Landscape + Architecture: An Interdisciplinary Design-Build Teaching Approach

This paper focuses on the experiences of a landscape architecture educator who has been assisting an architecture-based Design-Build studio since 2006. This paper reflects on a series of five Design-Build "Mexico Project" case studies covering the nature of interdisciplinary Design-Build education. It clearly points out the benefits of these teaching methods and includes a reflection on the strengths and weaknesses of this approach.

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INTRODUCTION

The complexity of today's architectural tasks necessitates interdisciplinary cooperation to find solutions. The associated professions require highly qualified employees with specialised knowledge and skills across disciplines. These requirements are however often not reflected in current academic curricula.

The "Mexico Project" is a Design-Build studio that introduces an interdisciplinary teaching approach to the field of the built environment. These teaching methods allow the students to tackle more complex planning tasks and develop more holistic design solutions. The project aims to establish an educational infrastructure that reflects "real life" design processes. Architects, Landscape Architects, Engineers and Craftsmen participate in the project which is run by educators from differing disciplines. Each discipline has specific goals and priorities within the project that are reflected in the teaching programme. The participants gain a deeper understanding of architectural concepts und benefit immensely from increased peer learning. By working in interdisciplinary teams and being supervised by educators from other disciplines they become more sensitive to the interests of other disciplines and gain multidisciplinary communication skills.

The"Mexico Projects" go far beyond the need for functional necessity by addressing the broader needs of the client and community. We not only focus on the built structure itself, but also on the entire site, its relation to the surroundings and the process itself, bringing people and cultures together for a common goal.

Conventional studies in architecture tend to focus on disciplinary teaching methods, follow their own profession-specific trends and aesthetic values whilst focusing on the one off "featured" architecture of "star architects". This is propagated by architectural journals, competitions and architectural awards. These publications

portray “clean” images of the finished product, often taken soon after completion, without any sign of usage or the user. Interdisciplinary teaching methods help to counterbalance this by challenging each profession with other schools of thought, forcing debate, broadening horizons and negotiating shared solutions.

> “Students learn a great deal by explaining their ideas to others and by participating in activities in which they can learn from their peers” (1).

The complexity of our Design-Build tasks requires a comprehensive approach by an interdisciplinary design team. Each participant brings a wealth of disciplinary knowledge, individual skills and experience to a project team. The process of peer learning and knowledge exchange is multiplied within multiple disciplinary project teams throughout the research, planning and construction processes. This interaction increases group independency and communication between students.

Each project aims to become a model for future developments in the region with regard to; the holistic design approach, interdisciplinary planning and construction process, exemplary use of materials and construction techniques, planning for all users (incl. children, senior citizens) and the equal role of women throughout the planning and construction phase. The projects receive a high level of interest from the community itself and throughout the state. Visitors often come to the site during the construction period and after completion, to examine our construction techniques, design detailing or to see how we use local materials

STUDENT EMPOWERMENT

In our projects the students take on the full responsibility for the final results. The role of the educators is to guide and advise the group throughout this process. In order to achieve this, responsibility for the project needs to be transferred to the students step by step from the preliminary planning phase through to the construction process. Upon the beginning of the construction phase the students need to take full responsibility for the project. Each individual student becomes responsible y for a part of the design, and is accountable for its implementation on site. Leading positions (group leaders, site foreman etc.) are set for certain periods thus allowing for changing roles throughout the various project phases.

PROJECT STRUCTURE

The interdisciplinary projects featured here follow the following basic structure.

1) Project Application

The students apply by submitting their curriculum vitae together with a letter of support, explaining why they want to participate in the program. To tackle the complex assignments we put together interdisciplinary, international and multicultural project teams comprising students of architecture, landscape architecture, urban planning and construction engineering. We select a diverse project team composed of members with different qualifications, disciplines and skills. For a “Mexico project” team you need people who can develop innovative ideas, are technically skilled or are graphically gifted and people who can motivate others. You also need childminders, musicians and people who can cook. Depending on the complexity of the project construction it is sometimes necessary to seek craftsmen to assist in the construction process.

2) Design Seminar and Project, winter semester: (15 weeks)

The project begins with an intensive research seminar where we study local building traditions, contemporary architecture/landscape architecture, processes, materials, construction techniques, politics, the culture and cultural peculiarities.

This is followed by the design phase that encompasses the following:
Project research:
- Project Goals, objectives
- Analysis of client requirements
- Facility Programming
- Construction methods and materials
- Survey and analysis of site and surroundings
- Funding
- Best practices

Preliminary Design (run as a design competition)
Final Design
Structural engineering
Costings
Construction Documents
Construction schedule and logistics

The design phase is supported by specialist lectures and seminars: e.g. timber construction, concrete works or adobe construction. Material, construction and first aid workshops may also be necessary at this stage of the project. We also organise a lecture on team building, group dynamics and how to cope with conflicts.

3) Construction Phase: (6-7 weeks, during the winter break)
Implementation of the planned projects

4) Follow-up Seminar: summer semester: (15 weeks)
Documentation of the results in the form of a film, exhibition, brochure and final public presentation

CASE STUDIES

The following case studies are all located in the state of Oaxaca in south Mexico. The state is crossed by three enormous mountain ranges, with altitudes ranging from sea level up to 3,750 metres, which serve as barriers to the winds coming from the Gulf of Mexico and Pacific Ocean. The local climate varies greatly with altitude. Similarly, the flora is incredibly diverse, with about thirty thousand different plant species within the state. The rainy season in the summer and early autumn is paralleled by the hurricane season. The capital city of Oaxaca lies in the central Oaxaca Valley with a population of about 260,000 (year 2010) and is the main market centre within the state. The cultural diversity of Oaxaca is especially high, with 18 different indigenous groups registered within the state. A large part of the population is farmers, growing mainly mangoes and coffee. Most Oaxacans speak Spanish as their first language, however about a third of the population speak indigenous languages. Oaxaca has a very high level of marginalisation, so that each year many Oaxacans (mainly male) migrate north in search of better opportunities in other Mexican states or with the intention of crossing the border into the United States (2).

Mexico is one of the most tectonically active countries in the world; Oaxaca itself experiences regular earthquakes of differing magnitudes. Therefore, when building in the region, it is essential to consider the concepts and principles of seismic design and construction. The rainy season and long dry summers generate an important need for rainwater management measures as well as the need for mechanical methods to control and prevent erosion. There is also a need to store rainwater for later use, either for cleaning or for watering plants.

In the design phase it is important to be clear of the specific requirements for external space in Mexico. The climate allows a large part of life to take place outdoors

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throughout the year. This leads to the intensive use of open spaces which needs to be taken into consideration when planning the site. However, because of the strong sunlight, it's hardly possible to stay outdoors for long periods without protection from the sun, so it is particularly important to create outdoor shaded spaces for daytime activities.

There are hardly any attractive and safe play areas or play equipment for children in Mexico. Local children follow their basic needs and play with whatever is within reach and excites their imagination. New developments need to be designed to allow for various forms of formal and informal play, for children of all ages.

CASE STUDY: SAN MARTÍN ITUNYOSO - PHASE 1 (2007/08)

Client: Children's home "Casa Hogar"

Project Team
Educators: Architect, Landscape Architect, Construction Engineer

Participants:
Students of the TUBerlin: 12 Architecture, 5 Landscape Architecture
Students of the TU-Dresden: 1 Construction Engineering
Students of the UNAM, Mexiko City: 6 Architecture, Craftsmen, 2 Carpenters
Local support: Support from the local nuns and women from the village

Design brief: Planning and construction of a meeting room and exterior outdoor play facilities for the Casa Hogar, a children's home located in the village.
A particular difficulty in the planning phase was that we did not know what materials were available on site and whether there would be a possibility to hire tools or equipment nearby. This led to several variants having to be developed.

Figure 1:*View towards meeting room,* copyright by TU-Berlin

The interdisciplinary nature of the project is clearly reflected in the design of the site with strong design and functional relationships between interior and exterior space. The newly created plaza acts as a central node of the site. It is a place to play and for events, it mediates between new and existing buildings while permitting views towards the hillside. The building blends into the surrounding landscape and opens up to the existing buildings, the garden and the playing field. The play areas were set so that they form design highlights in the landscape and complement the wide potential use of the new building.

On the construction site the interdisciplinary cooperation was of great advantage. The participants themselves could oversee their planned elements through to completion. Our engineer was available, so that planning changes could be incorporated on the spot. The carpenters supervised the timber construction workshop and supplemented our overall skills with their diverse construction experience. The construction took place mainly in interdisciplinary groups, however some of the tasks required specialist knowledge from skilled professionals.

CASE STUDIES: GUADALUPE MIRAMAR AND SAN MARTÍN ITUNYOSO (2008/09)

Educators: Architect, Landscape Architect, Construction Engineer

Participants:
Students of the TUBerlin: 13 Architecture, 8 Landscape Architecture
Students of the FH Eberswalde:1 Wood Technology
Craftsmen: 1 Carpenter
Local support: Support from members of the community

In 2009 two projects were implemented on culturally and climatically different sites in the region:of Tlaxiaco, Oaxaca. The design team was divided during the planning phase into two project specific groups that took responsibility for design and implementation. A regular student exchange took place between the two sites so that the special skills and knowledge of the participants could be meaningfully distributed, and so that the different cultural backgrounds were experienced.

CASE STUDY: GUADALUPE MIRAMAR

Client: UMCAMIX, Women's cooperative of coffee farmers

NGO: CAMPO, Oaxaca
Design brief: The women's cooperative required a meeting/schooling room, toilets, washing facilities and a guest room to supplement their existing grocery store and pharmacy.

Guadalupe Miramar is a small mountain village in the Mixteca Alta mountains. The main challenge for the project team was to fit the diverse and complex requirements of the client on the small and steeply sloped construction site. We decided to build a second storey extension using a lightweight timber construction method above their existing building as a meeting room with a separate guest room. Free standing steps connect the upper storey to the garden and lower storey. In the small garden we built an open kitchen with stove (Comal) and washing facilities. The ecological compost toilets were integrated into the garden space and make the building trio complete.

Due to the implications associated with placing the buildings into the steep slopes, access and circulation, slope stabilisation, erosion control and rainwater management needed to be considered in detail. The landscape architects planned paths and steps on the steep hillside property to connect the three levels (ground floor,

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garden, second storey) and the various elements together. The rainwater management system allows for surface and roof rainwater to flow freely from the site. A rainwater tank was installed to store rainwater for later use. Due to the lack of detailed site plans and soil analysis many of these measures needed to be planned on site.

CASE STUDY: SAN MARTÍN ITUNYOSO - PHASE 2

Client: Children's home "Casa Hogar"

Design brief: The children's home desired new compost toilets, a terrace and children's play equipment to complete the project from the previous year.

The students in San Martín Itunyoso completed the project which was started in the previous year in the children's home "Casa Hogar". A new terrace was constructed adjacent to the meeting room we built in the year before. We also installed composting toilets made of brick which made the existing unhygienic latrines superfluous. New paths and steps improve movement around the site. A new seesaw and swings complement the existing play areas and invite the children to explore new areas of the site.

A smaller construction team was necessary for this compact project; however the construction tasks were complex and diverse. It was necessary to exchange participants between the two sites throughout the construction period so that the skills and knowledge of the participants could be optimally distributed.

Figure 2:*View towards kitchen and second storey extension,* copyright by the author

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Figure 3: *View towards compost toilets,* copyright by the author

CASE STUDY: A SCHOOL FOR ZAACHILA (2009/10)

Client: The parish church of Zaachila

NGO: CAMPO, Oaxaca

Project Team
Educators: Architect, Landscape Architect, Construction Engineer

Participants:
Students of the TU-Berlin: 19 Architecture, 6 Landscape Architecture
Students of the FH-Eberswalde: 2 Carpenters
Students of the UNAM, Mexiko City: 3 Architecture
Local support: Local engineer from the village, adobe specialist, electrician, flooring specialists, support from members of the community

Design brief: To design and build classrooms and a multifunctional meeting room with play and sports facilities on the site of a former monastery.

This construction project was realised in the small town of Zaachila on the grounds of the main church of Santa Maria Natividad Zaachila. The site is located in the immediate vicinity of the Zapotec archaeological excavations, which was a special design challenge.

We designed the site as an analogy of the existing church complex, a network of courtyards and cloisters. The new building is set in the existing site and responds to existing rows of trees and buildings axes. The building acts as a transparent division of the courtyard by consisting largely of covered outdoor space. It connects the front

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courtyard (meeting room for events in the community) with the courtyard behind (for schooling and children's play). The result is an integrated design that allows the indoor and outdoor space to merge together. In the open part of the structure there is the meeting room and the library; classrooms form the ends of the structure. The covered open space allows for many uses e.g. as a meeting room, exhibition space or for teaching. It would also be possible to install play equipment for children on the open timber structure.

The single-storey structure was based on a modular timber building system. The dimensions of the construction followed the logic of the timber components with a standard size of size of 15x5x250 cm. In Mexico, timber is consistently cut to a length of 2.5 m for transportation; this corresponds to the loading width of the trucks. The wooden building structure is built on a concrete base, which protects the building from rainwater. The challenge of building and waterproofing the adobe walls was solved through discussion with local specialist craftsmen who still practice these rare old building techniques.

The focus of the landscape architecture was the integration of the building proposals into the existing infrastructure, site access and circulation, the design of play areas, a garden and rainwater management measures. Due to the hot climate, we designed the outdoor area as an extended living room with shaded seating areas and larger spaces for gatherings. The existing stage was upgraded with a new sunshade structure and painted by local children for the use of the community as a whole. We also planned a screened off area for the storage of equipment and waste.

Figure 4: Children´s courtyard view, copyright by the author

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CASE STUDY: SAN JERONIMO TECOATL (2011/12)
Client: Naxji, Women's cooperative of jam manufacturers

NGO: CAMPO, Oaxaca

Project Team
Educators: 2 Architects, Landscape Architect, Construction Engineer

Participants:
Students of the TU-Berlin: 15 Architecture, 3 Landscape Architecture, 1 Urban Design, 2 Construction Engineering
Students of the UNAM Mexiko City: 4 Architecture
Local support: Support from members of the cooperative

Design brief: A working kitchen and meeting rooms for the women's cooperative "Naxji"

The cooperative who produce jams and preserves required a working kitchen with an outdoor workspace, a meeting/teaching room, toilets, a terraced orchard and spaces both inside and out in which to gather. In accordance with our principles of inclusion we expanded our original brief to include play equipment for the children of the cooperative staff and visitors.

During the preparation semester we developed a design based on the construction of a building arrangement around a central patio. Upon arrival we realised that the site was completely different to our expectations, the incline was much steeper and the plateau, where the construction of our building arrangement was proposed, did not exist. The students needed to adapt the entire master plan to the real site conditions and develop new technical solutions. The interdisciplinary design team took a positive approach to the problematic situation and were able to completely

Figure 5: View between the kitchen and meeting room, copyright by the author

change the site layout in a short period of time, whilst managing to profit from the new situation.

The upper building needed to be cut into the steep slope. This involved moving large amounts of earth and an essential new need for slope stabilisation and erosion control. The steep slope between the 2 buildings was designed as a terraced communication, gathering and teaching space. This also forms the main entrance space and was therefore constructed using natural stone. The upper part of the site was designed as a terraced orchard for the production of fruit.

ANALYSIS

The benefits of interdisciplinary education or approaches within the case studies are wide ranging. The projects profit from a broader based design strategy, the optimisation of resources, multifunctionality and an increased acceptance of the client through a thorough handling of task.

STRENGTHS AND POTENTIALS

The strengths of conducting interdisciplinary Design-Build projects are, for example:

- Improved communication between disciplines
- Improved acceptance of each individual discipline
- Improved understanding of relationship between disciplines, specific roles and tasks
- Enhancement of peer learning
- Enable a holistic design approach
- Improvement of client relationship
- Building shared theories or ideologies between disciplines
- Development of professional and ethical principles
- Win-win situation for all stakeholders – clients, students, NGO´s, users
- Stimulation of practice related technical, social and cultural knowledge-transfer
- Foster cooperation
- Broad base of skills and knowledge for solving problems that arise throughout the project
- Viewing tasks from many perspectives improves the sustainability of the projects
- Profit from synergies between architecture and landscape
- Participants establish interdisciplinary networks, partners, friendship
- Social/ cultural gains from the intensity of the process of planning and implementing the project, sharing, working and living together.

WEAKNESSES AND DEFICITS

The key challenges that academics face in conducting interdisciplinary Design-Build projects are:

- Increased project complexity
- Increase in required manpower; ideally need educators from each discipline involved
- The increased workload necessary for Design-Build projects is often not rewarded with regard to working time and remuneration for educators as well as study credits for the students. The projects therefore rely on personal engagement way beyond the bounds of “normal” academic projects
- Increased conflict potential between disciplines, individuals and groups , especially when financing is cut or time is scarce
- Many participants involved in interdisciplinary work find it far more difficult and time consuming (never ending discussions, need for compromise etc.)
- Discipline-specific vocabularies and terminologies can often hinder communication (3).

- Differing expectations, objectives, motivation, theories, methods or ideologies, approach, way of working, cultures etc.
- The administration of universities often complicates collaboration
- The mutual recognition of periods of study between disciplines

In order to enforce the Design-Build methodology and interdisciplinary teaching methods we need to spend more time in evaluating the project outcomes. In order to do this we firstly need to develop a multifaceted evaluation methodology. This should include an evaluation of the following:

- Completed projects; design and technical aspects
- Social impact of the project
- Client, NGO and user assessment of project
- Teacher evaluation
- Teaching aspects, course content
- Assessment of the interdisciplinary teaching methods/ outcomes
- Self-assessment by the students

As educators we need to focus more on the processes of decision making and conflict management. A system for discussion making and/or conflict management needs to be set up and practiced throughout the preparative semester, for example to find integrated solutions or compromises between individuals, groups or disciplines. We also need to raise awareness of the benefits of interaction between disciplines.

Namian states that strong leadership is necessary especially at the start and end phase (publication) of interdisciplinary work (4). This reflects our experiences; the educators provide intensive input throughout the design phase and assist the construction phase. The follow up documentation and presentation semester needs to be well structured in order that the enthusiasm doesn't fizzle out.

CONCLUSIONS

The case studies challenge standard practices for traditional design studios, and show how we can enhance education in the built environment by implementing interdisciplinary teaching methods. These methods not only intensify and multiply the learning experience but also provide students with holistic qualities that are essential to the profession today.

The project aims to achieve a balance between innovation, good architectural practice, the technical qualities of the result, as well as making a contribution to poverty alleviation. The projects achieve a win-win situation for clients, NGO´s, users, students and other stakeholders. Students receive a valuable opportunity to work in an interdisciplinary team with a real client and realise their own ideas. The client receives a well-designed and thoroughly planned structure. The educators achieve their pedagogical and possible research objectives.

A transdisciplinary approach to the projects could enhance the project outcomes through a combined spatial and cultural analysis. The projects would profit from the viewpoints of other disciplines such as sociology, ecology, geography or economics. However, gathering a pool of experts from various university faculties would be very demanding in terms of coordination and time.

These projects represent an exemplary way to combine the synergistic potentials of teaching, research, practice, and development cooperation. Interdisciplinarity in teaching and practice is essential for developing more balanced living environments in the future.

ENDNOTES

1. Boud, D. (2001). *'Introduction: Making the Move to Peer Learning'*. In Boud, D., Cohen, Ruth & Sampson, Jane (Ed.). Peer Learning in Higher Education: Learning From & With Each Other. London: Kogan Page Ltd, 1–17.
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