Report on the mid-term training event (Amsterdam & online; May & June 2022)

During May 19-20, 2022, the cLovid project (**c**ollaborative **l**earning **o**f **vi**ewing and **d**ecision making skills) organized a training event on "Innovating microscopy education in pathology" in Amsterdam. The location was selected based on considerations of convenience related to travel connections for a relatively short visit of attendees from the Netherlands, Germany, and different parts of Finland. The programme was spread over two days. The main targets of the event were, first, to bring together teachers of clinical pathology and other relevant specialists together to consider recent difficulties and solutions in microscopy education. Second, the event aimed to introduce the main ideas and intellectual outputs of the cLovid project to medical students and teachers of pathology. Third, we aimed to get their feedback regarding the developed software and instructional ideas. Finally, we aimed to develop ideas together for piloting the work developed within the cLovid project. Concrete ideas on implementing the pilots have been discussed and will be used for fine tuning the activities in the following months.

Throughout several occasions during the seminar, participants' opinions (regarding the teaching tools and the seminar as a whole) were inquired through Mentimeter[1] surveys. In the surveys, seminar participants gave both Likert-scale answers and open-ended text answers. These surveys were not planned for research purposes, but for providing (a) a basis for constructive discussion during the event, as well as (b) notes about ideas for further development.

After a welcoming speech by Dr. Bas de Leng, the event proceeded toward a keynote lecture by Dr. Peter de Jong. The title of this talk was "Technology Enhanced Learning for student-centred, active learning in the medical sciences". de Jong's presentation provided a broad sweep of the various forms in which technology has been used to develop teaching and learning in the medical sciences. Towards the end of the talk, De Jong's presented empirical findings from a study about the effect of stereoscopic augmented reality visualization on anatomy learning. De Jong also presented the "Group for Research in Pathology Education", a network of pathology educators that was merged within the IAMSE in 2020 (https://www.iamse.org/gripe-history).

De Jong's presentation was followed by an introduction to the medical curriculum and undergraduate pathology education at the University of Maastricht by Dr. Jack Cleutjens. The presentation of Cleutjens focused especially on the instructional approach of problem-based learning (PBL) in which the University of Maastricht has a long history in the field of medicine.

Through a video call, Prof. Jarmo Reponen from the University of Oulu gave a remote lecture with the title "Harmonization and modernization of basic medical education through digitalisation". Reponen's talk focused especially on the MEDigi project, a three-year long effort by five Finnish universities to define core competencies in medicine and dentistry and to design suitable digital tools and materials for developing the kind of medical teaching that aims towards those competencies.

The first day ended with a focus on the cLovid project, which was first introduced by de Leng. Dr. Koen Vincken provided an overview of the VQuest software and its possibilities, focusing on new developments

[1] https://www.mentimeter.com/

regarding the use of whole slide images in an online educational setting. VQuest is a software package for training and testing one's skills in the analysis and interpretation of high-resolution (2D and 3D) images—in our case mainly whole slide images of normal and abnormal samples.

Finally, de Leng presented the range of tools developed in the cLovid project in order to design an online flipped learning scenario for clinical pathology education. Tools as virtual slide tours (i.e. streamed, expert-narrated videos about analysing a whole slide image) and compare and contrast rounds (i.e. an application that repeatedly shows a number of images that have to be compared) can be used in various learning management systems. Overall, the participants considered these tools as useful for active self-study with images. Because the differentiation of normal and pathological tissue samples is not a teaching objective for undergraduate medical education, the usefulness of the compare and contrast rounds was however considered less for undergraduate than for graduate education. Possible scenarios for working in virtual groups in a computer supported collaborative learning (CSCL) environment were also discussed.

The next seminar day began with an introduction by de Leng of the PRISMA leaning dashboard and its affordances. PRISMA is an application that presents back to a group the aggregated output from other software—such as VQuest—and enables the group to address these data together with a moderator in collaborative feedback sessions. Through a Mentimeter survey, the participants' views on several topics related to PRISMA was inventoried. Most participants estimated PRISMA as more useful for moderating discussions in online sessions than in teaching with physical presence. Overall, participants regarded PRISMA as a valuable tool for pathology and anatomy education, and considered it slightly more useful for the teaching of residents than for undergraduate education. Participants anticipated that students would quickly learn how to use PRISMA, but that teachers might find it more difficult, and thus need good guidance—from both a technical and an instructive point of view.

Typical feedback from the Mentimeter surveys during the Amsterdam event.

Among the anticipated obstacles of using PRISMA, participants listed several factors, including the following ones:

- Getting teachers to use it
- Configuring the right kind of version that is not unnecessarily complex for teachers
- Getting lost in the several options it has for use
- Having enough time to review the feedback

Throughout the seminar days, the tools and the flipped classroom scenario were discussed, and the cLovid project gained lots of valuable feedback both in the form of both critique and ideas for what and how to develop the software and applications further. The end of the second seminar day was spent brainstorming on possible CSCL-pilots with the discussed tools. This time was spent while split into two groups. At the end both of the groups came up with ideas for that are currently being developed further. One group began planning a joint international course in which some of the tools will be tried out. Another group came up with the idea of piloting the compare and contrast rounds with pathology residents training for their specialization examination. The possibilities and specifications of both of these ideas are currently being probed into in more detail.

At the end of the seminar, we inquired the participants' opinions on the seminar itself and their grasp of the developed tools and scenarios. Participants' opinions were mixed regarding whether they ended up with a clear idea with how to prepare either a self-study phase or a collaborative online seminar for microscopy education. We interpret this as a sign that we needed to get the teachers and other participants to experience the tools by trying them out themselves. This was also something that several participants indicated in their feedback: many wanted to get a hands-on experience (especially with VQuest and PRISMA) and a better grasp of how whole slide images could be used in PRISMA.

A month afterwards, on June 14th 2022, the Amsterdam event was followed up by an online event. During this event, all participants were given test accounts for VQuest, and they were able to try its functionalities with whole slide images (manipulation and answering questions). The functionalities of PRISMA were also presented during the meeting, to make clear how answers of participants can be collected and gathered together in the dashboard. Some participants managed to also try it out with test accounts. However, probably due to an unfortunate overload of the server, not all participants were able to log in. Thus, PRISMA was partly presented through a shared video with demo data, which clearly showed the potential of the dashboard for teachers in giving feedback to a group of (online) students. The online event was concluded by a reflection on the tools and their potential use in different scenarios. Participants also provided feedback on the tools and their experiences with them in terms of flexibility, user-friendliness, speed, etc.

Through open-ended responses, several points of important feedback were received. These related especially to technical aspects of the tools that need to be improved or developed. Points mentioned, were:

- VQuest: Difficulties with the marker (hard to move, two-click function is not intuitive, need to remove a marker, changing arrow into dot)
- VQuest: Sometimes a bit slow loading of images and zooming
- Ambiguous formulation or articulation of the multiple-choice items
- Support for different browsers
- One-armed bandit: Need for failure description or corrective feedback
- PRISMA: Possibility of representing long-list item responses in a more graphical way (e.g., a bar chart)
- User interfaces of all tools need to be foolproof
- Possibility of a single login

In general, most participants considered the tools as valuable or very valuable for teaching both undergraduate medical students and pathology residents. For some specific tools, there were interesting

differences between these two levels. The video tours were considered as more applicable to undergraduate education, whereas the one-armed bandit tool was considered more applicable to pathology residents. For both undergraduate and resident level, PRISMA was considered more usable in the *preparation* phase of teaching than for displaying answers *during* teaching. With different VQuest functionalities, participants saw more utility in multiple choice questions for undergraduate medical education, whereas long-list, marker, and free-text question types were seen as more valuable for teaching of pathology residents. In general, the option in Vquest to view two WSIs side by side in their own window was considered as very valuable.

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