ELIA Future Arts: Towards a Virtual University of the Arts

TU Dublin
30 June 2021

Dynamic responses:

the experience of using VR in teaching urban design at the Harvard GSD

by Heinrich Wolff & Sarah Fayad

Abstract

How can a South African architect present a course in urban design at Harvard University, focused on rapidly changing the current impasse on land justice, including scenarios of facilitating land invasions and squatting, without evoking a pessimistic sense of urbanisation in Africa? Simple; combine a candid investigation into the forces shaping one of the most unequal societies on earth with the techno-marvel of VR.

This paper will share the strategies and experiences of a design studio at the Harvard GSD. VR was strategically significant as a teaching and learning tool for this studio. At a basic level, it allowed collaborative discussion and design work between people isolated during the pandemic. VR facilitated a studio experience at a time when it was thought of as impossible to achieve. Similarly, it allowed the students to experience a distant place at a time when travelling was restricted. At a more profound level, the sensorial experience of VR achieved significant educational outcomes. By reestablishing studio culture and joint reviews, informal learning, which is so fundamental to the socialised learning environment of a studio, could take place again. The future potential of informal learning with people “outside” a physical studio opens a new space to engage with others in learning. VR allowed a pedestrian experience of urban spaces; we thereby replicated the point of view of the most vulnerable citizens in our society. The ability to design and discuss simultaneously, facilitated role-playing games where students are placed in the shoes of various urban actors to develop empathy for squatters, administrators, designers, etc. Students had real fun in VR; a pleasurable engagement with a subject matter enhances the openness of students to learning and it stimulates them to work hard and to remember what they learnt.

021 422 3803
info@wolffarchitects.co.za
Wolff Architects (Pty) Ltd
136 Buitengracht Street Cape Town 8001
P.O. Box 15350 Vlaeberg Cape Town 8018
(2011/145066/07)

Dynamic responses:

the experience of using VR in teaching urban design at the Harvard GSD

1 Introduction

I am a South African architect and urbanist and I was recently invited by the Harvard Graduate School of Design to present a studio in urban design. The focus of this studio was rapid urbanisation and the infrastructures that support this. It is not the first time that I am presenting a studio with this subject matter. As an academic, I do not have a permanent appointment at any university and I regularly accept appointments as a visiting professor. As a consequence, I have taught in a broad range of educational environments; from the Goa College of Architecture to the ETH in Zürich, from IUAV in Venice to Washington University in St. Louis. Some of these institutions are very well resourced and some of them run on shoestring budgets. This is a chalkboard animation made by the students of the Goa College of Architecture:

[Better Betim – Goa College of Architecture]

In Goa, the institution had almost no IT infrastructure and as a consequence, I devised a low tech method of visualising rapid urbanisation and its unfolding over time. At the same time, I found the students very open to the issues of rapid urbanisation since they are confronted with it in their daily lives.

The next animation was from a studio I presented at Washington University in St. Louis, USA.

[WashU Group 2]

This studio also used fairly basic technology. The models were built with corrugated cardboard. This material is ideal for building rough and fast models and fantastic to set on fire! To the absolute shock and horror of some students, I snuck into the studio in the middle of the night and set their work on fire. This was necessary to make them understand the distress caused by urban fires in shack settlements and to force them to deal with the consequences.

It has been my experience that when I teach students who are not confronted with rapid urbanisation in their daily lives, that there is a tendency to project otherness onto this subject matter. In other words, the lessons learnt by people from

the Third World in dealing with rapid urbanisation has very little relevance to privileged societies, because those are “other” people’s problems, not theirs. Such a misconception is an impediment to learning.

[Dividing bridges and bridging divides]

My urban design studio at the Harvard GSD was called Dividing Bridges and Bridging divides. It was ambitious;

[King David Golf Course]

I wanted the students to investigate how to take over two pristine golf courses in Cape Town and use the land for social housing.

[Reclaim the city protests]

There currently is a political impasse between the City of Cape Town, who owns the land and activists fighting for urban land justice. This tension could easily boil over and lead to illegal land occupation. The question that the studio asked was whether urban design as a discipline can facilitate rapid urbanisation. Can we defuse the tension between the various parties and achieve a better urban future than one which is brought upon by uncontrolled urbanisation?

[Shack fires]

As a teacher, the challenge was how to educate students about the subject matter without them “othering” the content, which in turn would prevent constructive learning. How do I teach this subject matter without evoking a pessimistic sense of urbanisation in Africa? Simple; combine the urban design exercise with the techno-marvel of VR. The use of collaborative VR as a design tool was an ideal way to expose students to working methods required to negotiate urban futures with divergent stakeholders in the city.

2 VR as a collaborative design tool

Collaborators, skills and infrastructure

So, how did we do it? Firstly, I had to collaborate with people who had complementary expertise. I started working with Jason Stapleton, a multi-skilled VR expert who had an enthusiasm for VR which was matched by an imagination for the potentials and the restrictions that the medium currently offers. Jason in turn, put me in touch with Maciej Fijalkowski and Armin Rigo. They are software developers who created a plugin for SketchUp called VR Sketch which provided the software platform for the studio. Not only did they provide a software platform, they also developed tools in the software that I needed to achieve the educational aims of the studio. Over time, our team was supported by Ralph Borland who helped with the funding document, Alia Bader, my teaching assistant, Matt Smith a procurement manager, Lauren Oliver an administrator and Ray Harli, a VR training volunteer.

After we launched the studio, I approached the Harvard Innovation Task Force to see if they had any interest in what I was doing in the studio. Sarah Fayad was an Irving Innovation Fellow with the Innovation Task Force at the time and she was assigned to study the VR experiment. This paper today is part of our reflections on the methods and opportunities latent in VR as a tool for collaborative design.

The Department of Urban Planning and Design at the Harvard GSD and Rahul Mehrotra in particular, were excited and supportive of the proposal to do an experimental studio using VR. They made a budget available to ensure that each of the students and staff of the studio would receive a VR headset and have internet access. Headsets were bought in the USA and shipped to students who were in COVID isolation all over the world. For a variety of reasons, Chinese students were asked to buy their own headsets and VPN's in China.

The classroom

I thought it would be cool to design a virtual studio space and to use this exercise to advance my thinking on virtual spaces.

[VR studio plans and section]

[VR studio with students]

The classroom had to be a very basic form to ensure that it had a low polycount. It was important to make sure that the

classroom *file size* was very small to ensure that we could upload the student files into the classroom. The educational aim was to view all the student projects simultaneously to allow learning to occur by comparison and group discussions. The classroom also had to create hype and excitement about the prospect of a collaborative VR design exercise.

If one had to design a basic virtual space, what would be the non-negotiables? At a basic level, we needed enough space to put work on walls and to have the scale models of all students in the space simultaneously. You may very well ask why scale models. Is this not a convention of the physical world? Indeed, but to limit the total file size of the classroom and all the student work in it and to allow the student with the worst internet speed to participate, we needed digitally reduced versions of the student models to allow them to exist simultaneously side by side. Each student model had a code which allowed all the participants to enter this portal to the full sized, full scale digital version of the model.

My students really enjoyed the experience of being with each other in this classroom with all the work around them. One of the students remarked that it was her best experience at university in the past year; she has been by herself in an apartment during lockdown and this was the first time she could work with other students and have a proper group discussion.

[VR classroom with floor and door]

The virtual classroom had two other features worth noting. Firstly, we made a very detailed, sensual floor. This was important to me because when looking down at your avatar, with or without legs, there is an uncanny sense of floating in space. This disembodied experience was the opposite of what we tried to achieve in the studio. I wanted students to have the sense of being a pedestrian in the city and experience it from that point of view. I will elaborate on this point later, but for now, it is worth mentioning that I wanted to have a “grounded” bodily experience. [Classroom - internal view] The oak, end-grain floor gives a scale, relative to the human body. As a sensual surface with recognisable material character, it orientates the users of the space.

The second feature built into the classroom was a doorbell. This was a device that I needed to register the arrival and departure of students in and out of the classroom. The doorbell facilitated good manners and socialisation; I can acknowledge the arrival of a student and make human contact at that moment as opposed to the anonymous connect/ disconnect of other digital platforms. Tied to the doorbell was an arrival space where you spawn on logging in. This meant that one would hear the sound of the doorbell and a moment would pass while someone is walking into the classroom space. It helps me as a teacher to finish what I am saying while preparing to acknowledge someone’s arrival.

Dynamic responses

[Three themes]

The studio focused on three themes; the first was exploring ways of contributing to the process of rapid urbanisation. The second confronted the politics of infrastructures; their enduring effects and their capacity to create disconnections as much as they can create connections. The third theme of the studio explored how new ways of seeing can inform new ways of knowing. The way we work as designers constitutes an epistemic structure. To view a situation or a question differently, assists us in producing new knowledge and skills of engagement. How can anyone catapult themselves into new forms of seeing and knowing, particularly if they have been practicing for a while? This studio proposed that experimentation with new ways of working can unsettle our exiting gaze onto the world. Such a gaze is a projection of our imagined professional role in urbanisation. By developing new ways of seeing the world, we create, in ourselves, the possibility of new understandings and new responses. In other words, by unsettling our frameworks of knowledge, we open ourselves up for constructing new understandings.

The Covid-19 era caused Zoom fatigue in many of us. Looking through a Zoom window at two-dimensional content is endemic to the medium. The pleasure of making things with others and the formal and informal discussions around this action are all gone. Verbal communication has begun to dominate visual communication. The ability to read texts is privileged over the ability to read artefacts.

During the global lockdown, digital media was necessary for remote communication, so why not explore advanced possibilities offered by this medium? This studio seized the moment to experiment with shared social virtual reality (VR) as a way of seeing and producing work.

VR offers new possibilities for the design process. Firstly, it offers the possibility to reconsider our point of view as urban designers; instead of the omniscient narrator, the genius author looking down at the plan, our experience of the design is from the point of view of a pedestrian. If we want to turn around cities that have become instruments of systemic marginalisation, the point of view of the least mobile citizen, the person on foot, should become the measure of the city. To this end, I asked the software developers to create a way of walking through the urban spaces that the students made. They developed a walking tool, that does not cause nausea and that moves you at walking speed. This is of course not a new invention, but what is significant to note is the relationship that I had as a teacher with software developers who could respond to my requests for augmentation of the software as we came across issues.

[Walking amongst the shacks]

Secondly, VR allowed immersive experiences of the project site in Cape Town and of the proposed designs.

[Students around a model] [Sarah's comics]

Thirdly, VR offered the possibility of alternative socialisation; the software platform that we used, allowed all participants to be simultaneously present and to have their own individual experience of the spaces. Sharing of these experiences changes the individual's point of view from that of the omniscient narrator to an alternating first-person narrative. A personalised experience is fundamental in shifting the learning environment from instructive learning to constructive learning.

Lastly, the ability to design and discuss collaboratively allowed me to create an educational situation where *role-playing* can occur. Let me elaborate on this; when a student is asked to do an urban design exercise at university, they inevitably imagine themselves as urban designers. To teach a student to be a good urban designer they need to inhabit the space of other people's interests, ranging from other professional inputs to the concerns of citizens. Also, to be an ethical urban designer one has to have empathy with the consequences that our designs may have on people and be open to the suffering our designs may cause.

The projects that I set up for students are designed like a game, the objective being a situation where a range of urban actors; city officials, designers, engineers, and citizens create the city simultaneously. This an important rehearsal of a typical Third World situation where cities are built by their citizens and where the city officials and the designers play a minor role. Like a flight simulator, this VR exercise offered us the possibility to rehearse scenarios of urbanisation to advance our skill and understanding in dealing with rapidly evolving urbanisation processes. Let me illustrate this by example; if you are sitting on an aeroplane and you look out the window and you see the engines are on fire, would it comfort you if the pilot were to say: "Oh goodness, I don't know what to do!" It would not, right? If the pilot said: "Don't worry people, I've been through this situation once before on a flight simulator." Would that comfort you? No, not really. But what if the pilot said: "I have practiced this emergency more than 500 times on a flight simulator with 100% success in landing the plane." Well, maybe I can relax, right? In the context of rapid urbanisation, we need to train urban designers to know what to do the day after a devastating fire in a shack settlement or the weekend before a massive land invasion. Repeated role-playing exercises can enhance the knowledge and wisdom of an urban designer to engage with significant consequence in such crisis situations. What is fundamentally required is a dynamic response to an unfolding situation.

The VR experiment at Harvard was set up for the students in such a way that it would engender empathy with the lives of others and to teach them to respond dynamically; to make informed judgements in the heat of the moment, to negotiate outcomes with others and to shape their design work in response to the actions of others.

3 Reflections

Our reflections on using collaborative VR are centred around the ideas of joy, dynamic responses, constructive learning and altered subjectivity.

Learning and joy

If there is one thing I have learnt from teaching architecture over the past 25 years, it is that if people love what they do, they are more receptive to learning. Enjoyment motivates them to work hard and stimulates the retention of what has been learnt. As much as the novelty of VR may diminish over time, one could not miss the fact that when we introduced people to VR, they were smiling and giggling. The excitement generated by VR has, to some extent, obscured the intellectual challenges that Third World urbanisation confronted students with.

As you can imagine, the experiment had its technical difficulties, but for the students, these were outweighed by the joys of the collaborative working experience.

Dynamic responses

VR augments traditional learning methods by creating immersive scenarios for students[1]. Key to this immersive experience is engaging the seven senses. These include the five commonly known senses of sight, smell, taste, hearing and touch, but significant to our discussion here also include equilibrioception and proprioception. Equilibrioception refers to one's sense of balance and spatial orientation, whereas proprioception refers to the sense of self-movement and body position.

[1] https://ed.stanford.edu/news/virtual-reality-offers-captivating-way-learn-classroom-and-beyond?newsletter=true

In everyday life experiences, our seven senses are typically engaged. However, as we move to various forms of the digital, most of these senses are flattened and unused. Unlike imagery and videography, which typically engages only sight and hearing, VR adds two additional senses that engage the body. By engaging these senses, learners have a more acute sense of the spaces they are making and this, in turn, leads to higher retention of information.

The sensory experience of VR is reinforced by other factors. The first would be *extraction;* VR removes the existing context and physical awareness of space, allowing the users to focus on the new reality in front of them. The second is *scale*; particularly in the context of designing urban spaces, students have a sense of the relative size and distance of things. Thirdly, the ability to work collaboratively opens the opportunity for social or collective learning and reinforcement of learning through having to articulate, motivate or defend your ideas or actions. The fourth factor is feedback; the consequence of engaging ones equilibrioception and proprioception in a collaborative design exercise is that there is constant feedback, both interpersonal and perceptual. This is very important to us; design is as much about making configurations as it is about understanding the consequences of our actions. Students need to hone their own skills in reading the consequences of their design, but they should also learn to listen to points of view presented by others about what they are doing. This conforms to Norbert Wiener's notion that adjusting our environment radically demands us to modify ourselves to exist in it.

In the context of my urban design studio, VR allowed collaborative work with a live feedback system which necessitated *dynamic responses* from the students. There is nothing virtual about these ends; they are purposive ends aimed at teaching students the skills to practice urban design in an unfolding socio-political reality, to negotiate decisions and judgements in the heat of the moment.

In pursuit of constructive learning

I believe that confusion creates knowledge. It's not the only way but I like challenging my own certainties and those of my students. This strategy is valuable to me as a thinker from the Third World, teaching in privileged First World environments. I don't want my students to judge the ideas that I introduce to them, solely based on where I am from. Ideas might be spawned in a particular context, but they certainly can travel, adapt and mutate.

The idea of teaching rapid urbanisation, using collaborative VR, springs from a desire to scramble up the world that these speculations land into. It is like digging the plough deep into the earth, to till the soil, before sowing.

Constructive learning refers to the idea that "*learners construct knowledge for themselves - each learner individually (and socially) constructs meaning - as he or she learns."* The philosophical assumption is that there is no knowledge *"independent of the knower, but only knowledge we construct for ourselves as we learn."* (Hein, G. E. 1991)

The fact that our software platform allowed collaborative design was a significant gateway to social learning. I believe this was a world first in the fields of architecture and urban design. The educational construction of the studio, around the need for dynamic responses, was aimed at enhancing constructive learning.

Altered subjectivities

Anyone who was educated in a creative practice will testify to the fact that learning occurs socially as much as it occurs individually. An avatar and a muted microphone certainly create many obstacles in advancing social learning. In the Harvard studio, I was lucky; since I taught a post-graduate studio for only 10 students, we never had to mute our microphones. This meant that we were *audially* available to each other, all the time. I could sense confusion in a response or excitement in a delivery.

[Avatars]

Let's talk a bit about the avatars; those anonymous purple puppets with welding masks. Are these dehumanised persona or are they engaged in mimesis? An avatar is very much a lifeless puppet until one starts making things with other people. Since the designers have a digital world that they are co-creating, what dominates ones experience is the unfolding of the process and the dimension of time. The gestures and reactions of other people are more significant than their appearances.

The avatar is not a desaturated subjectivity, a mere prosthesis, a hammer of a sort. Katherine Hayles (2017) suggests that we are confronted here with a "*disperse subjectivity*"[2]. But the avatar can alter subjectivity and this capacity was extensively explored in the studio. The point of view of the alternating first-person narrative was used in role-playing

[2] Hayles, N.K. (Katherine) in Virtual bodies and flickering signifiers 2017
"Data are thus humanized, and subjectivity computerized, allowing them to join in a symbiotic union whose result is narrative"

scenarios. In the studio, we reenacted a land grab with one half of the group representing squatters who want to build houses as fast as possible and the other half representing the city and its designers who have to participate in the process of rapid urbanisation to enhance the future of the city, in service of the citizens.

This roleplaying game caused utter mayhem in the studio; emotions were flaring and people worked feverishly. As a learning exercise, it made a deep impression on the students. They gained insight into the real conflicts and negotiations required to improve the future of the city.

The dynamic responses required of all participants in the exercise, develop empathy with a multitude of urban actors. The alternating first-person subjectivity develops in space and in time. Imagining yourself as a squatter in a purple avatar certainly does not equate to the real-life experience of anti-blackness as it has developed in Cape Town over the past 360 years, but it certainly develops a degree of empathy for the lives of others.

4 Future

I asked the dean of the GSD to consider that the pandemic was just long enough to open up a space for new ways of working, but was it long enough to entrench its lessons?”

A huge amount of hardware and software development is required. I think universities should be significant sites for the advancement of VR to ensure that the technology is developed around human needs rather than commercial opportunity.

The necessity to work remotely has opened up new possibilities to involve distant collaborators/ teachers in a learning environment. Instead of students travelling to distant locations, the university could be available to students, wherever they are. This de-centering of the university could make a positive adjustment to the elite status of the institution. Classrooms can be transformed by having individuals participate who could not participate otherwise. To lower the threshold to participation is to open up the institutions for structural transformation.

Development of VR - any interest?