Exploring Architectural Education in the Digital Age

Learning, Reflection and Flexion

Ava Fatah gen. Schieck
Bartlett Graduate School, UCL
www.vr.ucl.ac.uk
ava.fatah@ucl.ac.uk

Abstract. *This paper reports on work carried out within the module 'Digital Space & Society as part of the MSc Adaptive Architecture & Computation course at UCL. I describe my approach in investigating possibilities for integrating digital media and computation into a module taught to students coming predominantly from a design background. The teaching adopts the design studio culture, which integrates: teaching, discovery (research), and application (practice). Here I present an attempt to develop new ways that extend beyond conventionally applied methods within traditional architectural education by adopting project based learning that is carried out in the real world. The project is driven by my recent research activities. Donald Schon's concept of the 'knowledge in action' provides a useful framework for interpreting my approach.*
Keywords: *Architectural education; digital; project based; teaching & research.*

Architectural education in the digital age

The rapid developments in information and communication technology and its applications in architecture have introduced new opportunities and challenges. Architectural schools have witnessed recently a growing importance of IT related courses in their curricula. Schoen (1985) has identified some of the dilemmas posed by the expanding horizon of knowledge within the architectural field. He identified the need for reflecting on: "what should be taught in school? What should be left to practice? Who should learn what, and when?" More significantly he identified a dilemma facing architectural schools as they start to recognise the increasing importance of new fields of knowledge to the education they must provide:

"architecture may try to incorporate them in a way that imitates the technical education in other fields, thereby turning its back on the tradition of the architectural studio. Or, out of a wish to remain true to a certain view of that tradition – and to the image of the architect….architecture may turn its back on the rising demands for technical education" (Schoen, 1985, p. 86).

I argue that, with the advent of the information age and as we find ways to incorporate digital media and computation in architectural teaching, we must rethink the role of architectural education, and how best to prepare architects for the new changes in the field. Here I present my teaching approach as part of the MSc Adaptive Architecture and Computation at

the Bartlett School of Graduate Studies, UCL.

Adaptive Architecture and Computation at UCL

The MSc AAC is a one-year taught course in the field of digital design. The course has been running for the third years (replacing the MSc Virtual Environments in 2005). Teaching on the course draws on a multidisciplinary milieu of two established disciplines in the Bartlett: the Space group, which explores different ways of investigating spaces and forms of architecture and the VR centre which uses computing technology in the field of architecture. It comprises 5 core modules that are taught in parallel during the two teaching terms followed by a thesis, which is supervised from May to September; The five modules are:

a. Introduction to Adaptive Architecture and Computation,
b. Digital Space and Society,
c. Generative Space, Form and Behaviour,
d. Computing for Emergent Architecture (1),
e. Computing for Emergent Architecture (2).

The taught modules (a, b and c) aim at challenging the students to think about how computation can improve the design and use of architecture. The studio based modules (e and f) give the students the hands on opportunity to create computational sketches by learning programming skills.

In this paper I focus on my teaching approach within the 'Digital Space and Society' DSS and illustrate an attempt to develop new ways that extend beyond conventionally applied methods within the traditional architectural education. This is achieved through implementing a project based learning that is carried out in the real world (in the actual site itself) within the urban space.

Digital Space and Society: towards a design studio culture

The DSS module introduces students to digital architecture, as an interface between people and other people, i.e., as a facilitator for society. One of the module's topics, on which I will focus in this paper, deals with investigating the complex relationship between the digital space and public space, and the way that this is mediated by and mediates people's relationship to each other. Bearing in mind that the majority of the MSc AAC students come predominantly from a design background, it seems that the challenge is to incorporate foundations towards an understanding of architectural research that will help achieve a better understanding of different aspects of the complexity of social and technological interaction in relation to its spatial context in which it occurs in a way which is compatible with their educational background as reflective designers. As a result, and building on the reflective nature of the architectural education, I have introduced a project based learning approach in an attempt to integrate digital media and computation into a taught module. This is primarily motivated by the design studio culture, a culture that represents a tradition of education for reflection-in-action and on the spot experimenting reflecting a generalised setting for learning-by-doing, which integrates the three environments of: teaching, discovery (research), and application (practice). The premise is that, adopting an approach based on the design studio culture will foster a creative and challenging environment that would encourage critical thinking providing values of optimism, sharing, engagement, and innovation. The proposed approach differs from traditional architectural education, however, in that the project is implemented in the real world setting, which requires applying a range of methods from interpretative-ethnographic to experimental approaches. In addition, an essential aspect of the teaching approach, within the module, is to encourage students to participate in a live research project, which is

informed by my current research activities, emphasising the emerging nature of this new field. In this way the students are active participants in the learning experience; they play an active role that helps shaping the final outcome rather then being passive participants.

In the following section, I present the group project, which was introduced during Feb/March 2007. After the description of the project, I discuss the challenges and explain the difficulty of linking teaching to research in an evolving field on the cutting edge of the research, and in a domain that lacks concrete methods, without affecting students' faith in the teaching process. After presenting the learning experience from the students' point of view I outline pedagogical issues raised during carrying out the project before finally describing ongoing work.

The project: Mapping and visualising the digital presence in the city

The students were asked to collaborate on mapping and visualising the digital presence with scans for Bluetooth (a short range digital field created by devices such as mobile phones and computers) and the physical landscape (count of pedestrians' movement) in the small historic centre of Bath (UK) using modern digital technology. The aim is to reconstruct a visual representation of the patterns of movement and the digital presence in the urban space in order to achieve a better understanding of the urban landscape augmented with the digital landscape. Bath was selected because it is manageable in size and this makes it possible for the students to carry out the project at the urban scale, but within a well constrained area. In addition, Bath is a tourist city that has many tourist attractions; this will make the exercise rather enjoyable for the students and ultimately promote learning as an enjoyable experience. For the students this should form the background to learning how to interrogate urban space in relation to pervasive technologies. During this exercise the students will have gathered and presented data, and will have attempted to interpret the data. This will give them the grounding they need to carry out individual research studies in the remainder of the course. An essential aspect of this project is that the students collaborate within groups. The project involved five groups (four groups of four students and one group of three students) in a collaborative study. Collaboration in itself is a reflective activity in Schoen's terms. The process of listening to others and internalising the dynamics of different relationships is itself learned through action and largely an implicit skill. During the project, this appeared to work very well, encouraging a very good group dynamics. This was also supported by Lawson (1990), who drew attention to the benefits designers can derive from working in teams.

The project was carried out during the last 4 weeks in the module. It was supported by the following teaching modes: Workshops, lectures, a field work in Bath and group tutorials. The groups were assessed formally by giving an audio-visual presentation at the end of the project.

In the following section I will describe the teaching modes that are supported by a variety of teaching styles in more details:

The workshops

The students were introduced to two workshops: The first workshop covered the technical aspects by introducing the students to the installation of the digital scan applications (in our case Bluetooth scans with a laptop), and running very small scan trails followed by explaining the meaning of the different parts of the scan results. It's perhaps worth mentioning that this workshop was run by a research fellow who is involved in the main research project itself from Bath Computer Science department. The second workshop covered observation techniques relevant to the project. These techniques and methods were presented by a teaching assistant from the MSc AAC course. The workshops were accompanied by a training session in order to ensure that the students are able to carry out the observations and scanning sessions in the field study on their own. 'Role play'

was introduced to help explain different aspects of the exercise. At this stage many students expressed elements of concern and uncertainty asking questions such as "how and where should we stand? We don't understand what this means" or "we don't know how to construct the relation between the data collected". This was expected, considering the nature of the exercise as being research based, this meant that it could follow many different interpretations. The students were encouraged to participate actively in exploring this issue and present their own interpretations and it was hoped that they would gain confidence in tackling research based problems. This of course raises one of the oldest unresolved pedagogical problems, which concerns the relationship between knowledge, the knower and coming-to-know: 'does one learn best by discovering or by instruction?' In order to clarify the nature of the tasks, I decided to go with the students through a training session in which they would check for themselves. This session wasn't planned in advance, but it was a response for a need, which has emerged while going through the process itself. The training session took place in the British Museum's Great Court in London. The students were asked to work in pairs. In each pair one of the students would carry out observations of the people's presence and the other student should detect the digital presence (Bluetooth scans), after 30 minutes they were asked to swap their roles. The training session was very useful. Going through this activity allowed all students to interrogate and check for themselves the relation between what they observe with their eyes and what they scan with their laptop. During this session the students were able to actually understand that what they scan on their laptops is a digital interpretation of the presence of people that carry mobile phones with them (with Bluetooth set to discoverable). This has helped clarify many concepts that were ambiguous.

Lectures

Alongside the workshops the students were guided through a series of concepts related to the properties of the technological artefacts that are available to us and the form of interaction space they support. An important aspect of the digital interaction spaces, that the students were introduced to, is that some digital interaction spaces map very closely to the pattern of movements of people as they go around the city. This characteristic make the digital interaction space appropriate for investigations by methods that study movement flow. Students were also introduced to issues related to connecting the scan results with the movement observation and flow counts. The timing of these lectures was very important, as some of the students were struggling with some of these concepts and their implications.

The field work

In the project the students were asked to map and visualize the physical and the digital landscape in the city of Bath. Data about pedestrian presence were gathered in Bath using an observation-based survey. Data was recorded throughout 6 time sessions from 10:30-16:30 over the course of one day. Nine different locations were selected to perform the observations. I stress the importance of the careful selection of the observation areas in order to expose the students to a variety of spaces with low, medium and high pedestrian flow. These locations were identified in a previous study (Fatah gen. Schieck et al, 2008). The students (19) were divided in to four groups of four of (4) and one of (3). Each group was divided into 2 subgroups of 2 students performing the observations of the pedestrians' presence and the scan for the digital presence for 30 minutes in 6 time sessions in the same location throughout the day. The observations in each location involved a pair of students working together (one location was covered by 3 students); this has encouraged exploring different ideas directly on the spot. One observer performed the manual pedestrian observation while the other performed the digital observation with the

Figure 1
Data was recorded in 9 locations in Bath (left). Scanning Bluetooth devices and counting people (right)

laptop. The field work was in particular very successful. The group collaboration flowed particularly well, all students worked very well to cover their tasks. It is perhaps worth mentioning two important learning outcomes, in relation to the module's objectives, that have emerged from the whole exercise in Bath: During the scanning for the digital presence, and when a device is detected nearby, its name will be shown on the laptop screen. Consequently, through scanning in different locations in the city, students were able to identify different patterns of mobile phone naming conventions and relate these to the properties of the built environment. For instance, the students found out that places with predominantly young people demonstrated rather interesting naming conventions. Moreover, from collecting data overtime, the students were able to trace people's projected presence over space and time. The exercise made them aware of the fact that it is easy to track people. This has raised concerns about the surveillance aspect. As a result the students started identifying questions related to privacy and security within the urban space, which demonstrated an understanding of some of the critical issues covered within the module.

Putting it all together-students presentations

After the trip in Bath the students were left to work on their presentations and the final findings. They were asked to outline the main points of their analysis and to present the main argument of their work, and finally present a model for the visualization of the digital presence in Bath and in the light of the information they were given in the lectures and the workshops.

The preparation of the presentation was thought important in stimulating the students to reflect on their experiences and learning process they have undertaken. Moreover, the students had to work together to work out a well prepared presentation. Presenting the work among the tutors and the other students in itself is a reflective activity. Here the key capacity during the presentation is to listen to the critique, to internalise its consequences and to use this knowledge to help refine the problem definition and to narrow the range of solution types that need to be developed.

The students learning experience

In spite of the technical glitches most students were able to collect the required data and interpret a big

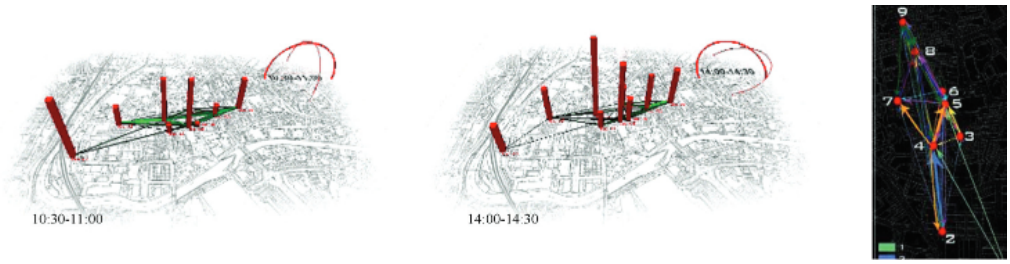

Figure 2
A dynamic animation of the digital flow and co-presence in 9 locations in Bath (left). Between 10:30 -11:00 the highest number of devices were scanned at location 2 and then at location 4 (right).

part of it successfully and although the students had to be on the streets and work through out the day, most of students found the trip very enjoyable. One of the positive aspects of the trip was strengthening the social bonds between participants since they had chance to socialize and talk about various issues during their collaboration and stay in Bath. At the end of the term, the students were asked to provide a feed back in a form of a questionnaire about different aspects of the module. Based on this feedback and my own observations, the following emerged:

The desire to engage with the students and the sense of discovery is important: one of the aspects the students reported as being positive about the module is 'tutor's passion' about the topic and the sense of the excitement of discovery.

Being organized is essential: Students feedback indicated that being organized is a very important skill that a tutor needs to be able to demonstrate. I believe that this point was mainly triggered due to the nature of the exercise as being research based, which meant that the students were not 'spoon-fed' but rather encouraged to present their own interpretations. In addition, carrying out the project within a very compressed time frame means that many issues especially the technical ones need to be discussed and tackled in advance, which wasn't always the case during this project.

Students' feedback indicated that they have enjoyed the collaborative events and activities. In particular, they noted that it helpful to experience the problems together in a non competitive way so that they did not feel they were alone in finding the problems unfamiliar and not knowing how to proceed at first.

Finally, as a tutor I was keen to ensure that all students felt that progress was being made by assessing students progress continuously and arranging informal group tutorials. Students were asked to present their 'work in progress' in different stages throughout the exercise in order to identify issues and respond to any question that needs to be addressed, however, the lack of teaching and technical support, at some crucial moments during the project, has created a situation of "hectic schedule, lack of feedback, lack of the availability of the scanners to carry out the work, etc."

From a teaching point of view: My approach in developing and carrying out this project was based on action research. In action research it is rather difficult and not often productive to separate out 'practice' from 'research'; each feeds into the other. A major advantage is that action research offers an opportunity for teachers systematically to innovate and then reflect on practice, in a spiral way that can lead both to consolidation and innovation (Cowan and Creme, 2005). In the following I identify some of the issues that were raised during my observations of the students going through the exercise and my reflections on their learning experience.

Discussion: pedagogical issues

The computer as a learning tool

Integrating the computation and digital media into the architectural teaching raises educational issues of how to infuse the computers into the process. In the MSc AAC the computer is a critical component of the learning experience. The DSS module, for instance, investigates the complex relation between technology and its interaction with the social, environmental and spatial context in which it operates. A recurring theme for me is to explore potential teaching approaches that would help students understand this complexity within an evolving field of knowledge on the cutting edge of the research. An important aspect of the presented teaching approach is that students are encouraged to be active participants in shaping the learning experience. The premise is that applying a project based learning that is carried out in the real world (of people, space and technology) will help students think more critically, instead of relying on passing established understanding and knowledge. However, we should be aware of potential educational risk Christie and Ferdos (2004) noted that when one seeks to improve

learning using digital media, the potential for a radically different, more innovative pedagogy has to be explored in addition to the fundamental questions that are asked within the traditional education. "Good pedagogy can inform and be supported by good IT. Poor pedagogy can subvert the very point of using good IT. A combination of bad pedagogy and bad IT is a disaster for the future of students' learning in general and architecture in particular". During the DSS project, for instance, some students lacked the required technical skills, and therefore they were rather struggling with the tools as opposed to being able to carry out interesting investigations. In anticipation of this we had given a number of preliminary workshops on the technology to give the students the required background skills but some students required more. Ideally when students become really stuck we should be able to intervene and provide guidance and advice including for all parts including the technical ones. We will need to improve on this next year. As a future development, the students would need to learn the related digital media tools in advance, so that by the time they start the project they will be capable of using the computer for the enquiry and exploration and this will allow the students to focus on the enquiry itself.

Teaching and research

There has been interplay between my research and my teaching; an interesting aspect of the approach I presented (and also a challenge) is that it was derived from my current research activities within an ongoing research project that investigates the relation between people, technology, and space. My teaching approach blurred the line between research and teaching and the students were actively involved in a research project. This was valuable because it has encouraged the students to explore and present their own interpretations, which was an essential part of the whole process. However, teaching and research may require different kinds of spaces and they may not serve to enhance each other. Research consists in the discovery or creation of new knowledge whereas teaching is the passing on of established understanding (Rowland, 2006). Drawing on my experience in setting up the DSS project, and having gone through the experience and the struggle with the various variables of the teaching objectives vs. the research agenda and the time and budget constraints. This raises the issue of the extent to which my research could and should 'inform' my teaching. I argue that understanding the role of discovery in learning within the DSS module, which explores an evolving field on the cutting edge of the research, is very crucial and hence teaching and learning can be mutually enhancing research. "If discovery is an important aspect of learning, as it is of research, then it could serve to link teaching and research: the space for discovery could be a requirement of each" (Rowland, 2006).

Collaboration

Having mentioned previously the positive aspects of collaboration, it is essential to mention also the drawbacks. A group of students consists of many individuals all of whom have important ideas to share and roles to play and this may promote reflective learning. However, it is important to strike a balance between the need to increase collaboration within the group against the significance of individual student development. From my observations of the group dynamics, I found that within different groups the computer related tasks (e.g. modeling and visualization) were carried out by one (or in some cases two students) that more technically adept then others. This has led to the division of labor and as a result not every student had the chance to be exposed to the same learning experience. We will need to improve on this next year.

Conclusion

New technologies and methodologies are constantly being incorporated into architectural practice and education. These provide tools that promote new modes of engagement with older questions.

However, there are issues and risks inherent in such adoptions. Among these is the possibility that some of the means of representing and communicating knowledge that are particular to architecture may be lost or, conversely, that the potential of new technologies may not be fully developed.

In this paper I have presented my approach in teaching the module 'Digital Space and Society' as part of the MSc AAC course at UCL. This approach is inspired by the design studio culture, and way of thinking, which integrates the three environments of: teaching, discovery (research), and application (practice).

I presented an attempt to draw attention to the possibilities and risks offered by the integration of new technologies into the architectural teaching in a module that explores the relationship with technology, space and people. The work presented in this paper raises the question to what extent research can and should 'inform' teaching. I did not think my research work should be completely divorced from my teaching work. I believe that it would be a valuable experience for the students to be involved in a live research project. For the students this meant that they were able to experience first hand that their tutors were also on a learning curve with respect to the new technology. Teaching in the form of a research led project was successful in meeting its goals of stimulating the students to reflect on different aspects of the relation between technology and the built environment. Evidence of this came from their report on, for instance, issues related to privacy and security within the urban space, which demonstrated aspects of awareness and critical thinking.

This experience has posed a rewarding opportunity and also challenges and dilemmas. One of the interesting aspects that unfold during carrying out the project is that the assumption that tutors act as keepers and distributor of knowledge was no longer valid. The teaching exercise blurred the line between teaching and research as the students were actively involved in a research project themselves. This has proved to be very valuable as it has facilitated active exchange of ideas, promoting creative exploration, and providing a collaborative learning environment with shared responsibility. Another interesting issue that was highlighted during carrying out the project is related to group work and collaboration, which may provide advantages but also drawbacks. All these aspect made learning perhaps rather challenging but also more enjoyable.

As part of our ongoing work is developing the curriculum within the module in particular and within the larger context of developing the curriculum at the whole MSc programme in general. One of the big challenges in developing curricula is to ensure that the three domains (knowledge, action and self) are adequately represented and more importantly that are sufficiently integrated (Barnett et al, 2001).

How can we best put together a curriculum experience that will enable us to achieve our aims? And how will we evaluate whether our curriculum is working? Considerably more investigations and deeper reflections are required in order to address this question and ultimately help inform a truly engaging and inspiring learning environment that will better prepare designers and architects for an ever changing world within the digital Age.

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