Experience of a long-term multilateral educational project in software engineering

based on the DAAD programme "Academic Reconstruction of South-East Europe"

Klaus Bothe

Institute of Informatics, Humboldt University – Berlin, Germany,
bothe@informatik.hu-berlin.de

Workshop

Cooperation at Academic Informatics Education across Balkan Countries and Beyond
Primošten, Croatia, 3rd – 7th September 2018

Contents

- Introduction

Outcomes and success factors:

- I: Joint teaching materials and more
- II: Guest lecturing
- III: Joint papers
- IV: Workshops
- V: DAAD funding and programme development

(Simple) success indicator:

group photos ☺

Group photo in 2015 (Bohinj/Bled)

Group photo in 2016 (Jahorina)

Group photo in 2001 (Novi Sad)

Novi Sad, Skopje, Belgrade, Plovdiv, Nis, Kragujevac, Berlin

Group photo in 2002 (Plovdiv)

Novi Sad, Skopje, Belgrade, Plovdiv, Nis, Kragujevac, Berlin

Group photo in 2003 (Ohrid)

Novi Sad, Skopje, Belgrade, Plovdiv, Nis, Berlin
+ Zagreb, Sarajevo, Banja Luka, Timisoara, Tirana

From DAAD reviewing our project in 2016
(another success indicator)

- DAAD 2016: one of the top-3 projects in the programme (out of 40 projects)

- Reviewer 2016: „With minor funds, fundamental outcomes reached – based on personnel efforts and motivation"

The project must have had a value

What counts as value (a feature, an activity, an outcome) in our DAAD project?

- Workshops annually
- Joint teaching materials
- Teacher exchange (guest lecturing)
- Joint papers

- Influence on local curricula
- Other projects: EU Tempus

Outcomes and success factors

I

Joint teaching materials

… not main subject from the very beginning

Fields of cooperation 2001 -2003

Distributed reverse engineering:

XCTL

Software system used in experimental physics

Joint course on software engineering:

JCSE

Network for software engineering training and teaching

In the beginning 2001:

Only the general aim of DAAD programme: „Academic reconstruction of South Eastern Europe"

→ Search for common interests
(Reverse engineering project – SE course)

JCSE: the core outcome

JCSE: Applications in real lectures (2016)

JCSE: 13 (out of 17) partner universities included teaching materials

- Novi Sad: 2002-04: 2 times, English, 10 particular participants, 2004-16: ordinary students, Serbian slides
- Skopje:
  English, materials used in 2 different courses since 2004;
  in 2007 the first real delivery of the JCSE in Skopje
- Plovdiv: Bulgarian, 2 different curricula, 100 participants, since 2003, textbook in 2006
- Kragujevac: Serbian, since 2003
- Zagreb (Dubrovnik): Croatian, 1 topic
- Timisoara: Romanian, 1 topic
- Berlin: 4 times (transparencies) + 6 times (ppt), German, 80 participants
- Belgrade (Faculty Elec.Eng.): 2005 - 2016, Serbian slides, 12 topics, 133 participants in 2005
- University of Tirana: 2007, some topics used in a Bachelor course
- Polytechnic University Tirana: 2007 - 2016, course delivered by guest lecturers and local teachers in a Master's study
- Rijeka: since 2010, selected topics by guest lecturing since 2014
- Sarajevo: selected topics, in 2012 - 2016 by guest lecturing
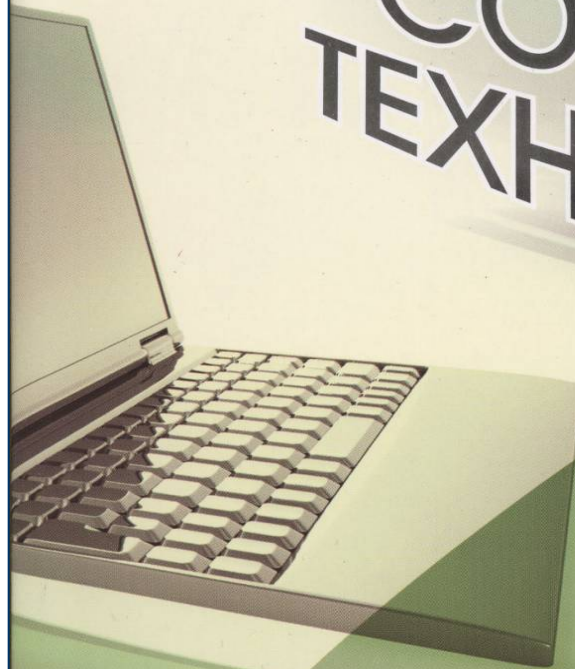- Tetovo: since 2014, selected topics by guest lecturing

JCSE: basis of different activities

- **Localization:**
→ *National versions* in Serbian, Croatian, Bosnian, Macedonian, German, Albanian, Bulgarian, Romanian …
→ *Multi-lingual dictionary* in SE
→ *S-Bahn-Tool (tool-support for localization)*

- **Textbooks** in Bulgarian, Serbian

- **eLearning**: Tool AHyCo

- **Project management of JCSE** (lecture notes, slide style guides, …)

Textbook released in Bulgarian language in 2006

Станимир Стоянов
Ася Стоянова-Дойчева
Малина Трендафилова
Емил Дойчев

СОФТУЕРНИ ТЕХНОЛОГИИ

УНИВЕРСИТЕТСКО ИЗДАТЕЛСТВО
Паисий Хилендарски

Common interests evolved from Software Engineering to … (many other fields)

DAAD project website:
The whole project is represented

Project – "Software Engineering: Computer Science Education and Research Cooperation"

DAAD | Stability Pact Sponsored by Germany

Subprojects

Software Engineering
OOP with Java
Software Project
Management
Compiler construction
Data structures and
algorithms
Multi-lingual dictionary
S-Bahn tool
E-learning
Reverse engineering XCTL

Workshops

Jahorina, BIH, 2016
Bohinj, SLO, 2015
Sinaia, RO, 2014
Bansko, BG, 2013
Opatija, CRO, 2012
Ohrid, MK, 2011
Ivanjica, SRB, 2010
Neum, BIH, 2009
Durres, AL, 2008
Risan, MNE, 2007
Ravda, BG, 2006
Baile Herculane, RO, 2005
Zagreb, CRO, 2004
Ohrid, MK, 2003
Plovdiv, BG, 2002
Novi Sad, YU, 2001

Introduction

Stabilitätspakt für Südosteuropa
Gefördert durch Deutschland
Stability Pact for South Eastern Europe
Sponsored by Germany

DAAD Deutscher Akademischer Austausch Dienst
German Academic Exchange Service

The project started in 2001 when it was supported by DAAD (German Academic Exchange Service) under auspices of Stability Pact for South Eastern Europe. The main goal of the project has been to cooperatively develop a joint web-based course in software engineering, the materials of which are now in use by several partner universities. The second main focus of the project was a cooperative research project on distributed software reengineering of a technical system in experimental physics.

In 2004 the project continued under support of DAAD and auspices of Stability Pact for South Eastern Europe Sponsored by Germany. It has 17 participating institutions from 10 countries. The leader of the project is Prof. Klaus Bothe, Institute of Informatics, Humboldt University, Berlin, Germany.

Currently project deals with:

- creation of new educational topics in joint course of software engineering and new case studies for usage in lectures;
- creation of joint teaching materials in "Object-oriented programming in Java", "Compiler construction", "Software project management", "Data structures and algorithms"
- continuation of the work on cooperative research on distributed software reengineering of a technical system in experimental physics;
- work on localization of produced material and building of appropriate specialized tool(s).
- transforming parts of existing teaching materials into an e-learning and distance learning environment

The activities and results of the projects are reported and reviewed on annual project workshops. Besides that, since the year 2003, there are also annual project coordination meetings. Results and reports on project activities have been reported in numerous papers published at international and national conferences.

© 2001 - 2015. For details of the project please contact Klaus Bothe. For the site contents contact Zoran Budimac.

http://www2.informatik.hu-berlin.de/swt/intkoop/daad/ **21**

Cooperation in Subprojects

JCSE — Berlin, Novi Sad, Belgrade, Plovdiv, Skopje, Timisoara, Zagreb, Tirana, Sarajevo, Rijeka, Tetovo

OOJava — Timisoara, Novi Sad, Skopje, Belgrade (ETF), Belgrade (Sc), Berlin, Plovdiv

SW PM — Novi Sad, Berlin

Compiler — Belgrade (ETF), Novi Sad, Berlin

RE XCTL — Berlin, Belgrade (ETF), Plovdiv, Novi Sad

National versions — Skopje, Novi Sad, Plovdiv, Timisoara, Zagreb, Tirana, Belgrade (ETF), Sarajevo, Kragujevac, Berlin

S-Bahn Tool — Development & use: Berlin, Novi Sad, Skopje, Plovdiv, Belgrade (ETF)

E-Learning — Rijeka, Novi Sad, Plovdiv, Skopje, Berlin

Curriculum development — Sarajevo, Berlin, Novi Sad, Plovdiv, Skopje, Timisoara, Belgrade (ETF)

TEMPUS — Berlin, Novi Sad, Skopje, Belgrade (ETF), Nis, Plovdiv, Timisoara

I I

Guest lecturing

… on the basis of JCSE, Tempus, and others

Guest lecturing for JCSE, Joint Master SE, Robotics, Research Methods

Intensive course „Research Methods": at Polytechnical University Tirana (2016)

Zoran Budimac, Mirjana Ivanovic, Gordana Rakic: Research Methods
April 2016

Intensive courses for TEMPUS joint Master:
Skopje→Novi Sad
- Katerina Zdravkova: Privacy, Ethics, and Social responsibilities (December 2015 – Jan 2016)
- Anastas Misev: Software Testing (June 2016)

Intensive courses for TEMPUS joint Master: Skopje – Novi Sad (since 2007)

Intensive course „Software Engineering": Polytechnical University Tirana (since 2007)

Klaus Bothe:
- Lectures: June 2016
- Assignments: July, August 2016
- Exam: September 2016

10th year

Intensive courses for TEMPUS joint Master:
Novi Sad → Skopje
- Zoran Budimac, Research Methods (April 2016)
- Mirjana Ivanovic, Requirements engineering (December 2015, April 2016)
- Zoran Budimac, Software Engineering for Critical Systems (December 2015, June 2016)

Course „Software Engineering": Sarajevo, Rijeka, Tetovo (combination of local and guest lecturing/ selected topics)

Sanja Candrlic, Klaus Bothe

Novica Nosovic, Klaus Bothe

Betim Cico, Klaus Bothe

Intensive courses: Cognitive Robotics

Hans-Dieter Burkhard:
- Rijeka (April 2016)

- Planned:
  - Tirana
  - Plovdiv

As guest and host:
Skopje, Novi Sad, Berlin, Tirana, Sarajevo, Tetovo, Rijeka, Plovdiv, Timisoara

I I I

Joint papers

Educational Cooperation across Countries by Shared Course Materials: More than 10 Years of Experience

Klaus Bothe
Institute of Computer Science
Humboldt University Berlin
Berlin, Germany
bothe@informatik.hu-berlin.de

Zoran Budimac, Zoran Putnik, Mirjana Ivanovic
Institute of Mathematics and Informatics
University of Novi Sad
Novi Sad, Serbia
{zjb,putnik,mira}@dmi.uns.ac.rs

Stanimir Stoyanov, Asya Stoyanova-Doycheva
Institute of Informatics
University "Paisii Hilendarski"
Plovdiv, Bulgaria
{S.Stojanov, a.stojanova}@isy-dc.com

Katerina Zdravkova, Boro Jakimovski
Institute of Informatics
University "Sts. Cyril and Methodius"
Skopje, FYR Macedonia
{keti,boro}@ii.edu.mk

Ioan Jurca
Institute of Informatics
Technical University Timisoara
Timisoara, Romania
ional@cs.utt.ro

Novica Nosovic
Dept. of Computer Science
University of Sarajevo
Sarajevo, Bosnia and Herzegovina
nnosovic@etf.unsa.ba

Damir Kalpic
Faculty of Electrical Engineering and Computing
University of Zagreb
Zagreb, Croatia
damir.kalpic@fer.hr

Betim Cico
Faculty of Contemporary Sciences and Technologies
South East European University
Tetovo, Macedonia
b.cico@seeu.edu.mk

Elinda Kajo
Faculty of Electrical Engineering
Polytechnic University Tirana
Tirana, Albania
ekajo@fti.edu.al

Sanja Candrlic
Department of Informatics
University of Rijeka
Rijeka, Croatia
sanjac@inf.uniri.hr

ICL

17th International Conference on Interactive Collaborative Learning
2014 World Engineering Education Forum
Dubai, 03–06 December 2014

Abstract— At the beginning of the new century, we started with an educational project aimed at the joint development and shared use of teaching materials for software engineering education. The aim was to transfer knowledge, as well as to save expenses. Over the years, our cooperation did not only cover the development of the course, but also its delivery, e.g. by guest lecturing. This paper reports on the experience gained in a multi-country project. Both success factors and problems are outlined.

Keywords— Software engineering; shared teaching materials; multilateral cooperation

I. INTRODUCTION

universities. This has led to novel aspects for our project: its multi-lateral character and a plethora of interesting contributions from different educational environments. These unique elements impacted on both the nature of the course material and the management of the project.

This paper addresses issues concerning the particular course materials to be produced in such an environment and the wherefores of project management. The original main objective was the introduction of an SE course for Southeast European universities based on materials and experiences of the German

17th International Conference on Interactive Collaborative Learning (ICL2014), Dubai 2 – 6 December 2014

Reviewer's remarks concerning …

… the paper at „Informatics Education Europe", Freiburg, November 2009

General Remarks:

- The results of the paper should be relevant to almost all universities in the future."
- The paper is a good experience report about a running project with experience. Nice results, high diversity of project partners.
- This paper illustrates a good experience of the sharing of teaching material across institutions and countries. It illustrates how the material can be used as both a complete course and as a selective topic choice.
- It is impressive that it was possible to use the materials for so many classes in all the different countries!

Also inquiries from outside the network, e.g. from Botswana

Subject: Joint course on Software Engineering
Date: Wed, 8 Feb 2017 12:32:10 +0200
From: Ayalew (Prof.) <ayalew@mopipi.ub.bw>
To: bothe@informatik.hu-berlin.de <bothe@informatik.hu-berlin.de>

Dear Prof. Bothe,

read about the joint course on Software Engineering that you are running with other European universities (e.g. Serbia, Bulgaria, etc.).

I am very much interested to have a similar cooperation to implement the joint course on Software Engineering in my university (Department of Computer Science, University of Botswana). If it works well, it could be extended to other universities in this side of the world.

Let me know if this idea is feasible from your side.

Best regards,
Yirsaw

****

Yirsaw Ayalew, PhD
Associate Professor, Department of Software Engineering
University of Botswana
Private Bag UB0704, Gaborone
Tel. +267-3552869

I V

Workshops

Workshops:

central events to exchange ideas on software engineering and other fields of informatics

Workshops: about 700 presentations

- ## E.g. Jahorina: 57 presentations

From	To	Duration	Monday, August, 22nd - **Chairperson: Costin Badica**
			20 minutes for presentation and discussion
09:00:00	09:30:00	00:30:00	**Klaus Bothe**: Opening talk
			SECTION: Curricula Issues
09:30:00	09:50:00	00:20:00	**Novica Nosović:** Who can (not) call him/herself a SW engineer?
09:50:00	10:10:00	00:20:00	**Patrizia Poščić:** Aligning Study Programmes with Occupational Standards and Qualifications Standards in the Field of Informatics Based on Croatian Qualifications Framework
10:10:00	10:30:00	00:20:00	Betim Cico, **Besnik Selimi**, Klaus Bothe: Doctoral School at SEEU: challenges and future directions after 3 years
			SECTION: Learning Issues: modules in programming, software engineering, and others
10:30:00	10:50:00	00:20:00	**Anastas Mishev**: Software quality by design
10:50:00	11:10:00	00:20:00	**Boštjan Šumak**: User Experience Design and Evaluation in Software Engineering
11:10:00	11:40:00	00:30:00	*SHORT BREAK*
Midday session:			**Chairperson: Stanimir Stoyanov**
			SECTION: Learning Issues: modules in programming, software engineering, and others
11:40:00	12:00:00	00:20:00	**Elinda Kajo Mece**, Vanjela Pine, Sibora Theodhor: Software engineers, the transition from student to employee in the Albanian job market
12:00:00	12:20:00	00:20:00	**Tijana Vislavski**: Crossing the line: from student to student instructor
12:20:00	12:40:00	00:20:00	Marco Polo, **Betim Cico**, others: New Trends in Information Technologies and Their Integration in University Curricula: a Brief Study in the Context of the FETCH European Thematic Network
12:40:00	13:30:00	00:50:00	*LUNCH BREAK*
Afternoon session:			**Chairperson: Krešimir Fertalj**
			SECTION: Case Studies and Projects
13:30:00	13:50:00	00:20:00	**Hans-Dieter Burkhard:** New Experiences with RoboNewbie Software
13:50:00	14:10:00	00:20:00	**Amelia Badica**, Costin Badica, Florin Leon, Ionut Buligiu: From Business Process Models to Agent Programs
14:10:00	14:30:00	00:20:00	**Jovana Ivković**: Maintaining and improving academic software
14:10:00	14:30:00	00:20:00	**Tihana Galinac Grbac**: Virtualisation technologies in software engineering management
Total Duration		05:50:00	
			In the afternoon: Organizational Issues

People reached by our DAAD 2000 – 2016/18

- 221 different workshop participants
- Students in Joint Master in SE (Tempus: Novi Sad - Skopje)
- Students in Robotics (H.-D. Burkhard at Plovdiv, Sarajevo, Skopje, Rijeka, Tetovo),
- Students in Research Methods (Novi Sad in Tirana)
- Students by guest lecturing JCSE
- Students by local teachers using JCSE, Project Managment …

→ **More than 1000 people (staff + students) reached**

e.g. Tirana: 342 Master students

Polytechnic University Tirana: intensive course JCSE since 2007

342 students in 12 years + …

2007	2008	2009	2010	2011	2012	2013	2014
19 – 24 March 2007	21 – 26 April 2008	22 – 27 June 2009	31 May – 5 June 2010	24 – 29 June 2011	4 – 9 June 2012	3 – 7 June ^2013	2 – 6 June 2014
17 students	32 students	17 students	14 students	25 students	28 students	40 students	42 students
4th semester	1st semester (15) 3rd semester (17)	2nd semester Master Tirana (11) 6th semester Bachelor Struga (6)	2nd semester Master Tirana	2nd semester Master Tirana	2nd semester Master Tirana	2nd semester Master Tirana	2nd semester Master Tirana
Master	Master						

2015: 18 Master students	2016: 32 Master students	2017: 35 Master students	2018: 40 Master students

Workshop participants

- **Novi Sad, YU, 2001**   **23**
- **Plovdiv, BG, 2002**   **26**
- **Ohrid, MK, 2003**   **27**
- **Zagreb, CRO, 2004**   **30**
- **Baile Herculane, RO, 2005**   **31**
- **Ravda, BG, 2006**   **35**
- **Risan, MNE, 2007**   **40**
- **Durrës, ALB, 2008**   **47**
- **Neum, *BiH, 2009***   ***42***
- **Ivanjica, *RS, 2010***   ***52***
- **Ohrid, *MK, 2011***   ***62***
- **Opatija, CRO, 2012**   **65**
- ***Bansko, BG, 2013***   ***62***
- **Sinaia, *RO, 2014***   ***53 *)***
- **Bohinj, *SLO, 2015***   **65**
- **Jahorina, BiH, 2016**   **53 *)**
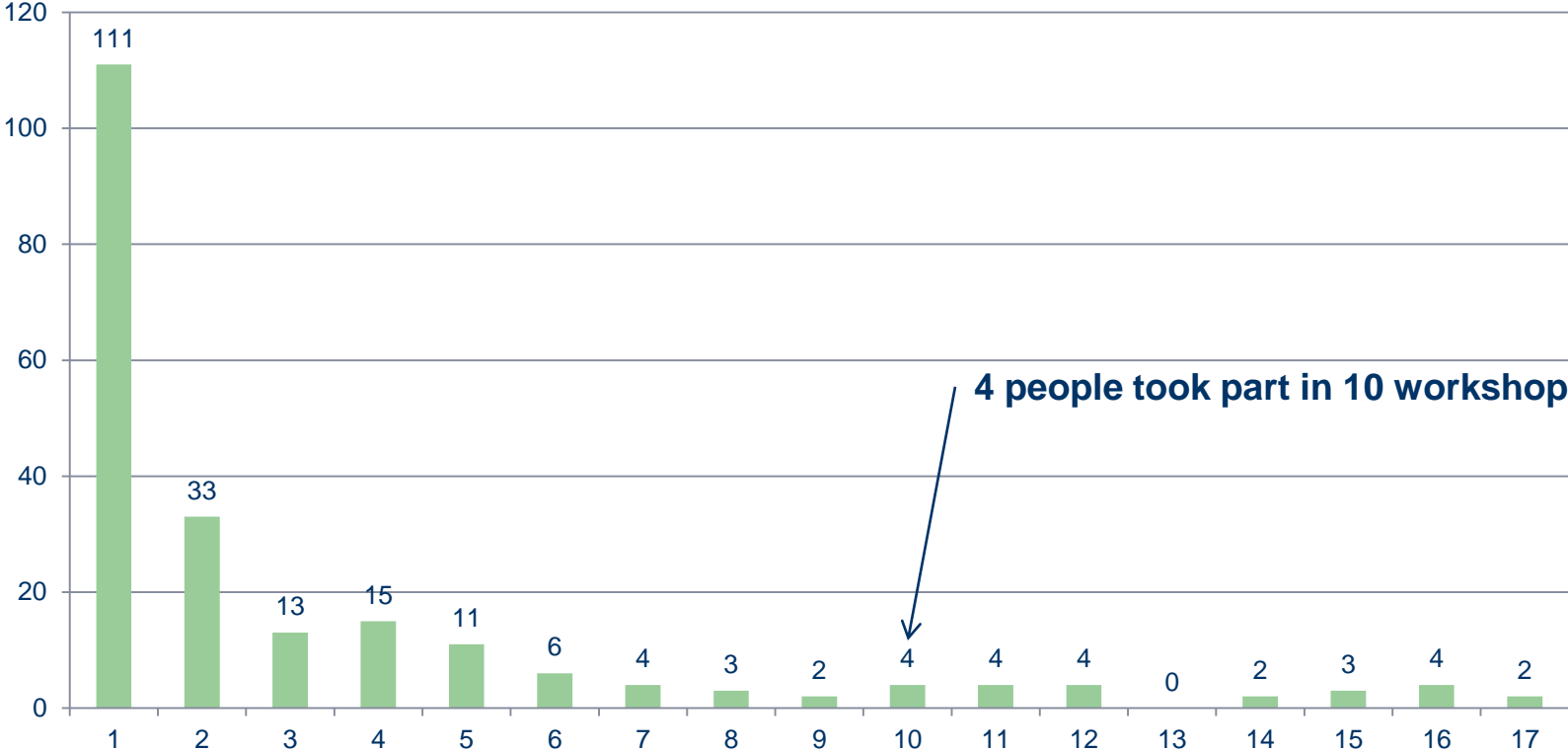- ***Primošten, CRO, 2018***   ***44 *)***

*) reduced budget

Stable participation - and healthy fluctuation

221 different participants 2001 - 2018

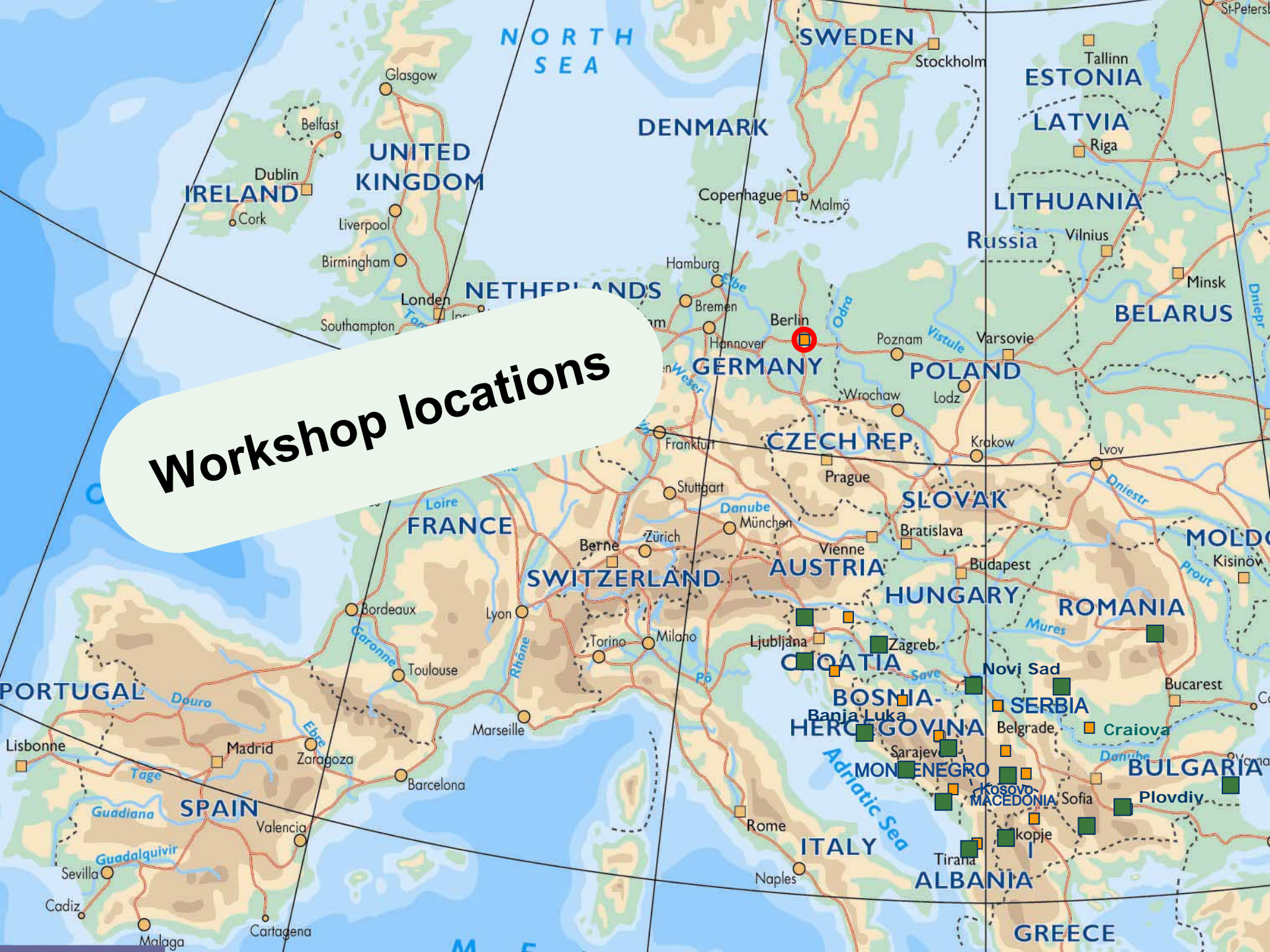# Participants by participation (workshops until 2018)

Graph of participation

4 people took part in 10 workshops

Total number of different participants: 221

Workshop locations:

impressions of different regions of Balkan countries and beyond

Workshop locations

Workshop locations

Bohinj
Zagreb
Opatija
Novi Sad
Sinaia
Baile Herculane
Primosten
Jahorina
Ivanjica
Ravda
Neum
Risan
Plovdiv
Durres
Ohrid
Bansko

Workshop:
social program and atmosphere

Workshop:
social program and atmosphere

Last – but not least …

V

DAAD funding

… and creative programme development

Stability of the program:
long-lasting

Stability of DAAD funding:

- Long-lasting for 16 years

- Our project received in 16 years: about 1.000.000 EUR

DAAD winter/summer school for young colleagues and students at Munich

e.g. participants of our recent workshop 2018: took part at Munich (Gordana Rakic/Novi Sad, Goran Banjac/Banja Luka)

DAAD conferences of all projects in the programme (exchange of ideas)

e.g. Tirana October 2012

DAAD Newsletter of „Academic …"

Summary

- Outstanding programme of DAAD: 16 years of funding
- By motivated and creative partners in our project, a lot of useful outcomes
- JCSE as a positive example of multilateral educational cooperation (reviewers of conferences)
- Many professional advancements of colleagues during that time (from Student to Staff to Professor)
- Personell contacts in our project did not lead to stability at the Balkan, but in our project ☺

My benefits

 $\rightarrow$ I enjoyed the project, since …

... I met motivated and creative colleagues

Berlin, May 2010

… I met open-minded and interested students

Tirana, May 2008

…I got insight into the every-day life and culture of the region

Novi Sad, 2012

… I enjoyed a beautiful nature and …

Sinaia, 2014

… and exciting history

Appolonia 2008 (from Durres)

… open-minded and interested students

… open-minded and interested students

Thank you for your attention