday, 20-09-2020</b>	Free day		
<b>Monday, 21-09-2020</b>	09:00	Video Lecture/Exercise:  Mining and acid mine drainage – a global challenge	PD Dr. Andre Banning,  Applied Geology, RUB
	13:00	Video Lecture/Exercise:  The energy sector under climate change	Prof. Dr. Steffen Bender,  Climate Service Center Germany, Hamburg
	16:15	Virtual workshop:  Discussion in working groups: open questions and presentation of concepts	All participants and group leaders
<b>Tuesday, 22-09-2020</b>	09:00	Written online examination (9.00-9.45); Participants present their group project (10-12), final discussion,  Online course evaluation by participants	All participants and lecturers
	13:00	Award of certificates, Departure ceremony	

**Annex-2: IGSB 2019 Participants List**

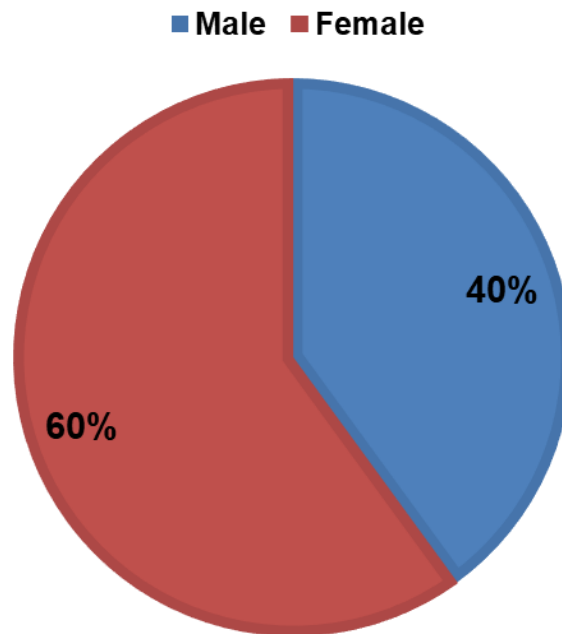
<b>S/No.</b>	<b>Last Name</b>	<b>First Name</b>	<b>Country</b>
1	Cobalchini	Erick	Brazil
2	Alonso	Sócrates	Mexico
3	Bastidas	Luis	Venezuela
4	Kaur	Navjot	India
5	Hashemi Tameh	Masoumeh Alsadat	Iran
6	Tarawneh	Esraa	Jordan
7	Abou El Ella	Ali	Egypt
8	Dereje	Bitsiet	Ethiopia
9	Sene	Yaye Nekhe	Senegal
10	Lalumbe	Lindelani	South Africa
11	Aguil	Nahir	Argentina
12	Faizi	Nazeer Ahmad	Afghanistan
13	Demeke	Betelhem Wondimneh	Ethiopia
14	Okofu	Louis Boansi	Ghana
15	Wache	Ricarda	Germany
16	Hartkopf	Eva	Germany
17	Burgos	Paula	Argentina
18	Niipaya	Hilma	Namibia
19	Askari	Maryam	Iran
20	Joshi	Pranjay	India



### Annex-3: Statistics of Participants



#### Gender distribution



### **Selection of participants**

#### **Priority applications**

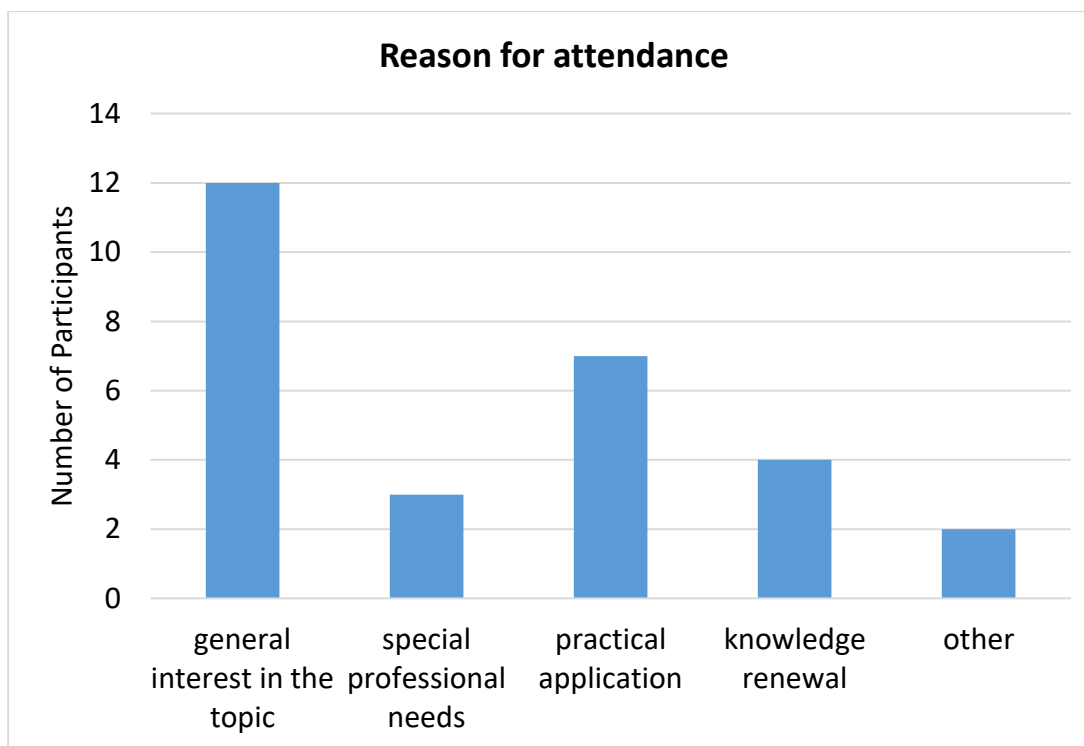
- 1 – Self sponsored applicants (with relevance of academic background to the course to be given, and submission of complete application documents)
  - 2 – Course scholarship applicants (with a relevant background and complete application document)
  - 3 – Partial scholarship applicants with relevant background, motivation letter, experience
  - 4 – Full scholarship applicants with very relevant background and experience, very strong motivation letter, mainly from Sub-Saharan Africa, South America and Asian countries
- One from each country (no two applicants from the same country is given a full scholarship unless special cases are considered)

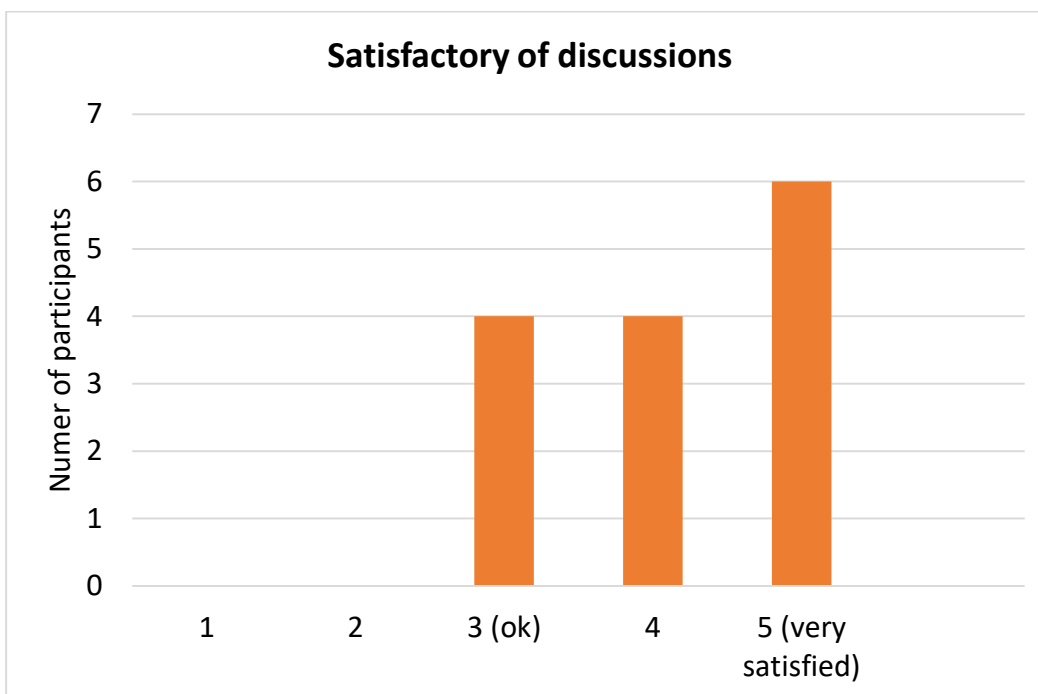
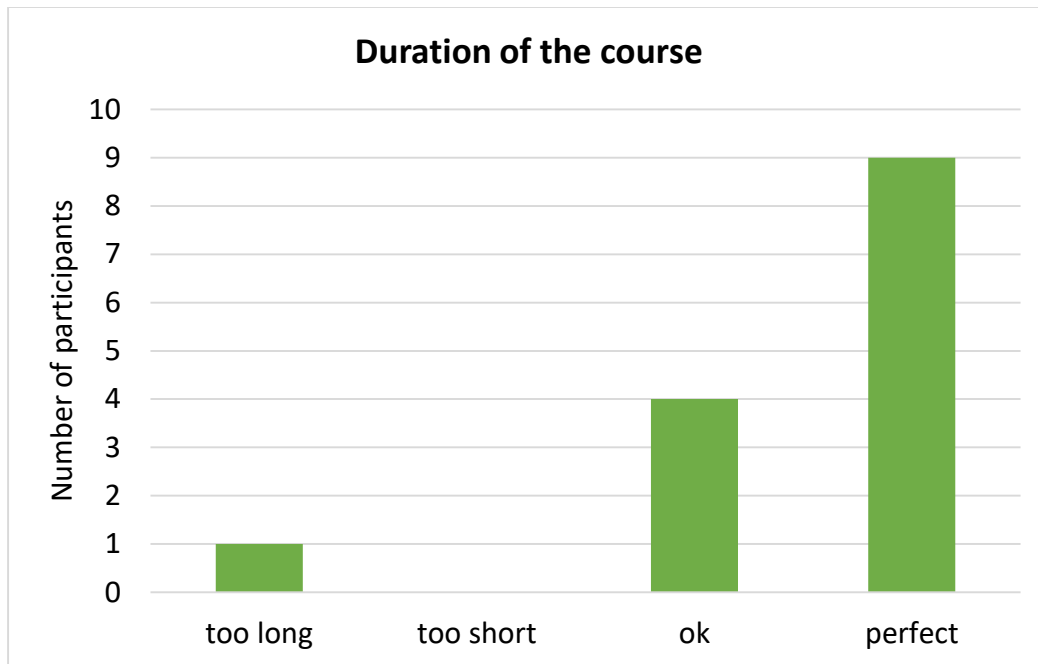
As the whole course was held online, no scholarships were needed, selection was only the academic background

**Excluded applications**

- 1 - Professors and Doctors with over 12 years experience
- 2 - Applicants with over 20 years of experience
- 3 - Applicants older than 50 and younger than 23
- 4 - Applicants with BSc and very limited experience
- 5 - Applicants with farthest academic and industry background from the course
- 6 - Applicants who participated in the same course in the previous years organized by IGSH
- 7 - Applicants who participated three or more times in the past may not be given a chance to take part in this course
- 8 - Applicants who failed to submit their CV and addresses of their referees (incomplete application)
- 9 - No two persons from the same country are allowed to take part in the course unless special conditions govern the situation
- 10 - Full scholarships for applicants from Europe, USA, Canada, Australia etc. should not be given unless special conditions govern the situation
- 11 - Applicants who failed to meet the application deadline (applications may be considered based on the type of scholarship they are applying for and their academic background)

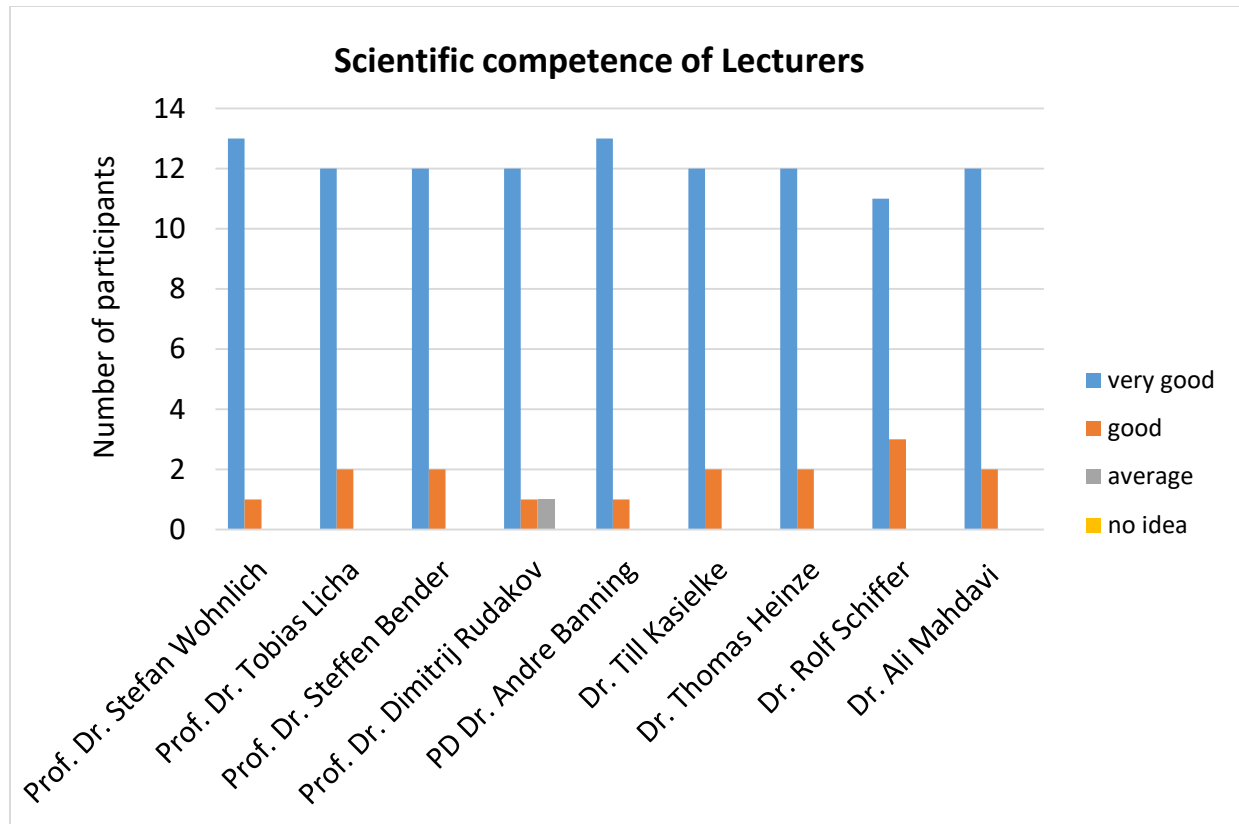
#### Annex-4 Statistical Evaluation of Questionnaire





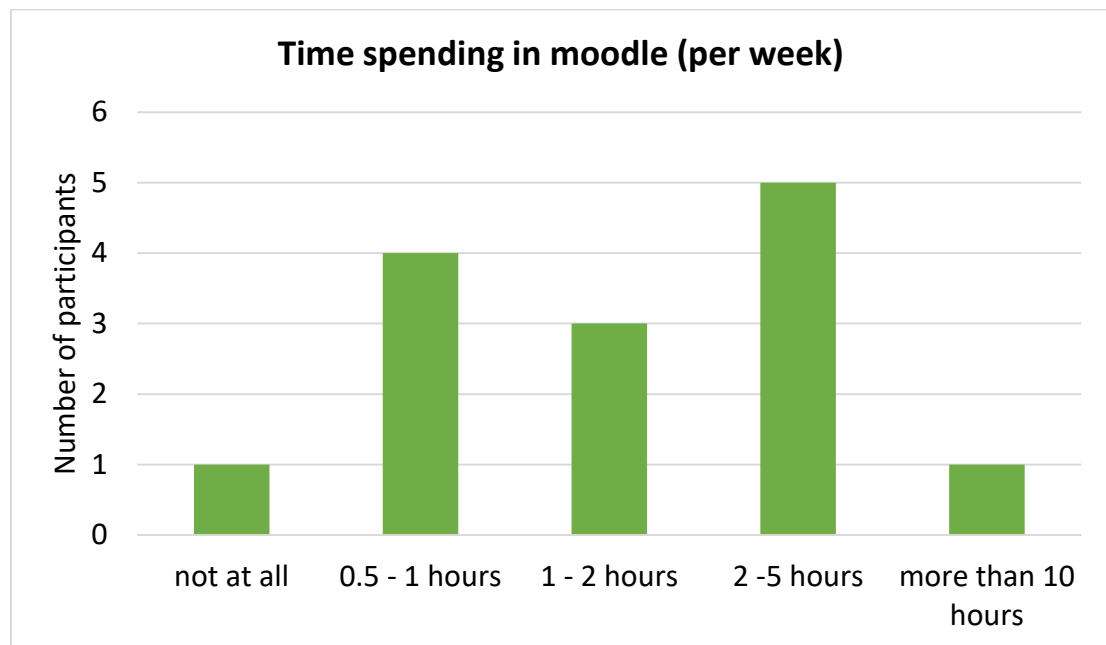
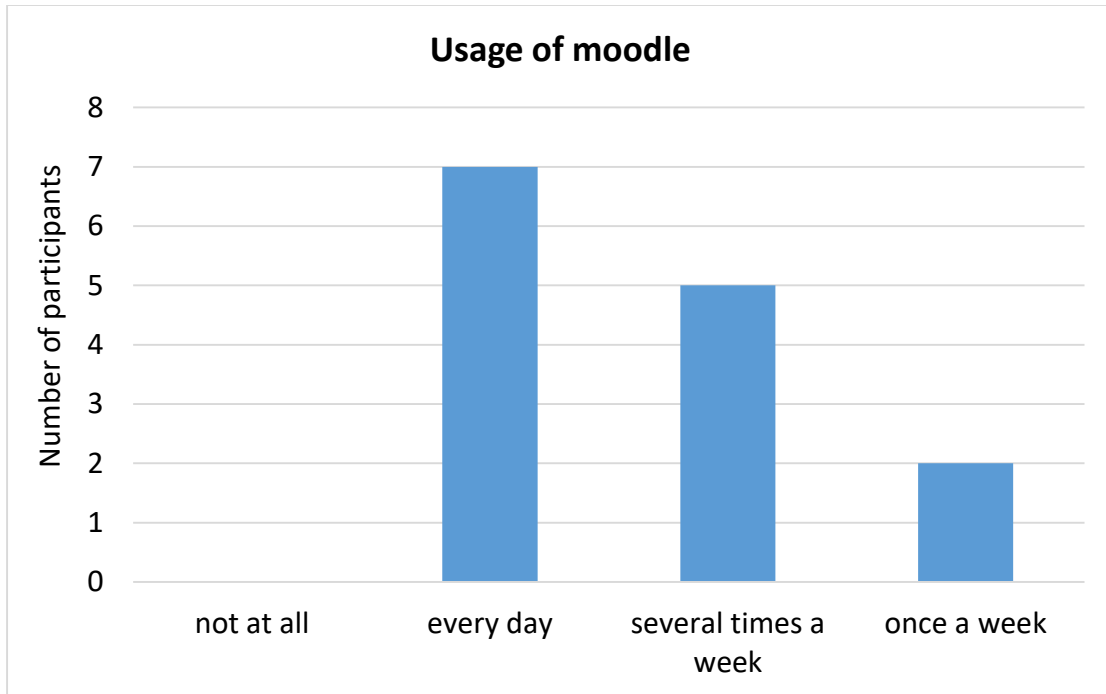
**From 1 to 10, how satisfied were you with the organization of the course?**

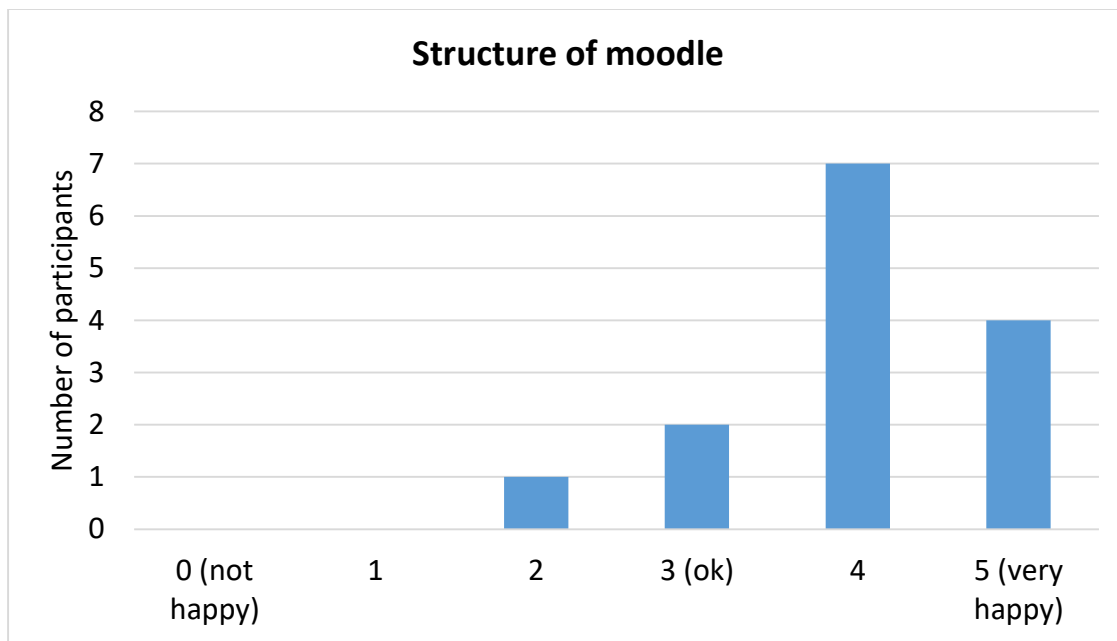
9.36 (mean value)



**From 1 to 10, how satisfied were you with the digital IGSH in general?**

8.2 (mean value)







**What comments do you have on the virtual group workshop?**

“The group workshop was very good, and the professors directed the project a lot. They should continue you doing so.”

“It was good, and There was cooperation, there was advices from Dr Stefan, and was good to make new friends”

“I think the organization was good especially the recording of the individual lectures which helped us to playback for more details. The first workshop was very good.”

**What other improvements would you like to suggest? Or what comments do you have on the digital IGSH?**

“Although this years summer school comes with challenges, I personally think you did the best out of it. I really enjoyed receiving Badges and have a Video tour through Bochum. Good Job!”

“I just wanted to say thank you so much for giving me this opportunity to participate in this course. It was great and I really hope I can participate in this summer school in person one day.”

“The first ever digital IGSH 2020 is a great success.”

“Thank you IGSH 2020 for giving a chance to participate in it.”

„I have no comment to improve. Everything was excellent“

“Everything went well - good professors and lectures, also guided tours. The main objective: building knowledge, was achieved.”

“It was an honor to participate. It was wonderful. You all deserve congratulations.”

## Annex-5: Foto

