How to organize design studios eligible for multidisciplinarity: a case study of clustered design studios

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Abstract

Eindhoven University focuses on multidisciplinary design incorporating four major disciplines: Architecture, Technology, Management, and Urbanism. Learning how to design is a key ingredient in all and is taught in studios (12-15 students supervised by 1 tutor). With over twenty studios and tutors it has always been problematic to reach uniformity in approaches.

A new model of organizing studios is developed since 2001. Still groups of 12-15 students, but now four groups are clustered in a special way. A cluster is housed in a large classroom, where anyone (of 50-60 students) is able to seek feedback from each one of the four tutors. So there is always a tutor with a discipline close to a student's individual interest. Clustering studios also facilitates mutual observations and discussions of weak students.

All students are individually marked by four tutors resulting in a more objective evaluation. Further uniformity within studios is improved by interchange of tutors in time.

Keywords: design studio; multidisciplinarity; organization.

1 Introduction

The department Architecture, Building and Planning at Eindhoven University of Technology (TU/e) is established as a multidisciplinary education to prepare architects, structural engineers and construction engineers for multidisciplinary design teams (Swagten, Moonen, & Wennekes, 2010). During early years many other disciplines such as building physics, urbanism, real estate, planning, product development, construction management and design support systems are added, resulting in a program with a complete scope of building disciplines. All tracks in the Master Architecture, Building and Planning focus on educating engineers able to collaborate in multidisciplinary design teams. For this reason all freshmen have to learn how to design. Indeed, design skills are a major selection criterion for all master tracks (architecture as well as technical engineering as well as programs leading to building or planning managers).

From the founding of the department in 1969 learning how to design has always been organized in design studios. Learning how to design via studios is widely adopted (Goldschmidt, Hochman, & Dafni, 2010; Salama, & Wilkinson, 2007). In 2000 all Departments of Eindhoven University decided to integrate professional design projects using design-based learning (DBL). In this educational approach, students learn to integrate and apply knowledge (Wijnen, 2000). DBL is grounded in educational principles of problem-based learning (PBL) (Graaff, & Kolmos, 2003) assuming that knowledge that is accumulated and acquired during the school's year in courses and lectures is applied in professional projects in a studio setting. This is based on the idea that students develop inquiry skills and integrate theoretical knowledge by solving ill-defined problems (Kolodner, Camp, Crismond, Fasse, Gray, Holbrook, Puntambekar, & Ryan, 2003). In higher education, there are considerable differences between domains, particularly in the characteristics of the projects, the role of the teacher, and the design elements (Gómez Puente, Eijck, & Jochems, 2013).

The Department of the Built Environment at TU/e organizes DBL in the first year of the Bachelor in studios of 12-15 students, supervised by a tutor and assisted by a teaching assistant (a master student). Within our memory there have always been attempts to gear methods and assessments in the various studios to one another. But since tutors often had quite different backgrounds there was little success in developing a uniform method in all studios. With over twenty studios (and tutors) the Department faced each year complaints of students as well as staff. The major complaint of students was (alleged) dissimilarity in assessments and marks. Over the years there were on average 5-6 requests for a second opinion (out of about 240 students), which often lead to fierce internal discussions of the teaching staff. The criticism of the staff affected drop outs of students that they thought were capable for a specific discipline (special when a student's preference deviates from the tutor's discipline) as well as questionable transfers of students into the second year.

Figure 1: Typical scenes of different design studios until 2001 (with both a tutor and a teaching assistant discussing design methods): same assignment / different methods and results

Figure 1 shows two typical design studios in the former organization visualising that similar assignments were organised complete different (while both studios presented at the end more or less the same output).This former organization of design studios is outlined in Figure 2 where four (out of twenty studios) are drawn as an example. In each studio 15 students are supervised by a tutor and a teaching assistant (senior student).

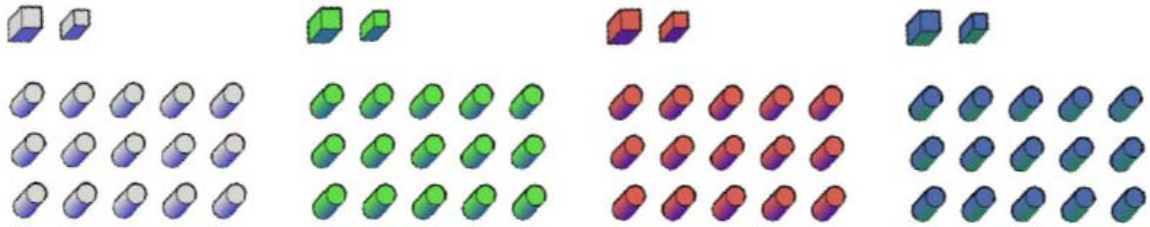

Figure 2: scheme of former organization showing 4 separated studios of 15 students (thus in total 60 students, indicated by cylinders in 4 different colors). Each studio is supervised by 1 tutor (indicated by larger cube) and 1 teaching assistant (smaller cube)

2 Combined design studios in a cluster of four

The method of working in design studios is improved from 2001 and on, and was based on a pilot project (shown in Figure 4). Figure 3 shows this reshuffling in a scheme using the symbols as in Figure 2. In Figure 3 the same four design studios as represented in Figure 2 are outlined in the new organisation set-up. Figure 4 shows this cluster of four studios in a photo. In both schemes (Figure 2 and Figure 3) the number of students is alike and also the number of tutors and teaching assistants is unchanged. In both organisational set-ups the overall teaching capacity is similar. The main difference (yet *very important* difference) is that students are randomly spread over a large room, as showed in Figure 4. By randomly mixing all students belonging to four different groups, all four tutors as well as all four teaching assistants have to spread over the room to supervise one's own students. In this way each student will automatically get into close contact with all supervisors of the cluster. Students will immediately notice different styles of coaching when adjacent students experience different approaches from other tutors when asking almost the same questions. In this organisational set-up each student will seek supervision of a tutor whose approach is the closest to one's individual interest.

At the same time a group of 15 students is still allocated to a specific tutor to ensure that there is at least one tutor who observes the full design process of a student. This tutor is committed to supervise all 15 students of a group (scattered over the large room) at least once a week. The remaining time for supervision of a tutor can be used to support any other of 45 students on individual requests. This arrangement embeds that there are no "lost" students and at the same time that there is at least one tutor who considers all aspects regarding the process during designing. This tutor will inform all other tutors about his observations at evaluation points, which at the end lead to individual marks per student by mutual decision of all tutors involved.

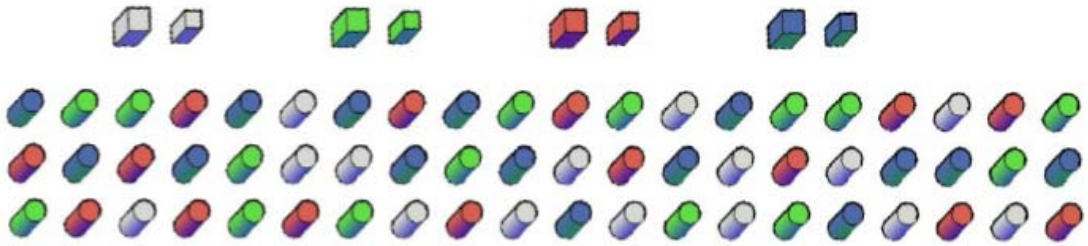

Figure 3: scheme of the same four studios of Figure 2, now organized in a cluster. Same overall number of students, (indicated by cylinders), tutors (indicated by the larger cubes) and teaching assistants (indicated by the smaller cubes) compared to the original situation. The colors show that students are scattered all over the room, so a supervisor will get close to all other students when coaching the fifteen students of one group.

The early projects clearly showed that mixing groups is a major aspect to make this organisation a success. This was experienced in early years where some clusters allowed students to reshuffle in the room during the semester. Since most assignments start with group explanations, it was found that in these clusters students tended to reassemble in no time to separate groups supervised by one tutor. Although also these clusters started in a scattered set-up, the arrangement rapidly changed from a mixed group to “four design studios in the same room”. Consequently the supervisors didn’t spread over the room as planned. The end result was that there were almost no advantages of mixed supervisions but lots of disadvantages of having four different noisy groups without interaction in a large room.

In today’s clustered studio there is special attention in early weeks to emphasize that students remain in a mixed set-up. After some weeks students are used to this unusual arrangement and don’t worry about working in this way.

Figure 4: Photo of four combined design studios in a cluster (50-60 students)

3 Advantages of clustered design studios

The major advantage is that all students get in close touch with differing styles of coaching since a student is free to select a specific tutor whose approach is closest to one’s individual interest. On the other hand each student is also accountable to the initial tutor in weekly supervision sessions. Yet by consulting other tutors a student will learn to deal with different opinions and visions, so at the end a student’s way of expressing (in words and drawings) improves.

Another major advantage is that several supervisors consult and debate about differences in marks. This is an ongoing process based on specific examples of typical work (often caused by a divergent outcome of one student’s findings out of a large group of almost similar assignments). From the beginning tutors are exchanged yearly over different clusters. In this way the level of assignments in all design studios has become more objective over the years.

Figure 5: Even though students normally work in large design studios this set-up easily deals with individually monitoring of every student (giving guidance once a week in a person-to-person setting or in a small group)

Also a key aspect is that every student is assessed by multiple tutors. In this way special qualities in design of individual students can be expressed. And the number of complaints regarding the final marks is dramatically reduced. Nowadays it is very rare to receive a request for a second opinion from a student who is dissatisfied with the final score. A salient aspect is that tutors in clustered group are more critical compared to separate studios. This effect was not expected but is a consequence of the method of working of assigning by a group of tutors. In today's situation there is always a tutor who is well acquainted with a student's design process, some tutors know this process roughly but there are also tutors who receive the outcome of a student for the first time. Discussion between a tutor who for instance feels sympathy to a hard working student and a tutor who only knows the outcome in hard results often leads to a more explicit mark. This is concluded from the former situation with separated studios where the percentage of drop outs has been about 25-30% percent. From the remaining students less than 5 % failed. Most of these failed students made a complaint to the Exam Committee and requested a second opinion. Today, in the clustered studios the percentage of drop outs remains the same (25-30 %). But now, approximately 15% of the remaining students fail while at the same time the number of requests for second opinions is reduced to about 0,5% (less than 1 per two semesters).

Another positive aspect is that working hours of the four tutors can be schedule such that there is always one tutor available on days that the design studio is scheduled. Students will work more frequently in the studio instead of working at home. The major advantage is that it takes less effort to make students more receptive to discussions of fellow students in the early stages of a design process. Supervision in a cooperation of four tutors also appears favourable when arranging replacements in case of illness or in case of absence (for instant if a tutor visits a conference).

Every academic year all available tutors are arranged in such a way to have disciplines equally divided over all clusters. Special care is taken to link newly employed tutors to well experienced tutors. This enables new tutors to adopt existing methods and practices just by following someone's lead. In this way new tutors can bring in new ideas but within the context of uniformity in all clusters.

And specific for the situation at Eindhoven University of Technology where quite different disciplines are gathered together in one Department, this set-up of clusters helps to improve on the interdisciplinary character of the Departments' staff because of employees working very close together (and having many discussions about the quintessence of different domains in building).

Figure 6: hardly any difference is noticed in peer-coaching among students in autonomous design studios (12-15 students) and clustered design studios (50-60 students)

4 Disadvantages of clustered design studios

Composing cooperative teams for all clusters is more difficult compared to single design studios, as an optimal mix has to be found regarding criteria for tutors regarding content (for example availability of required disciplines), regarding organization (for example linking novel tutors to experienced tutors) and regarding individuals (for example facilitating good teamwork). In actual practice the last criterion (individual virtues and vices) is often decisive in arranging teams in clusters. In recent years a variety of specialist were brought together, at times resulting in unexpected recognitions but also from time to time in internal conflicts. Effective cooperation is always depending to what extent tutors in a team respect individual methods and approaches of the other tutors. If this factor is underestimated one gets a set-up where an individual tutor might tend to correct directives and instruction given to undergraduates by other tutors. In addition to observing this process in a cluster, an indicator of adverse cooperation is found when tutors complain regarding lack of time for supervising their own groups or other complaints of being understaffed.

Facing first-year students with four tutors (and four teaching assistants) giving guidance to the same problem from all different perspectives is often confusing for novice students in the beginning. For this reason -yet also to meet requirements of exploration, selection and reference of freshmen regarding possibilities and skills in designing- the supervising team stays unchanged in each cluster during the first year of the study. Yet at the end, dealing and coping with conflicting directions of tutors is considered more an achievement than a disadvantage.

A real disadvantage regards the overall time required to grade individual results. Grading 50-60 projects is in itself a laborious task. Mutual marks make this even more time-consuming. Today this is brought under control to some extent by splitting up the cluster into two groups. So when final presentations are given two tutors grade half the cluster (about 30 students). Afterwards all unsatisfactory marks can be reconsidered by all four tutors (as well as all excellent marks).

Figure 7: In a clustered studio, students of different tutor groups extensively discuss each other's progress.

5 Conclusion

Even though one would think that enlarging design studios is in contradiction to improved education this is not necessarily the case. However it does require an explicit policy in the way design studios are organized. A crucial aspect is that a maximum of 12-15 students are assigned to one tutor, with weekly meetings including personal attention. Since the assigned students mix with a large group in a cluster special effort is required to assure that a tutor keeps up with the individual progress of every single student. But on the other hand it is also crucial that a group assigned to one tutor is not allowed to gather as a separate group. If this occurs one ends up with four separated groups causing more inconvenience to one another instead of deriving benefit from different tutors. In practice it is not difficult to keep students mixed in a cluster; this only requires special attention in the first weeks.

The main advantage of mixing studios in a cluster is that any student will notify differing methods of supervising and dissenting perspectives for the same issue when listening to another tutor when coaching a student nearby. Being part of a mixed group a student will have an easy way of addressing another tutor who's approach is closer to his individual interest (of course additional to the weekly meetings with the student's assigned tutor). Consulting another tutor with a different opinion will in the long run improve a student's communication skills. Another benefit is that mixed tutors can match their individual working hours to arrange daily coaching when students are supposed to participate in a design studio. So even though working hours of tutors do not correspond with the total hours of a design studio there is still always at least one of the tutors present to supervise.

In addition, tutors also benefit since they too will notice other methods of teaching or ways to explain a topic. On the supposition that a tutor respects approaches of fellow-tutors, inspiring and instructive discussions among supervisors will occur. In time these discussions and gradually fine-tuning of process control leads to a better understanding of the essence of teaching in a design cluster as well as to more explicit criteria for marking. Because of this, tutors are exchanged over clusters on a yearly basis, resulting in an ongoing internal discussion and continuous levelling of assessments and marks. This leads to a more objective level of assignments in all design studios over the years.

Another attractive aspect is that staff in the department comes in close contact with one another and will get acquainted with the interests of others. A special benefit is that this set-up might improve the initiation of new staff members and simplifies absence through illness (or other reasons such as attending a conference) considerably.

The number of complaining students regarding marks is reduced when working in clustered studios. Nowadays a request for a second opinion regarding failing a studio is rather exceptional. Such request is only considered under exceptional conditions, since all students are already marked by several tutors in advance.

The drawback of clustering design studios is that this requires large working rooms and also a laborious way of marking all students. By splitting up the group during final presentations this can be somehow handled. Consensus within the team of tutors is required to harmonize marks that are assessed in separate sessions (duo assessments).

Composing a supervising team in a cluster deserves particular attention since criteria regarding content (availability of staff), organization and individuals (good teamwork) have to be considered.

In the beginning students have to get used to clustered design studios with lots of different opinions that on first thoughts seem conflicting. However at the end this is just a favourable result in teaching students how to handle design problems.

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