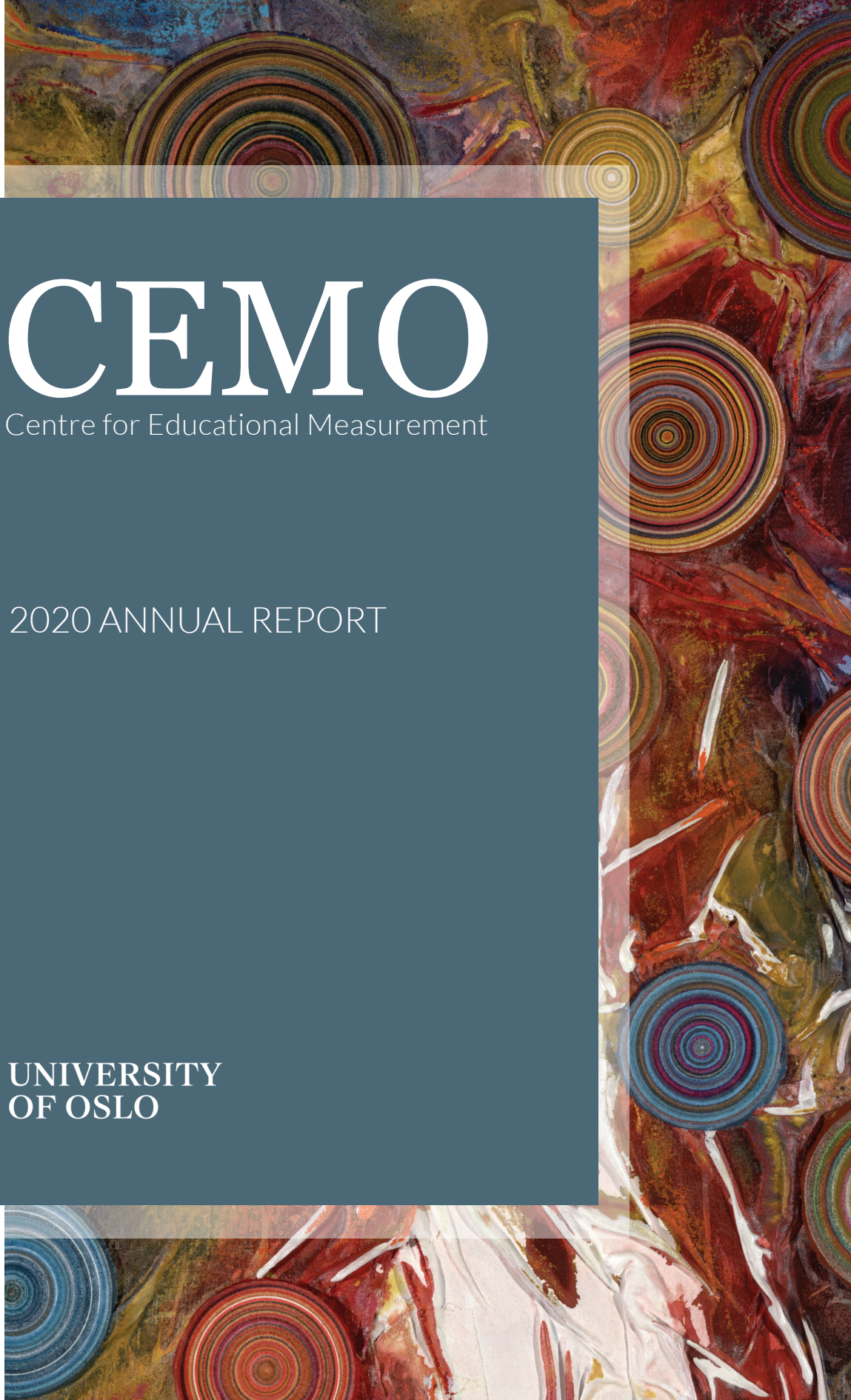

# CEMO

Centre for Educational Measurement

## 2020 ANNUAL REPORT

UNIVERSITY
OF OSLO

The Centre for Educational Measurement (CEMO) at the Faculty of Educational Sciences, University of Oslo, is a research unit for fundamental and applied research in the field of educational measurement and assessment. Our goal is to solve challenges of educational assessment systems and, thus in the long run, to promote educational quality, equity and student development. CEMO develops measurement and assessment competence in Norway and the Nordic countries by teaching Master and PhD students as well as practitioners, and by counselling stakeholders. The Centre collaborates with similar units in many other countries and is part of a large international research network. This report provides a comprehensive overview of our achievements, ongoing projects, outreach, publications and events over the past year.

# CEMO 2020 in Brief

2020 has been a year to remember with the outbreak and spread of the coronavirus. CEMO had a strong year in spite of the challenges presented by the pandemic.

CEMO is now in its eighth year and at its so far largest size with more than 30 employees from 17 different countries: five (associate) professors, five adjunct professors, four postdoctoral fellows, thirteen PhD candidates, three administrators and five research assistants. In 2020, CEMO welcomed a new leader of the administration, two new PhD candidates, one new postdoctoral fellow, and one new adjunct professor. In addition, we hosted two guest researchers. Due to the pandemic, we were unfortunately not able to accept visiting guest researchers or Gustafson & Skrondal Scholars during the second half of the year.

PhD training is a core task of CEMO. Two PhD candidates submitted their doctoral thesis for approval to the Faculty of Educational Sciences in the second half of 2020.

CEMO team members (co-)authored some 40 scientific articles in 2020 with a focus on psychometrics and statistics, national and international large-scale assessments, computer-based assessments, and determinants and effects of cognitive skills. Of these, 25 were published in journals of the highest quality level (2) or level (1) with an impact factor >1, according to the Norwegian publication system.

CEMO has led a Centre of Excellence application in collaboration with the other three units at the Faculty of Educational Sciences. We submitted the application in November and will learn about the outcome of the first screening step in June 2021. The centre has two EU-funded projects and three projects funded by the Research Council of Norway (RCN). Three additional RCN applications and one application to the Marie Sklodowska-Curie Actions Individual Fellowship (MSCA-IF) have been submitted. The centre is also involved in the evaluation of *Fagfornyelsen*, a large curriculum reform in Norway, along with the other three units at the Faculty of Educational Sciences.

The largest single activity at CEMO is our Master of Science in Assessment, Measurement and Evaluation. All employees are actively involved in the program. The highlight of the past year was that the first cohort graduated in spring 2020. All the graduates have been successful on the job market.

In 2020, together with colleagues from Sweden, Denmark and Finland, we have established the Nordic network "Educational Measurement and Assessment" as part of the Nordic Educational Research Association (NERA). The purpose is to have an arena where researchers who work on measurement in the Nordic countries can exchange information and knowledge and build collaborations. The network hosted its first meeting at the NERA conference in Turku, Finland from 4-6 March 2020.

The process of transforming CEMO into a permanent unit at the faculty was an important achievement of 2020. In the fall, the Faculty board decided that CEMO will be continued as a basic unit at the Faculty of Educational Sciences after the funding from the Ministry of Education and Research expires in July 2023.

# The Director's Comments

It is a great pleasure for me to report that CEMO had several breakthroughs in 2020 – despite all the complications caused by the corona pandemic with home office most of the year, including digital teaching and meetings. This was certainly not what we had envisioned for 2020 beforehand! It made us aware that CEMO is not only a workplace but also an important social environment!

CEMO has already arrived at its eighth year of existence. Time is flying! I am glad to see that we continue to succeed with our missions: research, teaching and outreach activities are developing dynamically. The Faculty of Educational Sciences has decided to establish CEMO as a permanent basic unit of the Faculty. CEMO will be located on the same level as the three departments, Department of Teacher Education and School Research, Department of Education, and the Department of Special Needs Education, which means that we will have an independent status and can continue to develop our own distinct profile while still forging strong relationships.

A highlight in 2020 was that we could graduate the first cohort of our Master of Science in Assessment, Measurement and Evaluation program. It is enjoyable to see that our students are competitive on the labor market. They got positions either in academia as PhDs or as practitioners in the private or public sector, for example as data analysts. These were the types of jobs we envisioned when we created the program. Most of the graduates stayed in Norway which is in line with our ambition to strengthen national expertise on educational assessment.

A few weeks ago, our second PhD candidate graduated successfully. Kondwani ("KJ") Kajera Mughogho submitted his thesis in 2020 and defended it brilliantly in a public event in February 2021. Moreover, despite the challenges of the pandemic, he managed to get a job well fitting to his qualifications. Congratulations, KJ, and all the best for your future!

Seeing former CEMO team members succeeding in new positions and welcoming new team members to Oslo are the most enjoyable tasks of a director throughout an academic year. We were again lucky with our recruitments in 2020. José Manuel Arencibia Alemán and Kseniia Marcq joined CEMO as PhD candidates. Isa Steinmann–a former Gustafsson & Skrondal scholar–started as a Postdoctoral Fellow. And Bryan Maddox, University of East Anglia, UK, was appointed as Adjunct Professor. Looking forward to collaborating with all of you!

With a heavy heart we saw our administrative leader, Anne-Catherine Lehre, moving to a research position at the Department of Teacher Education and School Research. As the first person hired, Anne-Catherine had been the core of CEMO since the start, and the rise of CEMO is closely related to her work. Thank you very much for everything, Anne-Catherine! At the same time, we welcome Tara Sarin as the successor. Tara managed to fill big shoes in the middle of the pandemic. To start at a new unit as the administrative leader without having the chance to meet anyone in person is a challenge. Great to have you on board, Tara!

The cancellation of conferences, a substantial slow-down in journals' peer review processes, the inconvenience of working at home under conditions not meant for this purpose, and supervisors no longer sitting next door where one can quickly knock at the door and ask a question, were (and still are!) an extra burden for PhD candidates and postdoctoral fellows. They have fixed-term contracts and are supposed to succeed within a given time. However, the circumstances of the pandemic were beyond their control. In cases of delays, we have therefore extended contracts by some months.

## Comments by the CEMO Board chair: Rita Hvistendahl

The CEMO board has had one physical meeting in 2020, on 23 September. In this meeting, the board discussed the future of CEMO as a permanent part of the Faculty of Educational Sciences and provided feedback that was included in the further process. Finally, in December 2020, the Faculty board decided to establish CEMO as a permanent centre at the Faculty. The CEMO board takes great pleasure in congratulating CEMO with this decision that is crucial for the future of the centre. Simultaneously, the board congratulates CEMO with its very first cohort of students who graduated from the master program "Assessment, Measurement and Evaluation".

A number of issues were also decided upon in electronic board meetings, on 10 January, 18 February, 24 April, 3 June, 22 June and 22 October. The most important issues for these meetings have been to announce and fill positions. The CEMO board had the great pleasure to welcome Bryan Maddox as Adjunct Professor. The board also welcomed José Manuel Arencibia Alemán and Kseniia Marcq as PhD candidates, and Isa Steinmann as Postdoctoral fellow. The reports from the evaluation committees have been of a high standard, documenting that all applicants have been considered in a transparent and fair evaluative process.

At the end of my period as chair of the board since August 2012, I will express the board's high acknowledgments of what CEMO has accomplished during its first eight years. It has become an internationally renowned research and teaching centre, and collaborations with all the three departments at the Faculty of Educational Sciences as well as with other units at the University of Oslo are established. On behalf of the board, I wish CEMO all the best in their further development as an attractive research and teaching centre in the field of educational measurement, assessment and psychometrics.

# Table of Contents




**Graphic Design & Photos:** Shane Colvin
**Illustration:** Colourbox

# 1. Research at CEMO

Research on measurement challenges with a focus on educational applications is a primary task for CEMO, and team members working in this area specialize in statistics, psychometrics and latent variable modelling, the development of innovative assessment formats as well as linking and equating of data.

Such measurement challenges frequently appear in different areas of educational and psychological research which is another primary task at CEMO, and team members working in this area focus on measuring socio-emotional and cognitive educational outcomes, analyzing data from international large-scale assessments or assessing student progress with objective structured clinical examinations (in collaboration with the Faculty of Medicine).

Research at CEMO is firmly established, visible in the high quality of our publications, success in the competition for external grants, and international recognition in terms of awards and board memberships. CEMO has built up its research portfolio around four themes: modern test design, statistical methods for innovative assessments, educational measurement in the Norwegian context, and international large-scale assessments.

## Frontier Research in Educational Measurement (FREMO) research group

FREMO was established in 2018 to create an arena for cutting-edge research in educational measurement. Hosted by CEMO, the research group collaborates with other research groups at the Faculty of Educational Sciences and carries out advanced training of PhD candidates and Master students. FREMO includes CEMO's academic team members and is open for members from other departments at the Faculty. Activities are organized by FREMO leader, Associate Professor Björn Andersson and supported by Postdoctoral fellow Chia-Wen Chen.

In addition to PhD training, FREMO activities can be divided into two areas: joint activities which involve all the members of FREMO and specialized activities which involve the members of a subgroup reflecting the four CEMO research themes: modern test design, statistical methods for innovative assessments, educational measurement in the Norwegian context, and international large-scale assessments. FREMO also provides financial support for, e.g., research assistants, language review services or administrative support.

The bi-weekly brown bag seminar is the most frequent activity of the research group, engaging all FREMO members. PhD candidates are expected to present at the seminar. In 2020, the seminar has moved online and is open to the public via registration.

A major task of FREMO is to organize the international conference FREMO which was hosted in Oslo for the first time in September 2018. We had planned to host the conference in September 2020 and then again in 2021 but had to cancel the conference due to the corona pandemic. We will instead have an event presenting the research of FREMO members.

## External Funding

CEMO researchers have received a great deal of external funding over the years. The centre currently holds five research grants: two from the European Commission and three from the The Research Council of Norway (RCN). In addition, several CEMO employees participate in externally funded projects internationally. The goal is that all permanent academic team members have an externally funded project or an application under consideration at any time.

*Outcomes and Casual Inference in International Comparative Assessments (OCCAM)*
Marie Sklodowska-Curie Innovative Training network (EU Horizon 2020)
Rolf Vegar Olsen, Sigrid Blömeke, Jelena Veletic, Wangqiong Ye, Isa Steinmann

OCCAM aims to educate the next generation of educational researchers. The funding has been used to employ and support 15 PhDs, employed at one of the partner institutions. All PhDs have extensive stays at another institution (six months) and participate in regular network meetings and workshops as part of their training. The PhDs investigate trends and differences in educational achievement, determinants and changes of these and the effects of educational policy from an international perspective using data from international large-scale assessments (ILSAs) in mathematics, reading, and science.

*Inclusive Education and Social Support to Tackle Inequalities in Society (ISOTIS)*
EU Horizon 2020 research and innovation program
Henrik Daae Zachrisson (former CEMO adjunct professor)

The aim of the project is to contribute to the development of effective practices combatting inequality in education. Quasi-panels and aggregated longitudinal data sets are used to investigate variation in early education and educational trajectories across

countries and over time. To understand the complex interactions between individual and context characteristics, ISOTIS focuses on immigrant populations on the one hand and low-income populations on the other hand since both groups are confronted with persistent difficulties related to education.

*Educational assessments of the 21st century: Measuring and understanding students' adaptability in complex problem solving situations (ADAPT21)*
The Research Council of Norway (RCN)
Ronny Scherer and Alexandra Niculescu

The aim of the project is to understand the nature of adaptability. We are often faced with situations where the information needed to solve a problem is not immediately obvious and things change rapidly. The ability to cope with such situations is referred to as "adaptability". The project focuses on how secondary school students adjust their thinking, behavior, and drive to changes and novelty in problem solving situations. A computer-based test has been developed that captures the construct and is currently under validation. The data will be used to examine the relation of adaptability to constructs such as intelligence, school achievement, self-concept, and the willingness to engage in problem solving.

*Latent Variable Factor Mixture models to track Longitudinal Differentiation Patterns*
The Research Council of Norway (RCN)
Johan Braeken and Saskia Van Laar

This project aims to develop sound statistical procedures to accommodate the tracking of differentiating developmental patterns. Development is something that is typically aspired in education, for example in terms of student learning, or in clinical practice, for example in terms of patient improvement. Usually, the same measurement instrument is used and scores can be compared across time. However, in some situations you are unable to use the same instrument or you have to redefine what you are measuring, and qualitative changes would be a sign of development. In such situations, it is necessary to provide alternative ways to measure and model such development.

*Embracing Heterogeneity in International Surveys: Optimal Test Design and Parameter Estimation*
The Research Council of Norway (RCN)
Leslie Rutkowski, David Rutkowski, Kondwani Kajera Mughogho, Yuan-Ling Linda Liaw (former CEMO Postdoctoral fellow)

In this project, the aim is to develop, integrate, and further refine several methods intended to improve the accuracy of achievement scores by incorporating (rather than ignoring) country or region-specific factors into the test design and estimates. Current methods assume that a single set of questions is universally suitable for dozens of highly varied participating countries. It is assumed that participants understand and answer questions in the same way regardless of their cultural background while departures from this assumption have important consequences for achievement results and rankings.

## PhD candidates and Postdoctoral fellows at CEMO

A core task of ensuring sustainable research in the field of educational measurement is training the next generations of PhD candidates and Postdoctoral fellows. These two groups are our most valuable resources when it comes to long-term effects of CEMO's research. PhDs and Postdoctoral fellows are typically employed for four years, including a 25% share of service work that mostly means teaching in our Master program. This time distribution contributes to developing the competence needed in future jobs both inside and outside academia.

CEMO's Deputy Director, Professor Rolf Vegar Olsen, is the PhD coordinator. He organizes the activities

related to our PhDs and maintains the supervision guidelines which describe expectations and responsibilities for the PhDs and their supervisors. To support the career development of Postdoctoral fellows, CEMO has also installed a Postdoctoral coordinator. This task is assigned to Professor Ronny Scherer.

CEMO values gender diversity and aims for a balanced distribution at each level of the career ladder. We have so far succeeded with respect to PhDs and Postdoctoral fellows where the majority is female. However, this is reversed at the level of senior scientists. Thus, focused efforts at CEMO aim at promoting female Postdoctoral fellows to a level of scientific independence that will qualify them for permanent academic positions internationally.

## Nordic network in Educational Measurement

Although many similarities exist across the Nordic region in how each country thinks about and organizes education, there are clear differences in how educational assessment is approached. This provides a diverse range of policies affecting how assessment is conceptualized and practiced across the region. An objective of CEMO is to contextualize educational assessments in the societal and cultural characteristics of the Nordic countries. To address this, CEMO and their counterparts in the region established a new network for Educational Measurement and Assessment as part of the Nordic Educational Research Association (NERA): https://neranetwork1.wordpress.com. The public profile of the network also gives significant visibility to CEMO.

Strong efforts have been placed in the creation of this network and a solid foundation has been made through the contribution of the conveners: Rolf Vegar Olsen, CEMO, Norway; Jeppe Bundsgaard, Aarhus University, Denmark; Mari-Pauliina Vainikaine, University of Tampere, Finland; Christina Wikström, Umeå University, Sweden. The purpose of the network is to create an arena for exchanging research ideas and planning research collaborations across countries. The network is open for research targeting innovative assessment formats, comparisons of assessments across the Nordic countries, use of assessment data for accountability and/or school development, issues of validity, fairness and equity in assessment, psychometric theory and practice, and similar themes.

The network hosted its first meeting on the coattails of the NERA conference in Turku, Finland from 4-6 March 2020. The event featured an inaugural symposium on the history and the current state of national assessments in Denmark, Finland, Norway, and Sweden.

# 2. Teaching at CEMO

CEMO is currently involved in a range of teaching and development activities on the Master's and PhD levels. We regard the relation between research and teaching as a two-way street where both are mutually dependent on the other.

The Master of Science in Assessment, Measurement and Evaluation (MAE) program is our most important long-term contribution to serve sectoral needs. The program, led by Professor Johan Braeken and study coordinator Siri Heslien, provides specialized training in developing and administering measurement instruments, analyzing data, and reporting results from assessments, measurements or evaluations as the first and only program in the Nordic region. Due to the pandemic, both the second and third cohort had digital teaching for most of 2020.

The number of MAE applicants continues to increase since the program started. The number of applicants that select our program as their first choice at University of Oslo is about twice as high as most other programs at the Faculty of Educational Sciences. However, this may change since we have substantially sharpened our admission criteria with respect to knowledge of introductory research methods/statistics. In addition to this, the minimum English requirement for international programs at the University of Oslo has been increased. We believe that this will ensure even higher qualifications of our graduates and improve retention rates. We assume that the number of students who can be evaluated as qualified and receive an offer to start the program will decrease due to this change.

### First cohort 2018 – 2020

The first MAE cohort graduated in spring 2020 and has been competitive on the job market. Two of the graduates started their PhDs while others have started positions as data analysts at private companies or in the public sector. It is clear from this success that our program leads to great career opportunities. The projects our graduates have been working on as part of their thesis provides an overview of their interests and qualifications (supervisors in brackets).

All theses can be accessed through the UiO library database by following the links published on our program pages: www.uio.no/english/studies/programmes/assessment-evaluation-master/thesis-projects.

Haverkamp, Ymkje Elisabeth: Investigating the underlying item characteristics in NIFU's 1+1 tests for elementary mathematics (Johan Braeken and Stephan Daus, Nordic Institute for Studies in Innovation, Research and Education–NIFU)

Jørstad, Oscar Skovdahl: The older the better? Relative age and grade effects on Norwegian national test performance (Rolf Vegar Olsen and Henrik Galligani Ræder)

Marcq, Kseniia: Accounting for bandwidth selection variability in estimating the standard errors of Kernel equating (Björn Andersson)

Hessami, Nasseem: Model selection using a stepwise Bayesian information approach in multiple group models with binary data (Björn Andersson)

Sari, Intan Maya: Decomposing Gender Differences in Reading: Evidence from Nordic PIRLS 2016 (Rolf Vegar Olsen and Henrik Galligani Ræder)

Uehara, Dan: Classification accuracy of equated item response theory (IRT) scores and sum scores (Björn Andersson)

Yoon, Ga Young: Item performance in context: Differential item functioning between pilot and formal administration of the Norwegian language test (Chia-Wen Chen and Tor Midtbø, Kompetanse Norge (Skills Norway)).

Zhao, Weichao: Identification and validation of disengagement measures based on response time: An application to PISA 2012 digital math items (Denise Reis Costa, Hanna Eklöf, Umeå University, and Maria Bolsinova, ACTNext)

## Second cohort since 2019

The second cohort is now halfway through their studies and will finish the program in spring 2021. They have followed a packed program that has provided them with the knowledge and skills needed to succeed as PhDs or assessment professionals. Throughout the program, the students had to deliver research reports, work collaboratively, present their findings to multiple audiences, and respond to feedback from peers. They have developed algorithmic skills in statistical computation and are familiar with the open-source software R.

## Third cohort since 2020

For the third cohort, CEMO received over 100 applications out of which 18 full-time students started at the end of August 2020. The program started with classes in Data Science and Linear Models (taught by Johan Braeken) that provided not only the basics for everyone intending to work or do research in the fields of assessment and evaluation, but also introduced the students to the open-source software R. They also attended Principles of Measurement with Björn Andersson, which provides an introduction to test theory. Currently students are taking Constructing Measures (Rolf Vegar Olsen) and Item Response Theory (Björn Andersson) before they will go over to Measurement Models (Ronny Scherer and Denise Reis Costa) in the spring. In parallel to this, students take Research Seminars. In the fall, they will proceed to Multilevel Models, Current Topics and Debates in Assessment and Evaluation and Selected Topics in Educational Measurement. The retention rate of the third cohort is uncertain since these students are distributed across the world and do not benefit from being part of a regular real-life peer group.

# 3. Outreach Activities

An explicit mission of CEMO is to reach out to practitioners and stakeholders responsible for assessments in education and in need of knowledge about measurement, assessment and evaluation. Assessment results often have profound impact both on individuals, such as teachers or students, and on institutions, such as schools or municipalities. This, in combination with the fact that measurements often are technically complex, generates different information needs on the side of students, parents, teachers, school-leaders, politicians and administrative bodies. CEMO activities to meet such needs range from collaboration with academic and non-academic stakeholders in Norway and the Nordic countries to producing outlets for a range of popular media channels.

## Evaluation of the Norwegian system of school exams

In 2020, a large curriculum reform called *Fagfornyelsen* was implemented in Norwegian schools. As part of this change, the Ministry of Education and Research established a group of experts in 2018 whose task was to evaluate the exam system in place at the end of primary and secondary school education. CEMO director Sigrid Blömeke led this work. The group included a broad range of teacher and student unions as well as researchers. Most of the work was carried out in 2019 where the group published a large summary of the state-of-research: www.udir.no/tall-og-forskning/finn-forskning/rapporter/Kunnskapsgrunnlag-for-evaluering-av-eksamensordningen/. Based on this knowledge, the group developed suggestions for changes and published these in 2020: www.udir.no/eksamen-og-prover/eksamen/vurderinger-og-anbefalinger-fremtidens-eksamen/

The report created public discussions and was followed up by digital workshops and seminars organized by teacher unions. There was also a public hearing of suggested changes and several trials of new approaches in 2020: www.udir.no/eksamen-og-prover/eksamen/slik-endrer-vi-eksamen/. As a consequence of the group's work, a broad range of changes will be implemented from 2021 and onwards.

## Websites and social media

During 2020 we have seen an increase in numbers of followers on social media. Both Twitter (678 followers) and Facebook (1149 followers) were used actively to spread information about CEMO's research activities, possibilities, and cooperation. On the websites, the main features remain the personal pages for each CEMO member, information about CEMO's research and teaching, upcoming events, and the list of publications. Overall, our websites had around 66.000 hits in 2020. Moreover, two of our PhD candidates are involved in blog activities: https://international-education.blog/en/.

## Selection of further activities

*Consultancy for national and international governmental bodies*

- Directorate for teaching and training and units developing the national assessments
- Parliamentary hearing on changes of the national assessments in Norway
- National assessment system in Denmark
- Norwegian PIAAC Advisory Board at the Ministry of Education
- TALIS (Teaching and Learning International Survey) Questionnaire Expert Group
- Advisory Board for Knowledge Centre for Education (University of Stavanger)

*Collaboration with partners outside of UiO*

- Educational technology companies (Studix and MadeToGrow)
- Kompetanse Norge (Skills Norway), Norwegian Centre for Mathematics Education, Norwegian Defence University College, Norwegian Business School (BI) – in particular as part of our Master students' thesis work
- Oslo University Hospital: Development of an adaptive instrument to map/diagnose personality disorders

*Evaluation of policy reforms*

- Fagfornyelsen (EVA2020), reform of the Norwegian school curriculum in 2020

# 4. Summary of goal accomplishment in 2020 and outlook to 2021

The CEMO team has developed a 3-year plan with specific short-, mid- and long-term objectives for 2019-2021 regarding research, teaching, outreach and organization. The plan is updated regularly. In the following, we look back at our goals in 2020 and provide insight into our plans for 2021.

## Research 2020

Our overall objective regarding research over the years 2019-2021 is to sharpen and strengthen our research profile and visibility nationally and internationally to accomplish our long-term goal of becoming the leading Nordic and European centre within educational measurement. With respect to 2020, this meant among others to:

- to have a broad range of activities (only partly accomplished due to the corona pandemic), and to establish the FREMO conference as a brand (not yet accomplished, conference postponed to 2022 due to the pandemic)
- publish with high-quality in journals on level (2) or level (1) with an impact factor >1 according to the Norwegian publication system (accomplished), at least one article in a leading Q1 journal (accomplished), and to publish in Norwegian and Nordic outlets (accomplished)
- further develop the robustness of the centre and the quality of its research by expanding our portfolio of external grants (only partly accomplished, no new external grant in 2020, but several new applications submitted) and preparing an application for a Centre of Excellence or an individual ERC grant (accomplished)
- provide extensive support for our Postdoctoral fellows and PhD candidates in terms of good mentoring or supervision practices and frequent opportunities to present their work internally and externally (accomplished with respect to internal presentations, not accomplished with respect to external ones due to the pandemic), participation in teaching activities (accomplished)
- strengthen our international network through highly-qualified Gustafsson & Skrondal scholars (accomplished during the first half of 2020 but not in the second half due to the pandemic), a meeting with the International Advisory Board (accomplished in a digital version), have additional guest researchers with their own funding and collaborate with international research units (not accomplished due to the pandemic)

One of our goals each year is to publish at least one article that has agenda-setting potential. It is difficult to find an appropriate criterion to evaluate this goal and also to do this already the year after a publication. We use therefore the number of citations with respect to articles published the year before. We had 12 articles published in 2019

that had received at least 10 citations at the end of 2020 according to Google Scholar. One of these articles stands clearly out with more than 300 citations already now: Scherer, R., Siddiq, F., & Tondeur, J. (2019). The technology acceptance model (TAM): A meta-analytic structural equation modeling approach to explaining teachers' adoption of digital technology in education. *Computers & Education*, 128, 13-35. Based on this large number of citations in such a short time, it is fair to say that we have accomplished our goal in 2019.

## Teaching 2020

Our overall objective regarding teaching over the years 2019-2021 is to offer a high-quality Master of Science program in Assessment, Measurement and Evaluation and to attract a large pool of highly qualified national and international applicants. With respect to 2020, this meant among others to:

- further develop the selection criteria for the program (accomplished) and the program's profile (accomplished), attract a large and qualified enough pool so that we can once more fill all study places (with 18 students almost accomplished), receive positive feedback from the first Master cohort regarding teaching quality (accomplished), and to have good throughput (only partly accomplished)

## Outreach 2020

Our overall objective regarding outreach over the years 2019 to 2021 is to be visible in the Norwegian and the Nordic context. With respect to 2020, this meant among others to:

- establish a Norwegian board with representatives of the professional testing field besides the already existing scientific international Advisory board (not accomplished, postponed due to the pandemic) and publish a textbook or an article in a popular science outlet such as forskning.no (not accomplished)
- create a network in assessment, measurement and evaluation as part of the Nordic Educational Research Association (NERA) (accomplished) and publish at least one article each in a journal with a Nordic focus (accomplished)

## Human Resource Management 2020

Our overall objective regarding CEMO as an institution over the course of the next three years is to offer our team members a stable, productive and enjoyable working environment. With respect to 2020, this meant among others to:

- establish CEMO as a level 3 unit at the Faculty of Educational Sciences with secure basic funding at the current size (accomplished)
- have collaborations with the other three departments at the Faculty of Educational Sciences (accomplished)
- give a voice to all team members and include them in decision-making processes (partly accomplished but limited by the pandemic and home office most of the year), ensure good information flow and communication styles (accomplished despite the challenges of the pandemic with digital meetings), have regular joint social activities that have the potential to include all team members (not accomplished due to the pandemic)
- have effective administrative routines for core processes (only partly accomplished, postponed due to the pandemic)

# 5. Management & Administration

CEMO is organized directly under the Faculty of Educational Sciences at the University of Oslo, and the Centre Director reports directly to the Dean. The Ministry of Education and Research and the University of Oslo are CEMO's main funders until 2023. They constitute the final reporting entities that define the guidelines under which CEMO operates. The Faculty is responsible for the main load of administrative support.

## Administrative structure

Professor Sigrid Blömeke (Director) and Professor Rolf Vegar Olsen (Deputy Director) spearhead CEMO. An administrative head, Tara Sarin, supports the centre management. The CEMO leadership team represents CEMO at the Faculty and higher UiO levels as well as outside the university. The CEMO board is responsible for major decisions; these include strategic decisions about CEMO's research, teaching and outreach profile, recruitment strategies and employments as well as the management of the CEMO budget.

The CEMO administration consists of three employees and is responsible for the daily running of CEMO. Operative tasks of the administration include, among other things, coordination of the master program, research support, external communication, facilitating a good reception and stay for guests, maintenance of the websites and social media, secretarial function for board meetings, recruiting interviews, and scientific advisory board meetings, and organizing and implementing the different arrangements like courses, seminars, and workshops. CEMO's administration also functions as permanent secretariat for the CEMO Board and the International Advisory Board.

The administration at the Faculty of Educational Sciences operates employments at CEMO as well as budgeting and accounting. The Faculty of Educational Sciences also provides IT support.

## The CEMO Board

The CEMO Board is an administrative body that meets three to four times per year to approve the CEMO budget, the director's progress reports about research, teaching and outreach activities at CEMO and the employments. In addition, the Board members provide feedback on CEMO's activities from an internal perspective. The Board includes the heads of the three Departments at the Faculty of Educational Sciences, an employee representative and a student representative.

| The CEMO Board | |
|---|---|
| **Name** | **Affiliation** |
| Chair: Rita E. Hvistendahl | Head of Department of Teacher Education and School Research, UiO |
| Ona Bøe Vie | Head of Department of Special Needs Education, UiO |
| Ola Erstad | Head of Department of Education, UiO |
| Jarl Kleppe Kristensen | Employee representative |
| Henrik Hung Haram | Student representative |

## CEMO's International Scientific Advisory Board

CEMO established in 2016 an International Scientific Advisory Board to receive feedback on its research, teaching and outreach activities from renowned and highly experienced international colleagues working in similar contexts in other countries. The Board shall also promote research between CEMO and other international research centers.

The first Board served from 2016-2019. In the fall of 2019, a new Board started and had its first annual meeting in December. The members discussed the CEMO portfolio including general strategic issues, research and recruitment politics, the new master program, public relation work, the FREMO research group, research on the Norwegian assessment system, research innovations ahead, and external funding applications.

| International Scientific Advisory Board | |
|---|---|
| **Name** | **Affiliation** |
| Cees Glas, Professor | University of Twente, The Netherlands.<br>Chair of the Department of Research Methodology, Measurement and Data Analysis |
| Stephen Sireci, Professor | University of Massachusetts Amherst, USA.<br>Director of the Center for Educational Assessment. |
| Petra Stanat, Professor | Humboldt University Berlin, Germany.<br>Head of the Department "Education and Integration"; Director of the Institute for Educational Quality Improvement (IQB) at the Humboldt University of Berlin. |
| Carolin Strobl, Professor | University of Zürich, Switzerland.<br>Head of the Research unit. |

# 6. Finances

The Norwegian Ministry of Education and Research (7.63 MNOK core-funding to CEMO) and UiO (several positions) are CEMO's main financial contributors.

### Revenues and expenditures 2020

| | | Financial statement | Forecast |
|---|---|---|---|
| Opening balance | | -13 964 639 | -13 964 639 |
| Total Opening balance | | -13 964 639 | -13 964 639 |
| Funding | Core funding | -14 991 958 | -14 619 910 |
| | External income | 0 | 0 |
| | Income from sales | 178 972 | 0 |
| Total funding | | -14 812 986 | -14 619 910 |
| Staff expenses | Salary cost | 10 368 733 | 10 128 306 |
| | Salary (variable) | 5 016 | 0 |
| | Holiday pay, payroll tax, pension | -423 174 | -200 000 |
| | Salary expenses | 4 570 938 | 4 549 363 |
| | Other refunds | 43 248 | 0 |
| | Hourly salary | 358 059 | 127 171 |
| Total staff expenses | | 14 922 820 | 14 604 839 |
| Operating expenses | Consultancy service | 53 407 | 0 |
| | Rent | 508 082 | 610 150 |
| | Travel costs, courses, conference | 249 238 | 578 000 |
| | Other operating expenses | 2 507 487 | 2 527 624 |
| Total Operating expenses | | 3 318 215 | 3 715 774 |
| Investments | Investments | 217 879 | 449 000 |
| Total investments | | 217 879 | 449 000 |
| Netto contribution | Own funding (UiO) | 1 345 990 | 2 005 129 |
| | Overhead | -2 197 992 | -2 677 307 |
| | Salary Reimbursement | -914 624 | -1 650 305 |
| Total netto contribution | | -1 766 626 | -2 322 483 |
| Project closing balance | Project closing balance | -215 150 | 0 |
| Total project closing balance | | -215 150 | 0 |
| **Total** | | **-12 300 486** | **-12 137 418** |

# 7. Appendices

## CEMO current team members

| Name | Nationality | Position |
|---|---|---|
| Blömeke, Sigrid | Germany | Director |
| Olsen, Rolf Vegar | Norway | Professor/Deputy Director |
| Braeken, Johan | Belgium | Professor |
| Scherer, Ronny | Germany | Professor |
| Andersson, Björn | Sweden | Associate Professor |
| Schauber, Stefan K. | Germany | Associate Professor/affiliated with the Faculty of Medicine |
| Chen, Chia-Wen | Taiwan | Postdoctoral Fellow |
| Niculescu, Alexandra C. | Romania | Postdoctoral Fellow |
| Reis Costa, Denise | Brazil | Postdoctoral Fellow |
| Steinmann, Isa | Germany | Postdoctoral Fellow |
| Tesema, Melaku Tesfa | Ethiopia | PhD Candidate |
| Mughogho, Kondwani K. | Malawi | PhD Candidate |
| Van Laar, Saskia | Netherlands | PhD Candidate |
| Ræder, Henrik Galligani | Norway | PhD Candidate |
| Haakstad, Haakon T. | Norway | PhD Candidate |
| Veletic, Jelena | Bosnia | PhD Candidate |
| Ye, Wangqiong | China | PhD Candidate |
| Kristensen, Jarl Kleppe | Norway | PhD Candidate |
| Zhang, Maoxin | China | PhD Candidate |
| Helland-Riise, Fredrik | Norway | PhD Candidate |
| Gonzalez Campos, Diego | Colombia | PhD Candidate |
| Arencibia Alemán, José Manuel | Spain | PhD Candidate |
| Marcq, Kseniia | Russia | PhD Candidate |
| Skrondal, Anders | Norway | Adjunct Professor |
| Rutkowski, Leslie | USA | Adjunct Professor |

| | | |
|---|---|---|
| Rutkowski, David | USA | Adjunct Professor |
| Frey, Andreas | Germany | Adjunct Professor |
| Maddox, Bryan | United Kingdom | Adjunct Professor |
| Lehre, Anne-Catherine | Norway | Head of Administration<br>*Until March 2020* |
| Sarin, Tara | Norway/USA | Head of Administration<br>*From April 2020* |
| Heslien, Siri A.P. | Norway | Senior Executive Officer |
| Grønlid, Gunnhild Nedberg | Norway | Higher Executive Officer |
| Brentlinger, Kristin | Norway | Research Assistant |
| Jørstad, Oscar Skovdal | Norway | Research Assistant |
| Montazerikafrani, Fatemeh | Iran | Research Assistant |
| Sánchez Ruiz, Jesus Daniel | Peru | Research Assistant |
| Tan, Tony | Australia | Research Assistant |

**CEMO Gustafsson-Skrondal visiting scholarship**

| Name | Nationality | Period |
|---|---|---|
| Steinmann, Isa | Germany | August 2019-March 2020 |

**CEMO guest researchers**

| Name | Nationality | Period |
|---|---|---|
| Rusmann, Anna | Denmark | January 2020-April 2020 |

## CEMO events

### PhD Research Seminar

Together with the research group Large-scale Educational Assessments (LEA), FREMO organizes a research seminar for the PhD candidates connected to these research groups. During the course of the seminar, the PhD candidates present their research projects and provide feedback to the research projects of other candidates. They also present their work-in-progress and discuss journal articles. During 2020, the following events took place within the seminar:

| Date | Activity |
|---|---|
| February 11 | Presentation and discussion of Cecilie Weyergang's project "Kritisk leseforståelse i leseprøver". Response by Jarl Kristensen and Haakon Haakstad. |
| April 28 | Presentation and discussion of Oleksandra Mittal's project "Measuring Socioeconomic Status and Educational Equity: Validity and Cross-Cultural Comparability in Nordic Countries and Beyond". Response by Maoxin Zhang. |
| June 9 | Presentation of works-in-progress by Terje Throndsen and Maoxin Zhang. |
| September 8 | Presentation and discussion of Bas Senden's project "Investigating teachers' effectson student outcomes (TESO project): The role of high quality instructions". Response by Cecilie Weyergang. |
| October 20 | Presentation and discussion of Diego Gonzalez Campos' project "Principles and Practices to Synthesize Research Evidence from Complex Survey Data". Response by Kseniia Marcq. |
| November 27 | Midway assessment for Haakon Haakstad. |

### Brown Bag Seminars

During 2020, the following presentations took place:

| Date | Speaker | Title |
|---|---|---|
| Jan. 14 | Björn Andersson, CEMO | Exploring the longitudinal measurement properties of the Montreal Cognitive Assessment |
| Feb. 18 | Kondwani Kajera Mughogho, CEMO | The interaction between item parameter bias and subscore value |
| Feb. 25 | Anna Rusmann, Aalborg University | Digitally Measuring Process Management |
| Mar. 10 | Isa Steinmann, CEMO | Age and added-year effects in three Nordic countries: An application of regression discontinuity |
| May 5 | Jelena Veletic, CEMO | Developing a shared cluster construct of instructional leadership in TALIS |

| | | |
|---|---|---|
| May 19 | Wangqiong Ye, CEMO | Academic Resilience: Underlying Norms and Validity of Definitions Used in International Large-scale Assessments |
| May 26 | Chia-Wen Chen, CEMO | A Mixture Factor Model to Identify Misconceptions with the Certainty of Response Index |
| June 2 | Jarl Kristensen, CEMO | Dimensionality of Morphological Knowledge across Lexical Representations |
| Aug. 18 | Björn Andersson, CEMO | Stepwise model selection with the BIC in multiple group item response theory |
| Sep. 1 | Maoxin Zhang, CEMO | Identifying problem-solving solution patterns using network analysis of task interactions and response times |
| Sep. 15 | Fredrik Helland-Riise, CEMO | Cognitive tests in the Norwegian defense forces – trends and measurement quality |
| Sep. 29 | Haakon Thorbergsen Haakstad, CEMO | The Livingston and Lewis approach to classification accuracy and consistency, and how to apply it using the R-package "betafunctions" |
| Oct. 6 | Chia-Wen Chen, CEMO | Computerized Adaptive Testing for Student Evaluation of Teaching |
| Oct. 27 | Jelena Veletic, CEMO | Exploring school leadership profiles across the world: A cluster analysis approach of TALIS |
| Nov. 3 | Ana María Meija Rodriguez, University of Cyprus | What Makes Countries Effective in Promoting Quality in Education? A Meta-Analysis |
| Nov. 10 | Henrik Galligani Ræder, CEMO | Getting it wrong - A DIF analysis scheme of distractors |
| Nov. 24 | Saskia Van Laar, CEMO | Random responders in international large-scale assessments in education: a threat to validity |
| Dec. 8 | Wangqiong Ye, CEMO | Enhancing academic resilience in the classroom: a cross-cultural comparison of Scandinavian and Asian countries |

## PhD Courses

*Spring 2020*

| *UV9297: Measurement Models,* Ronny Scherer, spring 2020 |
| --- |
| The course introduces the fundamental theories and application of measurement models. |

| *UV9293: Item Response Theory,* Björn Andersson, spring 2020 |
| --- |
| The course introduces the core concepts and techniques of item response theory (IRT) which underlie current test design strategies, psychometric analyses, and evaluation of assessment instruments |

| *UV9040A: Research Seminar,* Björn Andersson, spring and autumn 2020 |
| --- |
| The intention with the research seminar is to follow-up the PhDs during the first two years, as well as to create an environment for research collaborations. |

| *UV9296: Methods for Causal Inference in Educational Research,* Jan-Eric Gustafsson, autumn 2020 |
| --- |
| The main purpose of the workshop is to give an introduction to techniques for making credible causal inferences from observational data and how such techniques can be used in educational research. |

*Autumn 2020*

| *UV9216: General Course in Meta-Analysis,* Ronny Scherer (together with M. Melby-Lervåg), autumn 2020 |
| --- |
| This course provides an introduction to key principles of meta-analysis, including random-effects models and effect size multiplicity. |

| *UV9218: Linear Models,* Johan Braeken, autumn 2020 |
| --- |
| This course provides an introduction to principles, terminology, and strategies for statistical modelling with the linear model as initial framework for data analysis. |

| *UV9253: Multilevel Models*, Ronny Scherer, autumn 2020 |
| --- |
| The course introduces the fundamental theories and application of multilevel models. |

| *UV9290: Data Science,* Johan Braeken, autumn 2020 |
| --- |
| The focus is on the core concepts and techniques that function as foundations for formulating and implementing successful data-based analysis strategies to perform evidence-based research. |

| *UV9291: Principles of Measurement*, Björn Andersson, autumn 2020 |
| --- |
| In this course, the focus is on the foundational theories and concepts in measurement. |

| *UV9121: Response Processes Data in Assessment*, Bryan Maddox, autumn 2020 |
| --- |
| This course introduces the use of response process data in the design and validation of computer-based tests including gamified assessments. |

| *UV9294: Analysis of International Large Scale Assessments,* Isa Steinmann, autumn 2020 |
| --- |
| This workshop aims to communicate both knowledge and hands-on analytical skills in the field of international large-scale assessment (ILSA) data. |

| *UV9275U: Multilevel and Longitudinal Modeling,* Anders Skrondal and Sophia Rabe-Hesketh, cancelled due to pandemic |
| --- |
| The short course introduces models for multilevel or clustered data. |

## Publications and Presentations

Contributors affiliated with CEMO in bold

*Articles in peer-reviewed level 2 journals or level 1 journals with impact factor>1*

Addey, Camilla; **Maddox, Bryan**; Zumbo, Bruno D. (2020). Assembled validity: Rethinking Kane's argument-based approach in the context of International Large-Scale Assessments (ILSAs). *Assessment in education: Principles, Policy & Practice* 2020.

**Andersson, Björn**; Xin, Tao (2020). Estimation of Latent Regression Item Response Theory Models Using a Second-Order Laplace Approximation. *Journal of Educational and Behavioral Statistics* 2020.

Bergem, Ole Kristian; Nilsen, Trude; Mittal, Oleksandra; **Ræder, Henrik Galligani** (2020). Can teachers' instruction increase low-SES students' motivation to learn mathematics? In: *Equity, Equality and Diversity in the Nordic Model of Education*. Springer 2020.

**Blömeke, Sigrid**; Kaiser, Gabriele; König, Johannes; Jentsch, Armin (2020). Profiles of mathematics teachers' competence and their relation to instructional quality. *ZDM: Mathematics Education* 2020; Volum 52, pp. 329-342.

**Blömeke, Sigrid**; König, Johannes (2020). Wirksamkeits-Ansatz in der Lehrerinnen- und Lehrerbildung. In: Handbuch Lehrerinnen- und Lehrerbildung. Julius Klinkhardt 2020, pp. 172-178.

**Braeken, Johan**; Paap, Muirne C. S. (2020). Making Fixed-Precision Between-Item Multidimensional Computerized Adaptive Tests Even Shorter by Reducing the Asymmetry Between Selection and Stopping Rules. *Applied Psychological Measurement* 2020.

Cramer, Colin; Rothland, Martin; König, Johannes; **Blömeke, Sigrid** (2020). *Einführung in das Handbuch Lehrerinnen- und Lehrerbildung*. In: *Handbuch Lehrerinnen- und Lehrerbildung*. Julius Klinkhardt 2020, pp. 11-18.

Engelhardt, Lena; Naumann, Johannes; Goldhammer, Frank; **Frey, Andreas**; Wenzel, Franziska; Hartig, Katja; Horz, Holger (2020). Convergent evidence for validity of a performance-based ICT skills test. *European Journal of Psychological Assessment* 2020; Volum 36, pp. 269-279.

Felske, Caroline; Konig, Johannes; Kaiser, Gabriele; Klemenz, Stefan; Ross, Natalie; **Blömeke, Sigrid** (2020). Pedagogical Knowledge-Validating the Construct Representation in the TEDS-M Test among In-Service Mathematics Teachers. *Diagnostica* 2020; Volum 66(2), pp. 110-122.

Felske, Caroline; König, Johannes; Klemenz, Stefan; Kaiser, Gabriele; Ross, Nathalie; **Blömeke, Sigrid** (2020). Pädagogisches Wissen von berufstätigen Mathematiklehrkräften: Validierung der Konstruktrepräsentation im TEDS-M-Instrument. *Diagnostica* 2020, pp. 110-122.

**Frey, Andreas**; Hartig, Johannes (2020). Methodological challenges of international student assessment. In: *Monitoring Student Achievement in the 21st Century: European Policy Perspectives and Assessment Strategies*. Springer Nature 2020, pp. 39-49.

**Frey, Andreas**; Spoden, Christian; Fink, Aron; Born, Sebastian (2020). Kompetenzorientierte individualisierte Hochschulklausuren und deren prüfungsrechtliche Einordnung. *E-learning and Education* 2020; Volum 13.

Gin, Brian; Sim, Nicholas; **Skrondal, Anders**; Rabe-Hesketh, Sophia (2020). A dyadic IRT model. *Psychometrika* 2020; Volum 85, pp. 815-836.

Gladushyna, Olesya; Strietholt, Rolf; **Steinmann, Isa** (2020). Disentangling general achievement levels and subject-specific strengths and weaknesses in mathematics, reading, and science. *Educational Assessment, Evaluation and Accountability* 2020.

Gunnes, Nina; Gjessing, Håkon K.; Bakken, Inger Johanne Landsjøåsen; Ghaderi, Sara; Gran, Jon Michael; Hungnes, Olav; Magnus, Per; Samuelsen, Sven Ove; **Skrondal, Anders**; Stoltenberg, Camilla; Trogstad, Lill; Wilcox, Allen James; Håberg, Siri Eldevik (2020). Seasonal and pandemic influenza during pregnancy and risk of fetal death: A Norwegian registry-based cohort study. *European Journal of Epidemiology (EJE)* 2020; Volum 35, pp. 371-379.

Hjetland, Hanne Næss; Brinchmann, Ellen Iren; **Scherer, Ronny**; Hulme, Charles; Melby-Lervåg, Monica (2020). Preschool pathways to reading comprehension: A systematic meta-analytic review. *Educational Research Review* 2020; Volum 30, pp. 1-23.

Howard, Sarah K.; Tondeur, Jo; Siddiq, Fazilat; **Scherer, Ronny** (2020). Ready, set, go! Profiling teachers' readiness for online teaching in secondary education. *Technology, Pedagogy and Education* 2020.

Hummelen, Benjamin; **Braeken, Johan**; Christensen, Tore Buer; Nysæter, Tor Erik; Germans Selvik, Sara; Walther, Kristoffer Lygren; Pedersen, Geir Feigum; Eikenæs, Ingeborg Helene Ulltveit-Moe; Paap, Muirne C. S. (2020). A psychometric analysis of the structured clinical interview for the DSM-5 alternative model for personality disorders module I (SCID-5-AMPD-I): Level of personality functioning scale. *Assessment (Odessa, Fla.)* 2020, pp. 1-14.

Jenssen, Lars; Hosoya, Georg; Jegodtka, Aljoscha Jakob; Eilerts, Katja; Eid, Michael; **Blömeke, Sigrid** (2020). Effects of Early Childhood Teachers' Mathematics Anxiety on the Development of Children's Mathematical Competencies. In: *Student Learning in German Higher Education*. Springer 2020, pp. 141-162.

Jentsch, Armin; Casale, Gino; Schlesinger, Lena; Kaiser, Gabriele; Konig, Johannes; **Blömeke, Sigrid**. (2020). Variability and generalizability of ratings on the quality of mathematics instruction between and within lessons. *Unterrichtswissenschaft* 2020; Volum 48(2), pp. 179-197.

Jentsch, Armin; Schlesinger, Lena; Heinrich, Hannah; Kaiser, Gabriele; König, Johannes; **Blömeke, Sigrid**. (2020). Erfassung der fachspezifischen Qualität von Mathematikunterricht: Faktorenstruktur und Zusammenhänge zur professionellen Kompetenz von Mathematiklehrpersonen. *Journal für Mathematik-Didaktik* 2020.

Jin, Shaobo; **Andersson, Björn** (2020). A note on the accuracy of adaptive Gauss–Hermite quadrature. *Biometrika* 2020; Volum 107(3).

König, Christoph; Khorramdel, Lale; Yamamoto, Kentaro; **Frey, Andreas**. (2020). The benefits of fixed item parameter calibration for parameter accuracy in small sample situations in large-scale assessments. *Educational Measurement: Issues and Practice* 2020.

Liu, Chen-Wei; **Andersson, Björn**; **Skrondal, Anders** (2020). A Constrained Metropolis–Hastings Robbins–Monro Algorithm for Q Matrix Estimation in DINA Models. *Psychometrika* 2020; Volum 85, pp. 322-357.

Nilsen, Trude; **Scherer, Ronny**; Gustafsson, Jan-Eric; Teig, Nani; Kaarstein, Hege (2020). Teachers' role in enhancing equity: A multilevel structural equation modeling with mediated moderation. In: *Equity, Equality and Diversity in the Nordic Model of Education*. Springer 2020, pp. 173-196.

Paap, Muirne C.S.; Hummelen, Benjamin; **Braeken, Johan**; Arnevik, Espen Kristian Ajo; Walderhaug, Espen; Wilberg, Theresa; Berghuis, Han; Hutsebaut, Joost; Pedersen, Geir Feigum (2020). A multi-center psychometric evaluation of the Severity Indices of

Personality Problems 118 (SIPP-118): Do we really need all those facets? *Quality of Life Research* 2020, pp. 1-9.

Rohatgi, Anubha; **Scherer, Ronny** (2020). Identifying profiles of students' school climate perceptions using PISA 2015 data. *Large-scale Assessments in Education* 2020; Volum 8(1).

**Rutkowski, David**; Aursand, Leah. (2020). Exemption or Exclusion? A study of student exclusion in PISA in Norway. *Nordic Journal of Studies in Educational Policy* 2020, pp. 1-14.

**Ræder, Henrik Galligani**; **Olsen, Rolf Vegar**; **Blömeke, Sigrid** (2020). Large-Scale Assessments in the Norwegian Context. In: *Monitoring Student Achievement in the 21st Century: European Policy Perspectives and Assessment Strategies*. Springer Nature 2020, pp. 195-206.

**Scherer, Ronny** (2020). The case for good discipline? Evidence on the interplay between disciplinary climate, socioeconomic status, and science achievement from PISA 2015. In: *Equity, Equality and Diversity in the Nordic Model of Education*. Springer 2020, pp. 197-224.

**Scherer, Ronny**; Howard, Sarah K.; Tondeur, Jo; Siddiq, Fazilat (2020). Profiling Teachers' Readiness for Online Teaching and Learning in Higher Education: Who's Ready? *Computers in Human Behavior* 2020; Volum 118.

**Scherer, Ronny**; Siddiq, Fazilat; Sánchez Viveros, Bárbara (2020). A meta-analysis of teaching and learning computer programming: Effective instructional approaches and conditions. *Computers in Human Behavior* 2020; Volum 109, pp. 1-18.

**Scherer, Ronny**; Siddiq, Fazilat; Tondeur, Jo (2020). All the same or different? Revisiting measures of teachers' technology acceptance. *Computers & Education* 2020; Volum 143.

**Scherer, Ronny**; Teo, Timothy (2020). A tutorial on the meta-analytic structural equation modeling of reliability coefficients. *Psychological methods* 2020; Volum 25(6), pp. 747-775.

Spoden, Christian; Fleischer, Jens; **Frey, Andreas** (2020). Person misfit, test anxiety, and test-taking motivation in a large-scale mathematics proficiency test for self-evaluation. *Studies in Educational Evaluation* 2020; Volum 67.

Spoden, Christian; **Frey, Andreas**; Fink, Aron; Naumann, Patrick (2020). Kompetenzorientierte elektronische Hochschulklausuren im Studium des Lehramts. In: *Bildung, Schule und Digitalisierung*. Waxmann Verlag 2020, pp. 184-189.

Teig, Nani; **Scherer, Ronny**; Kjærnsli, Marit (2020). Identifying patterns of students' performance on simulated inquiry tasks using PISA 2015 log-file data. *Journal of Research in Science Teaching* 2020; Volum 57, pp. 1400-1429.

Yang, Xinrong; Kaiser, Gabriele; König, Johannes; **Blömeke, Sigrid** (2020). Relationship between Chinese Mathematics Teachers' Knowledge and Their Professional Noticing.

*International Journal of Science and Mathematics Education* 2020.

Yang, Xinrong; Kaiser, Gabriele; König, Johannes; **Blömeke, Sigrid** (2020). Relationship between pre-service mathematics teachers' knowledge, beliefs and instructional practices in China. *ZDM: Mathematics Education* 2020; Volum 52(2), pp. 281-294.

**Zhang, Maoxin**; Hongyun, Liu; Yunyun, Zhang (2020). Adolescent social networks and physical, verbal, and indirect aggression in China: The moderating role of gender. *Frontiers in Psychology* 2020; Volum 11, pp. 1-16.

## External contributions

Andersson, Björn (September 2020) Presentation on "Estimating reliability of sum scores and maximum likelihood ability estimates with multiple group item response theory models" at the Department of Statistics, Uppsala University.

Andersson, Björn (September 2020) Presentation on "Estimation of multidimensional multiple group item response theory models with a second-order Laplace approximation, School of Business, Örebro University.

Andersson, Björn (November 2020) Discussant for doctoral thesis midway assessment of Erika Majoros, University of Gothenburg.

Andersson, Björn (December 2020) Opponent for doctoral thesis defense of Jonas Moss, University of Oslo.

Blömeke, Sigrid (January–March 2020) Leader for the Norwegian exam group evaluating the exam system on lower- and upper secondary school level.

Blömeke, Sigrid (March 2020) The future of national assessments in the Nordic countries. Presentation at the Nordic Educational Research Association Conference (NERA), Turku, Finland.

Blömeke, Sigrid (September 2020) Structure, predictors and outcomes of teacher competence across subjects and school levels. Invited keynote at the congress of the German and Austrian Associations for Psychology, Vienna, Austria (conference cancelled).

Blömeke, Sigrid (November 2020) Hva vil vi med eksamen? Udirbloggen https://udirbloggen.no/author/blomeke/

Olsen, Rolf Vegar and Ræder, Henrik (March 2020) National assessments in Norway: Stability, change and challenges. Presentation at the Nordic Educational Research Association Conference (NERA), Turku, Finland.

Olsen, Rolf Vegar (January 2020) Tester og prøver i en norsk kontekst: Historie, nåtid og noen utfordringer. Presentation for Styrelsen for Undervisning og Kvalitet, Copenhagen, Denmark.

Olsen, Rolf Vegar (January 2020) Tester og prøver i en norsk kontekst: Historie, nåtid og noen utfordringer. Invited presentation for Akademiet for pædagogiske test og evaluering, Copenhagen, Denmark.

Olsen, Rolf Vegar (March, 2020) Er utvalgsprøver løsningen? Presentation at the open Parliament hearing on education and research «Representantforslag om å omgjøre nasjonale prøver i grunnskolen til utvalgsprøver», Oslo, Norway.

Olsen, Rolf Vegar (September, 2020) Prøver og tester i Norge. Virtual presentation for Vidensmøde med den danske børne- og undervisningsminister og folkeskoleforligskredsen, Copenhagen, Denmark.

Olsen, Rolf Vegar (2020) Er utvalgsprøver løsningen? Utdanningsnytt.no https://www.utdanningsnytt.no/nasjonale-prover-rolf-v-olsen-skole/er-utvalgsprover-losningen/233451.

Scherer, Ronny and Costa, Denise Reis (June 2020) Virtual conference "Beyond results: Paving the way for the use of process data". Presentation on "LOGAN—An R Package for Log-file Analysis in International Large-Scale Assessments".

Scherer, Ronny (August 2020) Keynote talk at the virtual EARLI SIG 6/7 conference "Instructional Design and Technology: From the lab to the classroom". Presentation on "The potential and challenges of learning with technology: From cognitive benefits for students to higher demands on teachers' competences".

Scherer, Ronny (November 2020) Talk at the Quantitative Methods Hub virtual seminar at the University of Oxford on "Bringing together meta-analysis and structural equation modeling: Testing models and hypotheses across studies".

Steinmann, Isa, Strietholt, Rolf, and Gustafsson, Jan-Eric (2020, conference cancelled). Outcomes in International Large-Scale Assessments Part I: The Connection between Home and School. Symposium at the European Conference on Educational Research (ECER), Glasgow, United Kingdom.

Steinmann, Isa, Strietholt, Rolf, and Gustafsson, Jan-Eric (2020, conference cancelled). Outcomes in International Large-Scale Assessments Part II: Teacher and School Factors. Symposium at the European Conference on Educational Research (ECER), Glasgow, United Kingdom.

Steinmann, Isa, Strietholt, Rolf, and Gustafsson, Jan-Eric (2020, conference cancelled). Outcomes in International Large-Scale Assessments Part III: Country-Level Conditions for Student Learning. Symposium at the European Conference on Educational

Research (ECER), Glasgow, United Kingdom.

Steinmann, Isa, Strietholt, Rolf, and Gustafsson, Jan-Eric (2020, conference cancelled). Outcomes in International Large-Scale Assessments Part IV: Consistency of Measures and Scales. Symposium at the European Conference on Educational Research (ECER), Glasgow, United Kingdom.

Steinmann, Isa, Strietholt, Rolf, and Gustafsson, Jan-Eric (2020, conference cancelled). Outcomes in International Large-Scale Assessments Part V: Consequences of Methodological Choices. Symposium at the European Conference on Educational Research (ECER), Glasgow, United Kingdom.

Steinmann, Isa and Strietholt, Rolf (2020, conference cancelled). Using International Large-Scale Assessments to Study Educational Effectiveness. Symposium at the American Educational Research Association (AERA) Annual Meeting, San Francisco, United States of America.


# CEMO

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