

# Collaborative Learning and Work on 3D Educational Content in a Virtual Campus and Virtual City Context

## Background

The use of 3D Collaborative Virtual Environments for educational purposes has been constantly increasing during the recent years. One of the reasons is the potential and possibility of such environments for supporting collaborative work with various types of content. Most CVEs allow advanced content manipulation, uploading, creating and sharing 3D objects and other media, such as text, graphics, sound and video. Another important reason is an opportunity for participants to interact in a way that conveys a sense of presence, lacking in other media. These opportunities result in a number of benefits for establishing and supporting learning communities, and collaborative work with 3D content. Nevertheless, this area is on the early stage and needs both theoretical concepts and empirical results.

## Virtual City projects

### Travel in Europe



### Virtual City of Yoshkar-Ola



## Virtual Campus design

### RQ 2: How can a virtual campus benefit educational activities in CVEs?

**RQ 2a:** How to design a virtual campus to support collaborative work on 3D educational content? What are requirements for a virtual campus?

**RQ 2b:** How can an integration of a virtual campus with a virtual city benefit learning/educational process in CVEs?

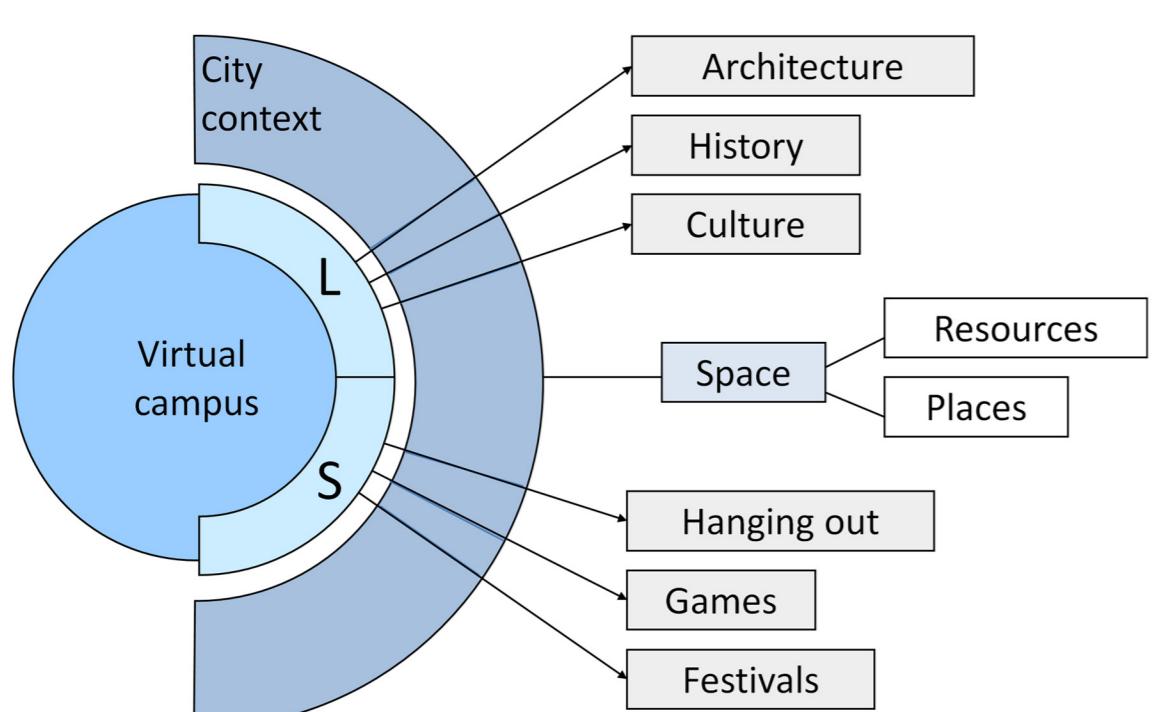
**Contribution 3:** Requirements for Virtual Campus that is considered as a place for learning, researching and socializing.

**Contribution 4:** Guidelines for integrating a virtual campus in the context of a virtual city.

## Virtual Campus of NTNU



## Virtual Campus. City context



## Theoretical perspective

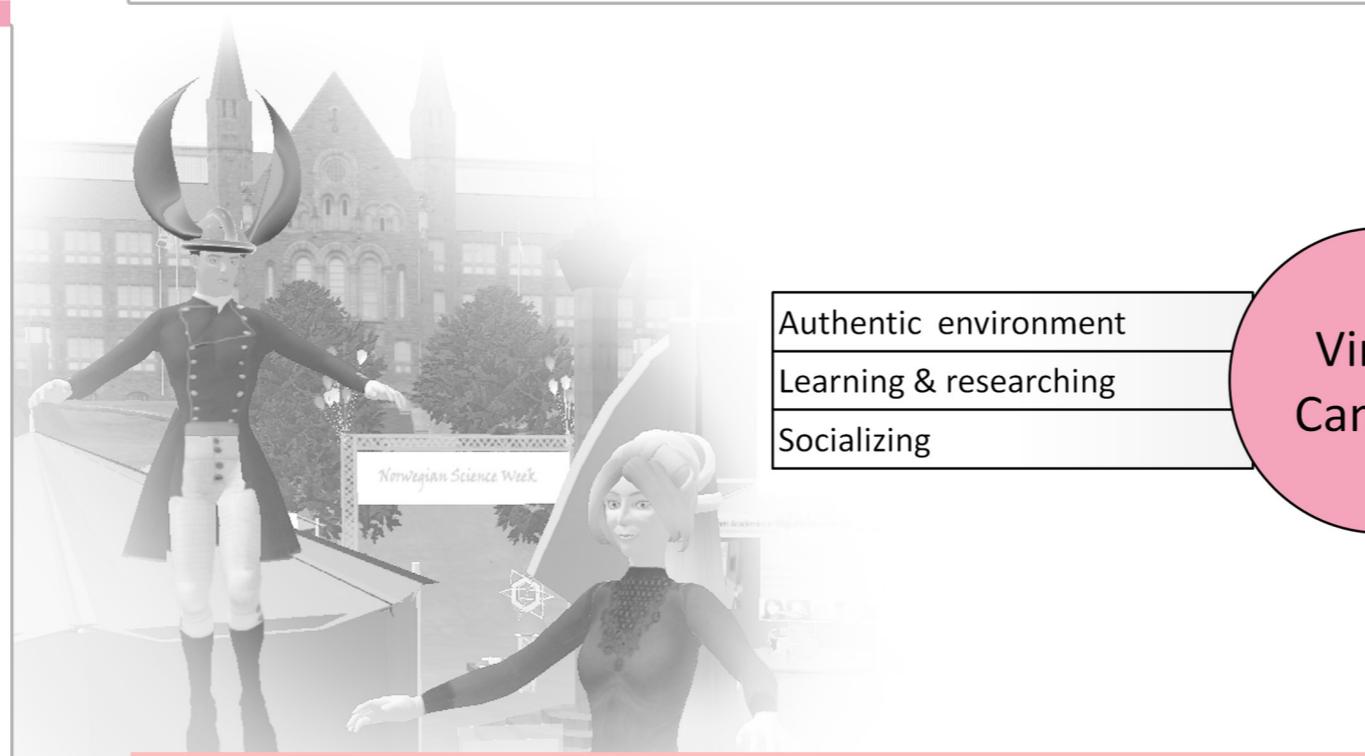
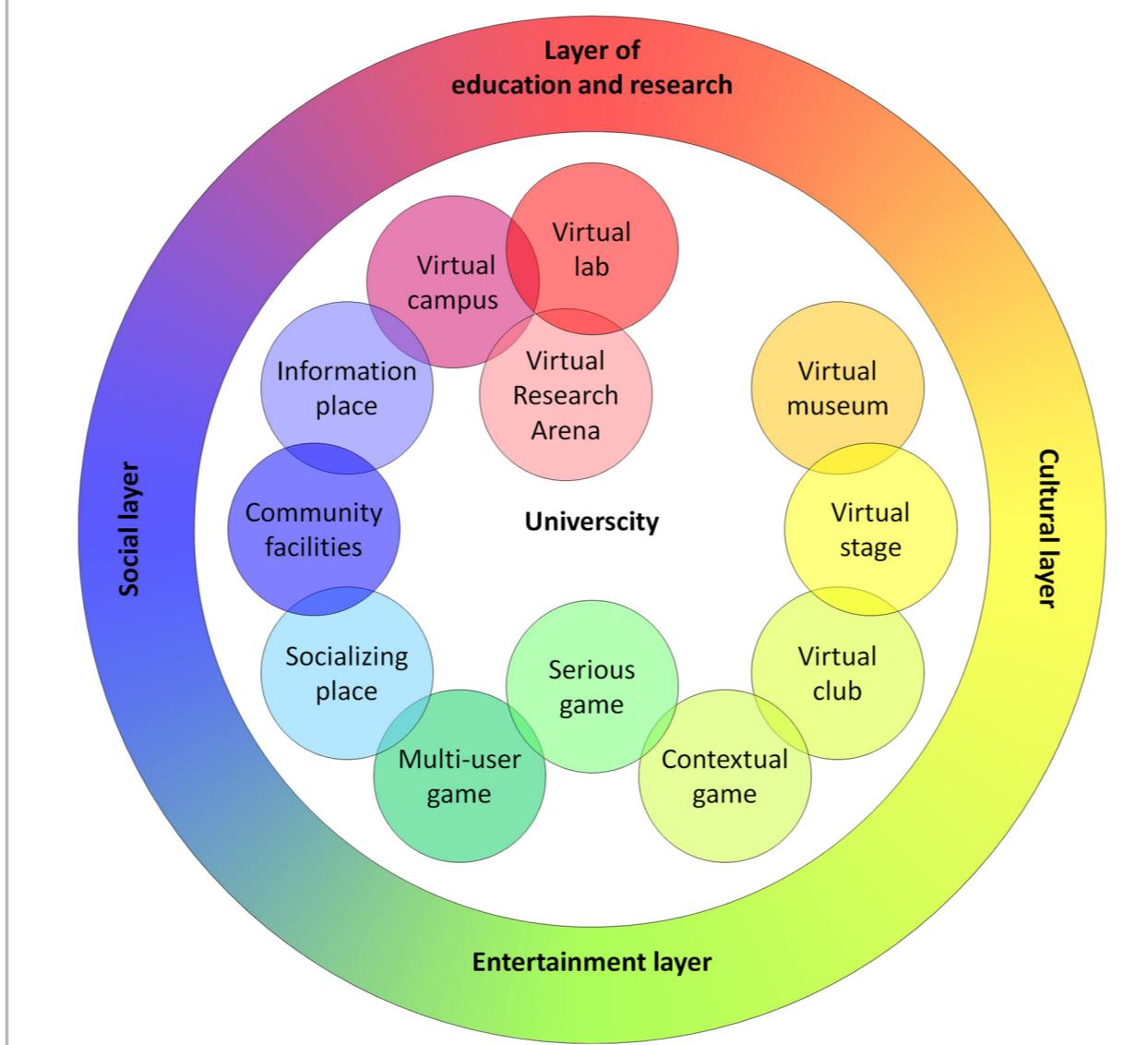
The applicant's PhD research aims at exploring collaborative work with 3D educational content and providing recommendations for supporting such an activity. This method is based on 'Constructionism' – an educational philosophy, which implies that learning is more effective through the design and building of personally meaningful artefacts than consuming information alone. Constructionism is related to the Social constructivist approach.

In addition, collaborative learning and work on 3D content is studied in relation to the social, cultural and entertaining activities. Activity theory, learning communities and game based learning approaches are also used in the work.

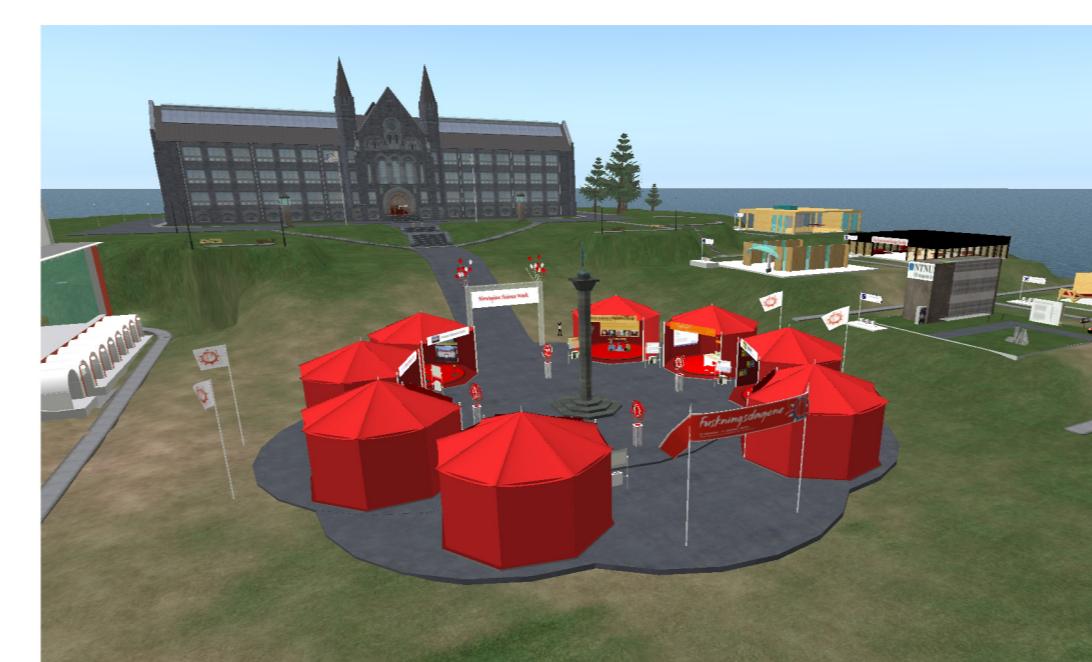
## Methods

The overall research approach applied in this research work is a combination of qualitative and quantitative research methods. The approach emerged over time. Answering research questions outlined on the early stages of the work required various methods. Research methods are both theoretically and empirically based. Exploratory research was applied on the early phases of the work and descriptive research – on the late phases. The work started with formulating theoretical propositions that were tested and modified in 3 empirical and 4 theoretical studies. Empirical studies were preceded by developing prototypes. The main target group were university students, including their relations to other social groups. The data sources included direct observation, video recordings, student artefacts, group essays, reports and questionnaires. The data were analysed using a mix of qualitative and quantitative research methods.

## 'Universitycy' framework



## Virtual Science Fair



## Virtual Science Fair pavilion



## TARGET Summer School

## Virtual City design

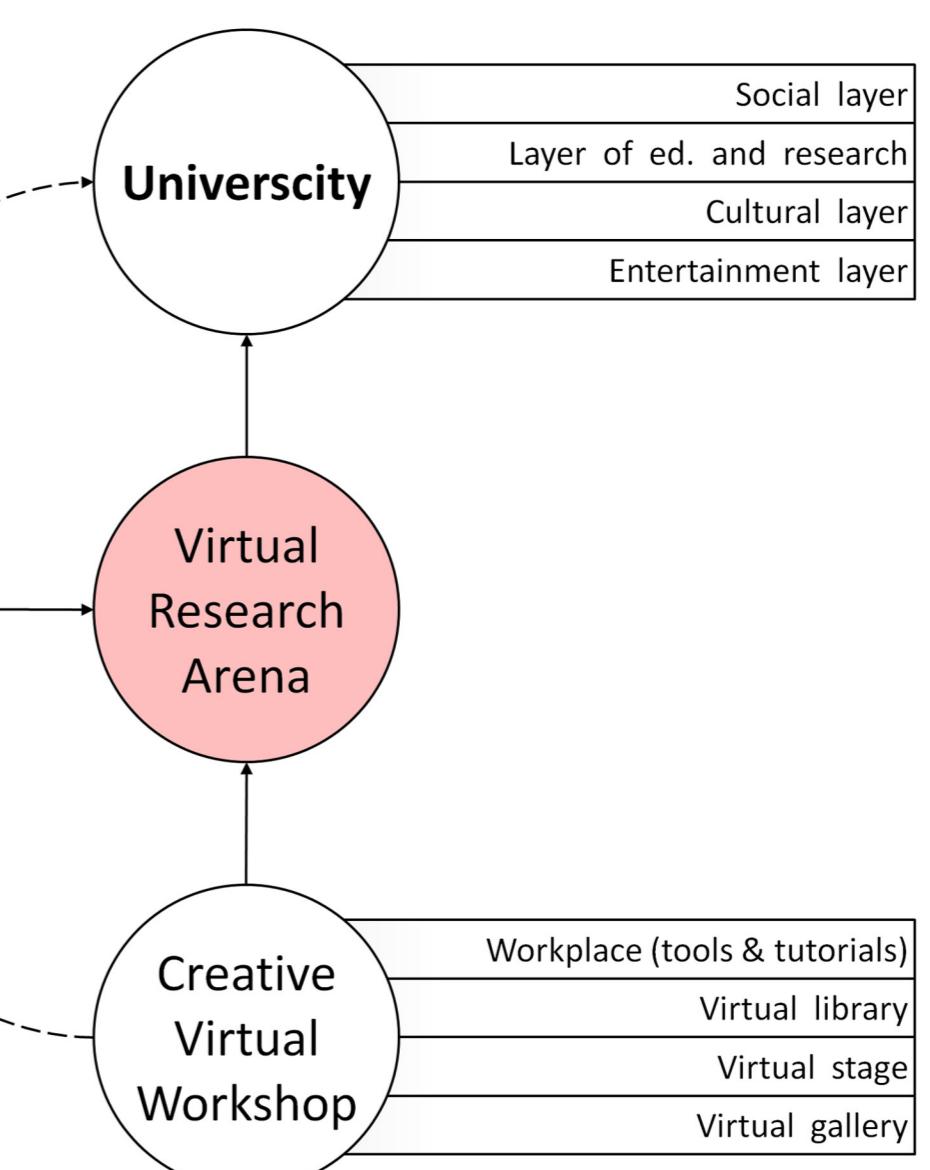
**RQ 3:** How can a virtual city benefit educational activities in CVEs?

**RQ 3a:** How to design a virtual city to support educational and social activities in CVEs?

**RQ 3b:** How to support learning communities with collaborative work on 3D educational content in a virtual city context?

**Contribution 5:** Guidelines for designing an educational virtual city.

**Contribution 6:** 'Universitycy' framework. Applying a holistic approach to a virtual city design, we integrate different aspects of city life such as culture, society, education and entertainment.



## Work with 3D content

**RQ 1:** How can collaborative work on 3D educational content benefit learning/educational process in CVEs?

**RQ 1a:** How to support collaborative work on 3D educational content in CVEs?

**RQ 1b:** How to analyse collaborative work on 3D educational content in CVEs?

**Contribution 1:** Recommendations for collaborative work on 3D educational content in Collaborative Virtual Environments (CVEs) on educational visualizations.

**Contribution 2:** Methodology for work with 3D content. The methodology suggests describing a 3D construction along 2 dimensions: virtual exhibits (types of content) and visual shell (content presentation form). An additional dynamic category considers how the virtual exhibits are presented to the viewer.

## 3D constructions analysis

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Text	basic info, details	details	details	basic info	basic info, details	basic info, details
Multimedia	slideshow	slideshow, graphics, web links	slideshow, graphics	video	graphics, video	slideshow, web links
3D symbols	functional, real-life	decorative	functional, real-life	real-life	functional	real-life
Presentation	excursion, avatars	role-play, avatars, audience	role-play, avatars	discussion	role-play, discussion, audience	excursion
Aesthetics	elements	atmosphere, elements	elements	no	elements	atmosphere
Functionality	interactivity, simulation	navigation	navigation	navigation	navigation	navigation
Expressed meaning	visual symbols, metaphors	visual symbols	metaphors	no	metaphors	metaphors