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EMERGE REPORT 2024

Emerging Education – Emerging Technology:
Exploring the Emerging University

Trondheim – August – 2024

NTNU
Norwegian University of
Science and Technology

Faculty of Social and
Educational Sciences

Department of Social
Anthropology



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Preface

With the publication of every EMERGE report we have said to each other: «next year, we need to make the report shorter». This year we have finally achieved it! The present report is a short summary of the activities of EMERGE during autumn 2023 and spring 2024. As more of our research is published in other channels, there is no need to present it in depth.

We want to thank everyone contributing to EMERGE with experimental teaching, research and writing. Also, we wish to thank the SU faculty at NTNU for continuing their support even as the economy got worse in our sector. This helped us reach a level we are able to sustain our own activity through external funding. Thanks!

Håkon and Kristian
Trondheim, 26. August 2024

Introduction

Status at the end of our third cycle

We are now ending the third annual cycle of the EMERGE project. Three years of testing new ways of teaching and new technologies. It is time to look at what we have achieved and how we can make the best of the coming years.

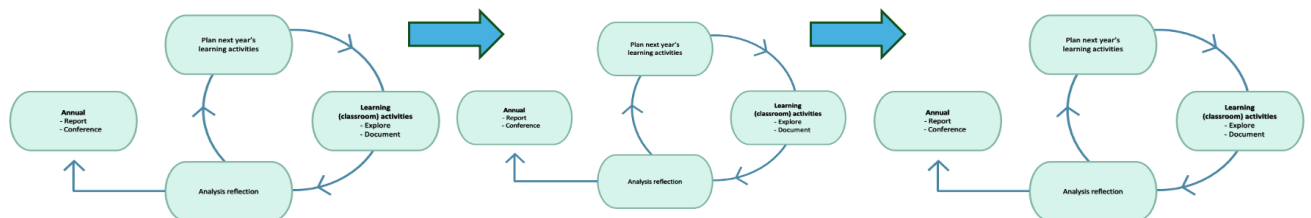


Figure 1: EMERGE cycles

When we started, we had ambitions for the next three years in several areas:

We wanted to strengthen research practice with a stable framework and the ability to share experiences through the annual cycles.

- This goal is achieved, but we still see room for improvement.

We wanted to consolidate the organization and include partners also outside the SU faculty.

- We have now several partners also outside SU. Still there are many more potential partners out there.

We wanted to encourage externally funded projects, so that EMERGE could eventually become financially independent.

- We have now several external projects connected to EMERGE, and we are now able to finance our own activity.

We wanted to make testing a natural part of teaching.

- There is still some way to go before that becomes the institutional norm, but several courses within the EMERGE network has achieved this.

After three cycles, we can notice some long-term trends:

Economy

When we started, EMERGE was well funded by the SU faculty, with funds for activities and not least a full position as project coordinator. The project coordinator in particular has been crucial in creating continuity, keeping the level of activity up and holding the project partners together.

As many have noticed, the past year has been characterized by economic cuts in the sector, which requires cuts in the faculty, which in turn has led to reduced funding of EMERGE. For a while it seemed that all funding for the project coordinator position would cease from 2024, but fortunately the faculty management find a way to finance the position for 25% in the spring term. This made us able to secure external funding to continue the employment for the coordinator also from autumn 24, which also is in accordance with the initial goal of being self-financed within 3 years. We are grateful for the effort made by SU faculty to support this crucial bridge in spring 24. Now we will be able to continue the EMERGE activities also the cycle H24-V25 based on fundings from external projects. We would probably not have achieved this goal without support, and much of the effort we have put in would have been useless. This also shows the importance of being able to think long-term in order to develop projects, even in difficult periods. A goal for the future is to be able to continue to create continuity and predictability for testing and development at NTNU.

Organization

Each year, we have gained more participants, if not a lot. While the ambition to involve more people has been realized, there is still great potential for more participants. It is also an important principle that participation should be 100% based on interest and desire, so the growth is natural.

Research with annual cycles requires predictability and stable frameworks. This is one of the main goals of EMERGE: to enable development and research over several years without needing to interrupt and start from scratch again later. Nevertheless, we notice challenges in keeping such a loose organization together over several years.

One thing is that people leave, and new ones join. This is completely natural, and part of the mission of EMERGE – to function as an organization that allow for replacement of people. Changes occur for example when courses involved in research changes teachers, or when we change jobs. Also, internally there are changes in EMERGE. Last year Kristian took over as project coordinator from Tonje.

We notice that the loose organizational form makes us somewhat dependent on enthusiasts, but no more than we can expect. We offer a structure, but a more rigid structure would likely become more of a burden than an asset for those running education at NTNU. We also notice that the connection to externally funded projects is essential for maintaining continuity in the research. This provides both resources and direction.

Research and development

Thematically, VR-technology and student-active forms of learning have still been central, but this year artificial intelligence has become a more prominent theme, together with the topic of learning communities among students and teachers.

After three years, we see the value of long-term continuity. When research and development are carried out through teaching programs that mostly follow annual cycles, it stands to reason that when we gain experiences one year, they can be used to improve the program and tested the next year. It's only in the third year that the experiences begin to take hold. But then it's also time to introduce new elements.

The rhythm of research is slower than the rhythm of technological development. An important part of the work is to stay relevant despite this. Technology can revolutionize from one year to the next, as we saw with the introduction of Chat GPT-3 in the fall of 2023. Here we saw the importance of a flexible organization that could react quickly. That is to say, it is the people in EMERGE who have been flexible; the organization has mostly ensured not to hinder this flexibility.

Thematically, the focus in EMERGE, regarding technology, has been especially directed towards VR technology. In the third cycle, AI has become an important focus, and we will always be somewhat behind unless we actively try out new approaches. Therefore, the research is not just a mere continuation from year to year.

In the following we present the mayor activates and experiences made by our fellows.

Department of Social Anthropology

Kristian F. Liven, Jens Røyrvik & Håkon Fyhn

Academic communities

The focus on what we call academic communities (in Norwegian “fagsosiale fellesskap”) emerged after the pandemic, highlighting the need for students to relearn how to be social in an academic context. The value of communities where academic and social aspects merge became evident. These communities often bridge gaps between BA students, MA students, and staff. How can we establish and strengthen such communities?

We have explored these issues via two approaches: A research project through “Fremtidens Campus”, and efforts and experiments to develop such communities through our own teaching:

Academic Communities on a Hybrid Campus

In 2023, with funding from Future Campus, we launched the project "Facilitating Academic Communities on a Hybrid Campus." This project emphasized understanding the role of digital tools in these communities and the interaction between social aspects and the design and use of spaces. The goal was to provide recommendations for campus design, digital infrastructure, and teaching organization to foster a vibrant student life, merging the academic and social side.

Students' social communities are crucial for their academic performance, identity, mental health, retention, and recruitment. While there is extensive research on educational settings and social life, the intersection between these, especially in both physical and digital spaces, is less understood. Through ethnographic studies actively involving students, we aimed to highlight this zone and its significance for academic and social life.

The project started with a workshop in January 2023, discussing research status and project opportunities, especially regarding case studies. In January and February, we recruited students for fieldwork across four subjects and campuses: Architecture at Kalvskinnet, Introductory Mathematics at Gløshaugen, Health Sciences at Tunga, Social Anthropology at Dragvoll, and a fully digital course. The fieldwork took place in the spring of 2023. We also conducted a future scenario workshop in May and a final workshop and report release event in November, featuring a live podcast recording.

Hvordan legge til rette for fagsosial tilstedeværelse på en hybrid campus

"Å stirre på skjermen, sammen"



Foto: Mathias Tømmervold

Figure 2: Report from Fremtidens Campus project

Led by Håkon Fyhn, with Mathias Tømmervold as the main researcher, the fieldwork was conducted by Heidi Grøholt (social anthropology), Lila Clark (social anthropology), and Mari Tanem (architecture). Mari also handled the report layout and contributed in many ways. Participants from various units and fields joined the workshops, including health sciences, architecture, educational support, mathematical sciences, computer science, and future campus.

The project produced recommendations for addressing students' digital and physical transitions to maintain and foster academic-social belonging and identity. *"Staring at the screen, together"* emerged as a key image for the hybrid spaces.

Physical Spaces:

The project highlighted the importance of familiar environments for student well-being. Even short distances can affect university life. Proximity to academic associations and social relations is critical. Involving students in designing their environments encourages creativity and exploration. The NTNU area concept report suggests shared identity areas across disciplines, but we found the value of discipline-specific areas. Students need fixed spaces for social cohesion and opportunities to withdraw. Trips to academic settings, cafes, or the "Stripa" for broader student interaction are also crucial.

Fully Digital Spaces:

Creating engaging fully digital classrooms is possible, but how well do they support academic communities? Research is needed on positive examples of communication flow in digital education, as it impacts presence. Personal, close, and active communication is essential for an inclusive digital community and successful digital classrooms.

Hybrid Spaces:

Today's students are hybrid, forming identity through transitions. Universities must design spaces and digital tools that foster community for hybrid students and enable them to "stare at the screen, together." Removing physical community spaces can hinder creativity, collaboration, and innovation. Listening to and involving students in testing new digital tools is vital for a strong academic and social environment. Hybrid spaces represent a significant knowledge form. Universities should focus more on what is created in the interactions between students in these spaces. Large screens and open areas can enhance creativity and innovation but remember the importance of academic identity and belonging.

The full report from the project can be found here:

<https://www.ntnu.no/documents/1292437758/0/Fagligsosial+rapport+2023.pdf/86155321-0a9b-fa39-0b48-d773f62a41fc?t=1707486929191>

Further Experiences with Academic Communities

Following the Fremtidens Campus project, we established the "Academic-Social Forum" ("fagsosialt forum") to explore academic-social aspects of teaching and organize related gatherings. The two courses SANT2026, Technology Anthropology, and SANT2025, Digital Transformations, were key areas for this experimentation. The goal was to engage students in academic discussions funded in interest in the topic, rather than interest in their exam results, emphasizing the importance of academic curiosity and the academic community.

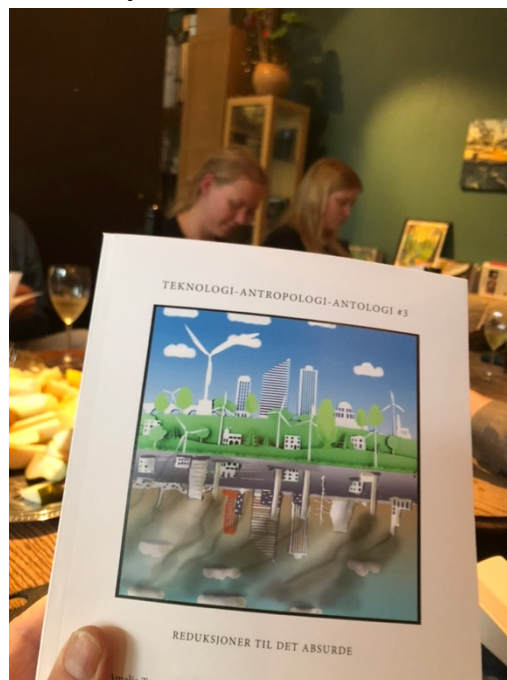


Figure 3: An anthropology made by students in SANT2026, spring 2024

Here are some insights on what can contribute to a strong academic community:

- It is essential to set and maintain the tone and attitude in the course, communicating that the goal is academic discussions, not just grades.
- Learning assistants play a significant role in the academic community and are given considerable responsibility.
- Shift focus from grades to academic discussions. In SANT2025, we removed the grades, encouraging students to experiment more in their projects. This requires that academic motivation is awakened. In SANT2026, systematic efforts were made to foster this attitude through focusing on non-graded activities, such as publishing an anthology.
- Students should be given great freedom to pursue what they find important. This can be challenging for some but is a skill they can learn to handle and appreciate.
- Students are given significant responsibility for their own work and for the community (taking responsibility for one's own education imply taking responsibility for the learning community).
- Take students seriously, and they will take their own work seriously as well.
- Exams and other works should be presented to the community (not just as communication between individual students and the examiner), allowing students to learn from each other and strengthening group identity. Presentations should occur in events with a "ritual" character, involving gatherings where experiences are shared, distinguishing them from daily activities.
- It is beneficial to arrange events outside the classroom, such as evening gatherings at a pub, with a focus on academic topics. Ideally, students should take responsibility for organizing these.
- Students should create things they perceive as valuable. In SANT2026, student essays were published as an anthology, a physical book they could showcase. In SANT2025, students produced films as their exams, which were screened at a public event with invited guests.
- Real-world relevance is crucial. The real world is here in the classroom, even as we look beyond it.

Experience shows that it is possible to help students form strong academic communities. They must do it themselves, but they need help. To be successful, it should be prioritized and integrated into the overall design of a course. Once the community is established, students are usually active in maintaining it.

Lively academic discussions are essential in an academic community. To achieve this, students need help to move beyond an instrumental view of what they study, where the subject is seen as a means to an end outside itself, typically related to career relevance. Students must become interested in the academic discussions

themselves, allowing other motivations to recede. NTNU and society at large often negatively contributes to this by constantly emphasizing career relevance in education. We must work against this focus among students. This does not imply reducing the work-life relevance of an education, rather 'it is about leading the attention of the students from focusing on what will happen after the education, to what is happening in the education.

Experiments in academic communities will continue in 2024-25. There is also an edited book on the way exploring the relation between education, academic communities and the technological university: *Anthropology, Technology and Education: Exploring the cracks in technological systems*.

VR as a communication tool across distance

During fall 2023, the Department of Social Anthropology hosted the course SANT3600 – Cultural Understanding and International Working Relations. The course is held at NTNU Gløshaugen and is aimed at giving engineering students a practical introduction to cultural differences, a theme they usually do not work with. The course is partly structured around a collaboration with the Romanian university West University of Timisoara (WUT). The collaboration means that NTNU students and WUT students work together on the development of a joint project, in which they must utilize the various skills and knowledge of the whole group. To facilitate the collaboration the groups must choose different kinds of technological and digital collaboration tools, and they are relatively free to choose which they want to use. We offer the loan of VR headsets to those of the groups who wish to do so, and in the autumn of 2023 three out of six groups chose to make use of the offer. They then used VR glasses in the collaboration of the development of a joint project and held an oral exam in VR. In the following, we summarize the advantages and disadvantages the students experienced with the use of VR for the collaborative process and oral examination.



Figure 4: Snapshots from SANT3600

After the semester ended, we conducted interviews with the students who used VR to collaborate. One of the recurring themes which all the groups mentioned was that the technology itself created additional work particularly due to technical

issues, but also that they had to learn how to use the technology in the first place. Most of them had never used VR-technology before, and therefore much time was spent on learning how to learn basic skills in addition how to operate in Meta Workrooms (which was the app the students worked and collaborated in). Some students mentioned that this additional work created extra stress before their oral exam in VR, because then they had to both prepare for the presentation of their project and at the same make sure that the VR-equipment was working properly. Despite some struggles with the technology itself, the students had primary positive experiences using VR and would prefer to continue working in a hybrid environment then using a mix of VR, videoconference (Teams, Zoom, etc.), and physical meetings (if possible).

A recurring theme among the students was that the use of VR created a different feeling of “being there” and “being together”. This has to do with both attention, body language and immersiveness, but also room layout and spaciousness. When using VR, the students meet in a joint room with their own avatar who they could create looks and clothing as they wished. Your avatar mocks your hand gesticulations, facial expressions, tone of voice, and as you turn your head the avatar does the same. Students especially highlighted that you could see if the others were listening to you when you spoke. If the avatars turned their head against you and look at you, it felt like they were listening to what you said.



Figure 5: Screenshots from exam in VR

The feeling of being together and listening to each other was also facilitated by that the students could choose different virtually room layouts. In the Meta Workrooms the participants can choose to layout the virtual room as they wish, from a conference room to a more classical classroom, creating a virtual experience that correlates to the intention of the meeting. If the groups wanted example to

have a group discussion on a topic the participants choose the room layout which was a round table that invited all the participant to be active during the discussion. And when the students had their oral exam, they choose a room layout which was best suited for presentations. Some choose a more traditional auditorium and others a conference table.

We also arranged the oral exam in VR. From the more administrative point of view, it was quite complected to find the right setup for how to make it doable in the first place. In the end we found a solution where we the students who had their exam where in VR together with an examiner and a researcher. The rest of the teaching staff and students from both NTNU and Romania where present and watched the exam through a Zoom-streaming, and they could also ask questions to the students in VR. Except that the technological equipment created additional stress and time use before the exam, the students where positive to having exam in VR. Despite creating some extra stress, it also reduced some of the stress for those students who didn't like to have presentations in front of other people. All in all, the students where happy with the use of VR and most of them would like to use it again some other time.

Artificial Intelligence

“Bytesized” – Artificial Intelligence and cheating

“Bytesized” is Marie Opdal Ulset’s Ph.D project on the blurred lines between legitimate and illegitimate student behavior. The project is based on ethnographic fieldwork with participant observation and interviews with students at the Norwegian University of Science and Technology (NTNU) in Trondheim. In the “Bytesized” project, Ulset is researching the strategies that students use to pass mandatory coursework, focusing on the grey area between legitimate and illegitimate student behavior. Examples of such grey-area strategies include “koking” (a form of plagiarizing particular to STEM students at NTNU), the use of generative artificial intelligence, and strategically failing exams. Her research focuses on the student perspective on how these strategies are applied. The projects also examine how students and educators have different perceptions of what constitutes cheating and how these perceptions provide new perspectives on learning.

AutoTruth – RCN application

During spring 2024 we applied for RCN grant about social and cultural consequences of artificial intelligence. AutoTruth is a project which aims to explore, understand, but also contribute to developing, the intricate interplay between emerging AI technologies and areas where (trustworthy) knowledge is handled. To do this, we need to address the institutions and communities engaged in this handling of knowledge. These are undergoing profound transformations,

both directly as more handling of knowledge and truth is “outsourced” to AI, and indirectly via changes in the conditions of institutions such as news desks and libraries (transformation in market, work-practices, and fundamental technologies). We address the topic via 4 “labs” representing communities of knowledge engaged in mapping, teaching, management and sharing knowledge, four areas of society that face profound transformations in relation to the emergence of AI technology.

At the heart of our investigation lies the recognition of the need to explore the intricate relationship between the three key elements of AI technology, truth/knowledge, and the communities that produce and manage it. By unpacking this relationship, we aim to shed light on the challenges, opportunities, and ethical considerations inherent in the integration of AI into knowledge practices.

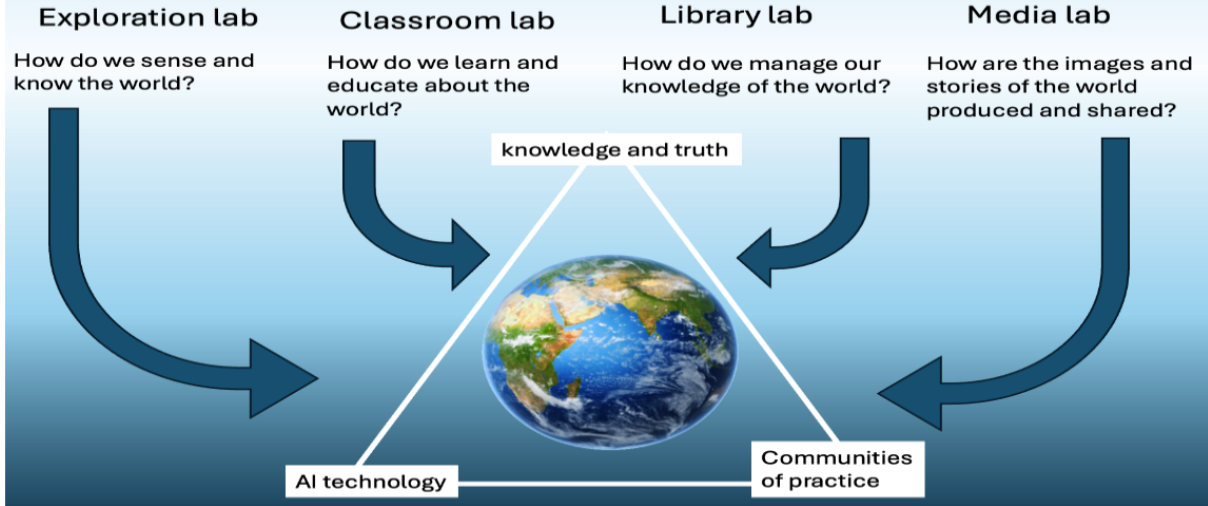


Figure 6: AutoTruth's main concepts

Through rigorous inquiry and interdisciplinary collaboration, we endeavor to contribute to the ongoing discourse and technology development surrounding AI and knowledge management. Our goal is to foster a deeper understanding of how AI technologies are reshaping our epistemological landscapes and to empower communities to navigate these changes with confidence and integrity and connect this knowledge closely to communities engaged in AI technology development and implementation

Department of Historical and Classical Studies

Heidrun Stebergløkken og Martin Callanan

In 2023, the archaeology program at NTNU has contributed in various arenas through both VR Learn and the “Future Campus” project TeTL-TI (Teknologi for tverrfaglig læring – Fra test til implementering). Additionally, NTNU’s Department of Historical and Classic Studies and NTNU University Museum initiated a pilot project funded by the Directorate for Cultural Heritage through “Bevaringsprogrammet for bergkunst (BERG)”, where the goal was to test 360 recordings for use in dissemination in 2022. We now have the opportunity to continue working on this and present it in 2024.

Spring 2023

TeTL-TI

In February we got funding and started the “Future Campus” project TeTL-TI: Technology for Interdisciplinary Learning – From Test to Implementation.

TeTL-TI aims to uncover what is required for larger interdisciplinary projects that explore technology as a learning tool and department-oriented initiatives to be implemented in campus learning practices. Specifically, the project will use low-cost VR as a case study, examining how VR technology as a diverse learning method can move from test to implementation. TeTL-TI will investigate how to benefit from active collaboration between technology, natural science and the humanities/social sciences when it comes to technology-supported teaching. This will be exemplified by the use of VR. The project analyzes the planning and strategic priority documents at the associated departments and faculties. By comparing implementation of the projects, implementation in teaching, as well as comparing barriers and success factors for the implementation of projects, they try to uncover what the campus of the future needs in order to get the maximum benefit from projects and local initiatives. The project results will provide a knowledge base that can contribute to an insight into how the campus of the future can be organized (such as common areas arranged for the use of various digital tools, prioritization of resources, training of student employees or the like), in order to achieve interdisciplinary cooperation and implementation.

Workshop with bachelor and master students in archaeology (TeTL-TI + VR Learn)

In March we arranged a workshop/test with 10 BA and 10 MA students in archaeology. The experiment was facilitated by student employee Kathinka Yildirim in collaboration with associate professor Heidrun Stebergløkken. Yildirim had in advanced made two annotated 360 recordings. The footage was taken of two different cultural monuments/cultural environments in connectin with previous

excursions to the burial ground/shipyards at Hunn in Fredrikstad (ARK 3002 H21), and a recording of the rock art field Gaulfossen in Melhus in collaboration with the NTNU Science Museum (Bevaringsprogrammet for bergkunst). The recordings were made with the same frame in Thinglink; these contained two different 360 images so that it was possible to experience the landscape from two different points of view/perspectives. In addition, the images were annotated with text describing the cultural heritage, discovery context, dating, images, and maps. In our experiment, the students were presented with an image that is continuous in all directions, which also contains fixed icons at various points where they could extract more information in the form of close-ups, text boxes and further references.

There were ten students in each of the test groups, and the tests were run with the BA students first – where five of the students saw Gaulfossen using Cardboard and the rest saw Hunn with desktop. They worked for about 15-20 minutes before changing objects, so all the students got to experience the rock art from Gaulfossen and the burial field at Hunn. Afterwards, the students answered a survey and were encouraged to answer honestly about the challenges they encountered, both surveys were anonymous and made through nettskjema.no.

This experiment forms the basis for a scientific article yet to be published in an anthology on VR for learning initiated by the project VR-Learn in 2024. This was also relevant for TeTL-Ti because exploring what opportunities 360 provides for student active learning, and information about which elements that are perceived as barriers to the implementation of 360 as a learning tool are essential as a knowledge base for TeTL-TI's goal achievement.

Field course

From the 24th of April to the 5th of May 2023, master students in the course ARK3002 were tasked with making 360 recordings of their localities from the field course. They had to annotate these and enter information about the place (text and regular photos, drone footage and DStretch manipulation of rock art sites). The BA students (ARK2002) were given the task of creating stands with finds, photos, etc. from the localities that were to be displayed in the foyer of the museum in connection with the communication day on 24 May – on one of these stands QR codes with the 360 recordings were placed together with Cardboard glasses so that the public could “visit” the locations digitally.



Figure 7: Students using VR and 360 equipment

Læringsfestivalen 2023

At the Læringsfestivalen 2023 we contributed with to posters with partners from VR-Learn and EMERGE:

- Cyvin, Jakob Bonnevie; Fyhn, Håkon; Saksvik-Lehouillier, Ingvild; Seland, Astrid; Bergset, Malin; Røyrvik, Jens Olgard Dalseth; Mørtzell, Tonje Victoria Lidahl; Skottun, Ane; Callanan, Martin; Stebergløkken, Heidrun Marie Voldheim; Fominykh, Mikhail; Prasolova-Førland, Ekaterina; Økland, Karen Engen; Bergland-Landheim, Magnus; Ulset, Marie Opdal. *Virtuell virkelighet som muliggjørende teknologi i høyere utdanning. Et spekter av erfaringer med varierte løsninger.*
- Kathinka Louisa, Aalberg; Cyvin, Jakob Bonnevie; Callanan, Martin; Stebergløkken, Heidrun Marie Voldheim. *VR som aktiviserende hjelpemiddel i undervisning. Læringsfestivalen, rundborstdiskusjon.*

Excursion to Horg Melhus

The 16th of May we went on an excursion to collect 360 footages of different localities at Horg Melhus (ARK 2002). The students were divided into groups and had to make 360 recordings of various localities, which can be used further in teaching and annotated. They were given the task of figuring out how the recordings should be made from dissemination and perspective and which elements could be added in annotation.

Workshop with the teaching staff at archaeology

We arranged a workshop that focused on how we can spread knowledge about the use of low-cost VR in teaching. The project aims to investigate how we can move from the teaching tools being privately owned, by Stebergløkken and Callanan, to the rest of the teaching staff being given the same opportunity to use this if desirable. It was therefore important to be able to carry out a workshop together where we could discuss how technology can be used in teaching, but from a pedagogical perspective. It must provide some room for possibilities that can contribute to increased understanding, more active learning, or other forms of learning. We also worked practically on making 360 footage and annotating these.

Also participating in the workshop were two student employees, Kathinka Yildirim from TeTL-TI and Ingeborg Gjelland Lid from VR Learn. They were an important support for employees, and we also see that this is an important resource to be able to implement new technology-oriented learning tools.



Autum 2023

EEA European Association of Archaeologists

Lene Vestrum, Heidrun and Stebergløkken: *360 Recordings of Rock Art – Why and for Whom?* Session: Immersive Techniques as Tools for Public Outreach in Archaeology. 29th EAA Annual Meeting in Belfast, Northern Ireland.

Abstrakt:

People want new experiences, and at the same time we need new approaches showing rock art to the public. In Central Norway a lot of the rock art are not that visible in flat light, due to weathering among others. A lot of the rock art is only visible after dark with artificial lighting, how can we show the rock art for tourists

during the summer when it barely gets dark? We want to present a pilot project from NTNU University Museum funded by The Directorate for Cultural Heritage, the Conservation program of rock art. This project also collaborates with the Department of Historical and Classical Studies and the archaeology program at NTNU. Student employees in collaboration with education staff and the project manager of the Conservation program at NTNU University Museum, are making 360 recordings which is annotated with information, tracings, scans etc. These objects can be experienced with low budget cardboards/desktop VR, which gives the public a possibility to visit the site digitally with a full 360 panorama of the rock art site. The archaeology program also collaborates with VR Learn (<https://www.ntnu.no/geografi/vr-learn>) and EMERGE (<https://www.ntnu.edu/sosant/emerge>), which also helps to implement this technology as one of the tools for education and dissemination for students and educators. In this way the students get experience in producing 360 recordings within a pedagogical frame, and experience with dissemination tools that is work related. The archaeology program gets 360 material that could be used and built on further by other students, og the University Museum will receive 360 recordings that could be used to give the public new ways of experience rock art in noninvasive ways that does not threat the fragile rock art.

Dissimination of TeTL-TI

We wanted to make our work with TeTL-TI available through various forums. That is why we have also communicated both externally and internally. Posters for the end-presentation of the Campus of the Future were made and prepared by Astrid Seland and Malin Bergset. The report and presentation can be found at: <https://www.ntnu.no/fremtidenscampus/prosjektene>

In addition, we wanted to collect experiences and results from the project in digital form, but also in a scientific work with pedagogical roots. We therefore decided to record a video where the project participants summarizes the projects and results. One of the interviewees, Frode Flemsæther (IGE) was also a participant. This video will be digitally available both on the website of “Fremtidens Campus”, but also on the research group’s website at IHK; Video has been published at Fremtidens Campus. <https://www.ntnu.no/fremtidenscampus/prosjektene>, and EMERGE <https://www.ntnu.edu/sosant/emerge>

We plan to complete a scientific article dealing with the analysis of parts of our findings by the end of 2024 and publish it in 2025.

Examples of student-active learning from the Department of Geography

Jakob B. Cyvin

In this year's EMERGE-report, we will present some examples of the use of innovative learning methods from the Department of Geography through a presentation of some videos and podcasts.

Shape2Gether

The project Shape2Gether is a collaboration between different universities in Europe. In the video linked below in the QR code we discuss what this project and what it means: The project aims to implement innovative approaches in the education for sustainable development in the context of climate change and its impacts on Europe by bringing together three groups of partner specialisations, i.e. geosciences, new technologies, and serious game design. The project also aims to shape a new curriculum in education for sustainable development, taking into account geosciences education, new technologies and gaming elements. This should lead to an application for the Erasmus Mundus Joint Masters programme. The project will investigate how these approaches can be used to enhance students' learning and engagement in topics related to climate change and sustainable development, ultimately leading to greater awareness, action, and impact. The main (and most-of-all) motivation of the project is to develop a systematic educational framework assessing the current climate change situation by applying novel and state-of-the-art approaches leading to awareness-raising about environmental and climate change challenges.



VR-Learn

In the project VR-Learn, we have through many years used VR for learning, and in this connection, we have produced several podcasts. The following QR codes present four of them here:

Episode 1: Introduction to the VR-Learn project:



<https://shorturl.at/L0Srz>

Episode 2: The use of virtual reality at the archeology education at NTNU



<https://shorturl.at/JLRv1>

Episode 3: VR in teaching of history at teacher education



<https://shorturl.at/ZQemw>

Episode 4: Technology optimism and the future



<https://shorturl.at/OtZAB>

TeTL-TI

In the TeTL-TI project, in collaboration with EMERGE and VR-Learn, we have also presented the project's findings and residual results in a panel discussion. You can see this here:



<https://ntnu.cloud.panopto.eu/Panopto/Pages/Viewer.aspx?id=78ee95da-3329-4bd5-b468-b0d800ab892e>

Department of Psychology

Invgild Saksvik-Lehouillier and Håvard R. Karlsen

At the Department of Psychology our activity recently has revolved around the bachelor's project PLURAL (Personality and virtual reality lab). In addition, we have planned the game-based learning project *Personalitycraft: A social deduction game based on scientific principles*. Below we will provide a short outline of the projects, and the activity performed in these from autumn 2023 to spring 2024.

PLURAL

At the department bachelor students write their bachelor's thesis at different real research projects within psychology. The students most often participate in all parts of the research project, gathering data, analysing and writing their individual thesis. The PLURAL project is an experiment designed to investigate the effects of personality traits on movement in a virtual environment. Seven bachelor students participated in this project in the spring of 2024. The planning and preparation of the project started in the autumn of 2023. Two student assistants were recruited from psychology and nanotechnology in the autumn semester. Their task was initially to program the virtual environment used in the experiment that was central to the bachelor's project. Later, their tasks were expanded.

Autumn

The student assistants taught themselves how to use the game-engine Unity via an online workshop provided by the project. They then went on to design and program two virtual reality (VR) scenarios in the form of mazes for a "player" to navigate. The two mazes represented different conditions in the experiment, a negative condition (scary, creepy) and a neutral condition (plain, non-evocative). The players would don VR headsets (HTC Vive Pro 2), and using trackers (HTC Vive Tracker 3), move around a laboratory in real life while their virtual selves navigated the maze.

Spring

The VR scenarios formed the basis of an experiment that the seven students of the bachelor's project ran to collect data. The students divided themselves into three pairs and worked with the student assistants to recruit participants and run them through the experiment, gathering data (movement data from the trackers and headset as well as survey data collected before and after the experiment).

Student assistant contribution

The student assistants built the VR scenario assets from the Unity Assets Store and connected it to Steam to be able to run it via the VR headset. To allow the participants to move around in real life and have it translated to movement in the

VR environment, they mapped out the laboratory and had the environments conform to those dimensions. They did extensive trouble shooting and bug fixing. After the scenarios were ready, they took on the role of experiment facilitators: they supervised the bachelor's students as they ran the experiments, and organised scheduling for the lab space.

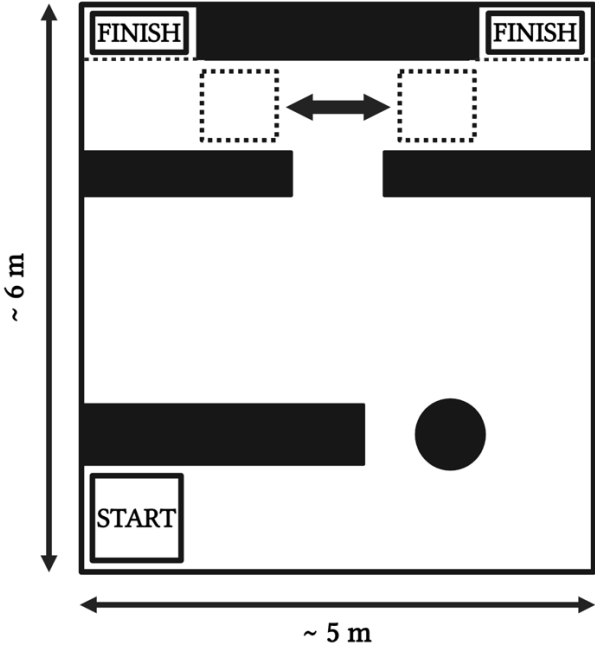


Figure 8: The maze design



Figure 9: Illustration of tracker placement and participant movement through the maze



Figure 10: The VR scenarious. Netural (top) and negative (bottom)

Personalitycraft

We have planned the development of the game *Personalitycraft* with the goal of teaching players important learning goals within personality psychology at the same time as being entertained. In the game players take personality trait related roles and have to behave in accordance with the trait they are given. In the winter of 2023-2024 we developed a project description for the game together with collaborators at Section for teaching, learning and digital services, NTNU Gunnar Orn Thordarson and Jonas Langset Hustad. This description involved a plan for development of the game in 2024 and 2025. In the spring the project received 150 000 NOK in funding from the innovation strategical fundings at the faculty of social and educational sciences, NTNU.

Publications

Lønne, T. F., Karlsen, H. R., Langvik, E., & Saksvik-Lehouillier, I. (2023). The effect of immersion on sense of presence and affect when experiencing an educational scenario in virtual reality: A randomized controlled study. *Heliyon*, 9(6). <https://doi.org/10.1016/j.heliyon.2023.e17196>

IMTEL

Ekaterina Prasolova-Førland and Mikhail Fominykh

Results and keywords from IMTEL

IMTEL has achieved several notable results recently. A final report was published on an XR project in collaboration with NAV, focusing on VR for career guidance for young job seekers. Additionally, a new VR “Blue Sector” app was released as part of the continuation project VR4VET. This app, developed in collaboration with NTNU, NAV Trøndelag, and the Career Center in Trøndelag County, had IMTEL as the project coordinator. Moreover, IMTEL was a partner in a recently completed Erasmus+ project, which resulted in the development of an AR NeuroLens app for peer learning in neuroscience, in collaboration with the Kavli Institute. Finally, IMTEL published an article in collaboration with the Norwegian Defence University College on "Military education in extended reality (XR)," exploring the integration of XR technologies in military training and education.

Courses

AI elements are integrated into all IMTEL courses, including the continuing education course PED6050, the UNIPED module 'Teaching in Immersive Learning Environments,' EiT (PED3801, now called VR/AR and AI for Learning), and the interdisciplinary profile Digital Innovation IT2025. In all these courses, we offer lectures on AI, focusing on how AI can be used in teaching, both directly as chatbots and in conjunction with other technologies such as virtual and augmented reality (e.g., digital twins/avatars of teachers that are available for assistance 24/7).

Externally funded projects

The externally funded projects include several key initiatives. The Erasmus+ VR4VET project (Virtual Reality for Vocational Education and Training) focuses on developing Non-Player Character (NPC) resources to be used across the project as AI career advisors and vocational school teachers within various VR applications that simulate different workplaces for career guidance and training. The Erasmus+ ARIDLL project (Augmented Reality Instructional Design for Language Learning) is working on the development of AI avatars for language learning, both conceptually and practically, to advance the use of augmented reality (AR) in this field. Natural language processing, speech-to-text, and text-to-speech are key components in our future designs. The EU Horizon XR4HUMAN project explores challenges and guidelines for the ethical, responsible, and inclusive use of VR/AR/XR at the intersection with AI technologies in Europe. Lastly, the NeuroLens project, in collaboration with the Kavli Institute and the recently completed Erasmus+ iPEAR project, investigates the potential of using AI-based 'spatial intelligence' to enhance user experience in augmented reality, particularly in the context of teaching neuroscience students.

Future research

In future research, there are plans to focus on three main directions at the intersection of immersive technologies (VR/AR) and AI. The first area will involve the technological and pedagogical design of AI-supported 'virtual humans'—learning assistants in virtual learning environments that are available to students 24/7 and can interact with them through language, body language, and other forms of interaction. The second focus will be on using generative AI to simplify, make more inclusive, and reduce the time required for the development of learning content and environments with VR/AR technologies by teachers and students at NTNU, without the need for advanced technical skills. The third area will explore methods for AI-based dynamic adaptation of 3D digital content to physical spaces in real-time, using camera and sensor data to naturally adjust the augmented reality experience to any physical environment. Additionally, a recently conducted workshop on XR and ethics, organized as part of our Horizon project XR4HUMAN, also contributed valuable insights to these efforts.