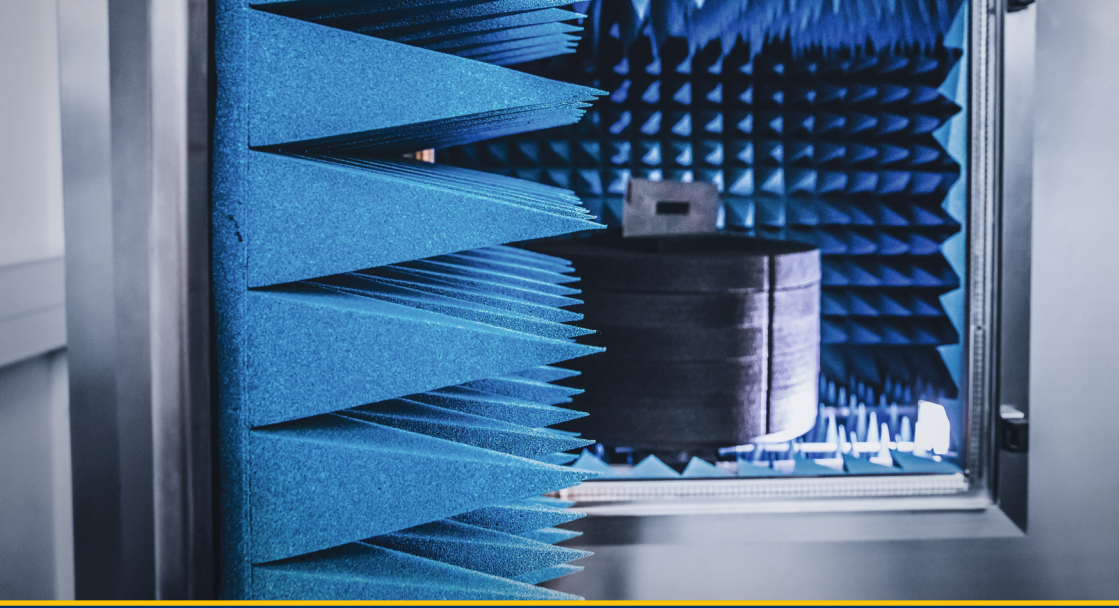

Uckelmann | Romagnoli | Baalsrud Hauge | Kammerlohr [Eds.]

Online-Labs in Education

Proceedings of the 1st International Conference
on Online-Labs in Education,
10 – 12 March 2022, Stuttgart, Germany

Nomos

Edition
Rainer
Hampp

https://doi.org/10.5771/9783957104106-1 https://www.inlibra.com/de/page/agb - Open Access - (cc) BY-NC-SA

Dieter Uckelmann | Giovanni Romagnoli
Jannicke Baalsrud Hauge | Valentin Kammerlohr [Eds.]

Online-Labs in Education

Proceedings of the 1st International Conference
on Online-Labs in Education,
10 – 12 March 2022, Stuttgart, Germany

Nomos

Edition
Rainer
Hampp

https://doi.org/10.5771/9783957104106-1 https://www.inlibra.com/de/page/agb - Open Access - (cc) BY-NC-SA

The DigiLab4U project, the conference and these conference proceedings were funded by the Federal Ministry of Education and Research (BMBF), Germany under the funding code 16DHB2112. The responsibility for the content of this publication lies with the authors.

© Coverpicture: HFT Stuttgart

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at http://dnb.d-nb.de

ISBN 978-3-98542-036-0 (Print)
978-3-95710-410-6 (ePDF)

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library.

ISBN 978-3-98542-036-0 (Print)
978-3-95710-410-6 (ePDF)

Library of Congress Cataloging-in-Publication Data
Uckelmann, Dieter | Romagnoli, Giovanni | Baalsrud Hauge, Jannicke
Kammerlohr, Valentin
Online-Labs in Education
Proceedings of the 1st International Conference on Online-Labs in Education, 10 – 12 March 2022, Stuttgart, Germany
Dieter Uckelmann | Giovanni Romagnoli | Jannicke Baalsrud Hauge
Valentin Kammerlohr (Eds.)
501 pp.
Includes bibliographic references.

ISBN 978-3-98542-036-0 (Print)
978-3-95710-410-6 (ePDF)

Edition Rainer Hampp in der Nomos Verlagsgesellschaft

1st Edition 2022

© The Authors

Published by
Nomos Verlagsgesellschaft mbH & Co. KG
Waldseestraße 3–5 | 76530 Baden-Baden
www.nomos.de

Production of the printed version:
Nomos Verlagsgesellschaft mbH & Co. KG
Waldseestraße 3–5 | 76530 Baden-Baden

ISBN 978-3-98542-036-0 (Print)
ISBN 978-3-95710-410-6 (ePDF)
DOI https://doi.org/10.5771/9783957104106

Onlineversion
Nomos eLibrary

This work is licensed under a Creative Commons Attribution – Non Commercial – Share Alike 4.0 International Public License.

https://doi.org/10.5771/9783957104106-1 https://www.inlibra.com/de/page/agb - Open Access - (cc) BY-NC-SA

Preface

The *Online-Labs in Education* conference, held on March 10-11, 2022 at HFT Stuttgart, Germany, marked the final phase of the DigiLab4U project (www.digilab4u.com). The goal of the conference was to disseminate the results of the project and to bring together a vibrant research community that is continuously working to enable the use of online labs in research and education without institutional boundaries.

Similar to digitalization in administration and industry, the digitalization or virtualization of lab equipment promises numerous benefits for involved stakeholders. The economic benefits of shared lab infrastructures, remote access to labs anytime and anywhere, the convenience of use, shared lab courses, fully online-labs, and experiments via online platforms are just a few of the benefits that come to mind when thinking of a federated lab network infrastructure. However, the effort required to digitalize 'physical things' should not be underestimated. The DigiLab4U project has investigated technical, organizational, and didactic issues related to online labs and lab-sharing networks. The scientific results have been published in numerous publications (see https://digilab4u.com/publications/). In our perception, publishing and discussing lab-based lecture content among peers is not common practice at scientific conferences, which leads to low visibility of what exists and hinders the uptake and re-use of existing online and remote labs.

For this reason, the *Online-Labs in Education* conference called for not only scientific contributions, but also lab-based lecture chapters. We would like to express our thanks to all authors for their contributions. The conference and the proceedings presented here followed the same structure and were complemented by interactive demonstrations. The conference proceedings are structured into the following main sections:

- General topics and organizational issues
- Technical topics
- Didactical considerations
- Educational learning chapters
  (educational considerations – learning chapters are available online)
- Interactive demos (abstracts)

There are institutions and people we would like to thank for their support of the conference. First, we would like to thank the *Federal Ministry for Education and Research (BMBF) Germany* for funding the project and the

https://doi.org/10.5771/9783957104106-1 https://www.inlibra.com/de/page/agb - Open Access - (cc) BY-NC-SA

conference. Second, we would like to thank our local institution, *Verein Freunde der HFT Stuttgart e.V.*, for their support. Third, we would like to thank the members of the advisory board and the program committee:
Advisory Board:

- Dr. Peter Ferdinand, Institut für Wissensmedien, Universität Koblenz-Landau
- Prof. Massimo Bertolini, Ph.D., Industrial Systems Engineering, University of Modena and Reggio Emilia
- Prof. Dr. Angel A. Juan, Data Science & Artificial Intelligence, Full Professor of Operations Research at the Computer Science Dept., Open University of Catalonia
- Prof. Dr. Abdelmajid Khelil, HAW Landshut
- Prof. David Romero, Ph.D., School of Engineering and Sciences, Tecnológico de Monterrey
- Prof. Dr. Gottfried Zimmermann, HDM Stuttgart
- Prof. Dr. Peter Rödler, University of Koblenz

Program Committee:

- Hadi Adineh, HFT Stuttgart
- Martin Burghardt, IWM, Universität Koblenz-Landau
- Jens Doveren, RWTH Aachen
- Giovanni Esposito, University of Parma
- Matteo Galli, University of Parma
- Birte Heinemann, RWTH Aachen
- Valentin Kammerlohr, HFT Stuttgart
- Nils Höhner, IWM, Universität Koblenz-Landau
- Davide Mezzogori, University of Parma
- Mattia Neroni, University of Parma
- Anke Pfeiffer, HFT Stuttgart
- Davide Reverberi, University of Parma
- David Schepkowski, IWM, Universität Koblenz-Landau

Last, but not least, we want to thank the organizing committee, including Anja Ernst, Anke Pfeiffer, Andreas Jäkel, Elisabeth Kraxner, Kevin Kutzner, and Marc Philipp Jensen for spending countless hours enabling a hybrid conference format.

The discussion at the end of the conference showed that further research and activities related to online-labs in education are expected. Some of the mentioned topics included:

https://doi.org/10.5771/9783957104106-1 https://www.inlibra.com/de/page/agb - Open Access - CC BY-NC-SA

- a demand for more universities collaborating and sharing labs;
- a need for a marketing platform to promote the usage of online labs;
- a need for more events to share experiences on using online labs in engineering education;
- interest in sharing experience on using Learning Analytics (LA) – not only in relation to online labs;
- the need for sustainable financing of labs and lab networks.

It will be interesting in the future to see the sharing of online labs by universities and eventually, cooperation between industries and lab teams will also be well accepted. However, this would require a fundamental shift in existing mindsets, budgets and funding programs.

Dieter Uckelmann
Giovanni Romagnoli
Jannicke Baalsrud Hauge
Valentin Kammerlohr

GEFÖRDERT VOM

Bundesministerium
für Bildung
und Forschung

https://doi.org/10.5771/9783957104106-1 https://www.inlibra.com/de/page/agb - Open Access - (cc) BY-NC-SA

https://doi.org/10.5771/9783957104106-1 https://www.inlibra.com/de/page/agb - Open Access - (cc) BY-NC-SA