



Introduction to assessing Design-Based Learning (DBL) by applying the Evaluation Assessment Carousel

Abstract

Design-Based Learning (OntwerpGericht Onderwijs, OGO) as a method of teaching is broadly accepted. However, there is much debate about the method used to assess the outcome and the design process. Reflection on the process as well as on the contents is extremely important in DBL. Since reflection has to be learnt as part of learning how to design too, an evaluation method has been developed by Eindhoven University of Technology (TU/e) that is suitable for evoking abundant feedback to prospective designers. This method, called the Evaluation Assessment Carousel, is used for individuals as well as design teams and allows (many) guest critics to be involved. The Evaluation Assessment Carousel may be used for informal mid-term evaluations, but also for formal final presentations that are meant for formative marks of design assessments.

This document describes the method and explains how to set up an Evaluation Assessment Carousel.

Introduction

Today's society faces fast and radical changes making societal issues more and more complex. To keep up with these changes, engineering education needs to readjust. The increased amount of complex questions demanding an interdisciplinary approach requires engineering education to turn out more broadly educated engineers, who have a thorough knowledge of a specific discipline, but who are also able to cooperate in a team (Clough, 2004). In other words, engineering education needs to educate students who are specialists who are capable of keeping track with the total process. For engineering education this plausibly means that it's emphasis of assessment will move from testing *factual* knowledge towards assessing *application* of the knowledge in an interdisciplinary context. In this way students will be prepared later to cope with future demands.

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"In response to our current times of rapid change, we become increasingly aware of the need to look beyond conventional models of organization and to develop more appropriate cross-disciplinary models" (Lehmann, 2006, pp. 92-93). One method is to incorporate practical assignments in engineering education using *Problem-Based Learning* (PBL) or its derivative *Design-Based Learning* (DBL) (Graaff, E.d. & Kolmos, A., 2003). PBL and DBL are based on the idea that students develop inquiry skills and integrate theoretical knowledge by solving ill-defined problems (Kolodner, J.J.L.; Camp, P.J.; Crismond, D.; Fasse, B.; Gray, J.; Holbrook, J.; Puntambekar, S. & Ryan, M., 2003) to learn to integrate and apply knowledge (Wijnen, 2000). The Dutch equivalent of "Design-Based Learning" is *Ontwerp-Gericht Onderwijs*, with OGO as its abbreviation (Wijnen, 2000). OGO is widely adopted at the TU/e (Gómez Puente, S.M.; Eijck, M.v. & Jochems, W., 2013).

Design-based learning is "a method of learning in which the learners first encounter a problem, followed by a systematic, student-centred enquiry process" (Barrows & Tamblyn, 1980). In this way students have to apply knowledge that is accumulated and acquired during the school's year to reach to a solution to a specific problem (Wijnen, 2000). Discussion is essential in DBL to explore issues raised and to encourage learners to make their own decisions based upon their own interpretation and reflections of the specific case. Typically in DBL, "students work in small groups with a faculty tutor who acts as facilitator of discussions and of learning rather than as a direct source of information. During their work with a problem, students:

- first encounter a problem 'cold', without doing any preparatory study in the area of the problem;
- interact with each other to explore their existing knowledge as it relates to the problem;
- form and test hypotheses about the underlying mechanisms that might account for the problem (based on the current levels of knowledge);
- identify further learning needs for making progress with the problem;
- undertake self-study between group meetings to satisfy the identified learning needs;
- return to the group to integrate the newly gained knowledge and apply it to the problem" (Schwartz, Mennin, & Webb, 2001, p. Introduction 1)

The process in a DBL assignment is typically an iterative process implying that the last four steps are repeated as many times as necessary or as time permits.

Assessing problem-based learning assignments

Design-based learning (*OntwerpGericht Onderwijs*) as a method of teaching is broadly accepted, however the method used to assess the outcome and also the process often calls for a heated debate. It is beyond doubt that reflection on the process as well as on the contents is extremely important in DBL (OGO), and also that this reflection has to be learnt, since students have to deal with little specifications and uncertainty as well as the complexity of emergent phenomena. Students in DBL have to learn how

to negotiate “between what is known in general and the particulars of an individual context or setting. Design knowledge is often meta-knowledge, in that it may lean less toward ‘answers’ and more toward ‘methods leading to answers’ ” (Hoadley & Cox, 2009, p. 20). “In the design literature, there are only two nearly universally held principles. First, good design is iterative. Second, iterations only help if some feedback (data) is used to improve the design for the next iteration. [...] usually feedback includes some form of student assessment, classroom testing, or other data collection.” (Hoadley & Cox, 2009, p. 20). Page | 3
So, feedback is essential (as in any educational process) and has to be provided during the whole process as well as in the final assessment.

Different methods of assessing Design-Based Learning

Since assessing DBL is both important as debatable, a number of different methodologies have been developed. These methodologies differ in *how* to assess, *when* to assess and in *what* will be assessed, such as “students’ problem-solving skills, reasoning skills, and personal progress. For example, according to the classification by Swanson et al. (1998), there are outcome-oriented instruments¹, as well as process-oriented instruments², and tutor, peer, and self-assessment” (Hung, Jonassen, & Liu, 2008, p. 495). The meta-analysis of PBL research Gijbels et al. (2005) found that the effects of PBL varied mostly depending on the focus of the assessment instrument used with the most positive effect occurring if the assessment instrument focuses on assessing the understanding of principles. “This may explain the pattern seen in PBL research that traditional students performed better in basic knowledge acquisition while PBL students did better in application of knowledge” (Hung, Jonassen, & Liu, 2008, p. 495).

Assessment in DBL is usually done by some means of criticism often in a kind of a jury system. “Criticism is the act of making judgements and evaluations from tutors to students” (Graham, 2003) to communicate design knowledge, and to bridge the gap from theory to practice (Salama, 1995). “However, there is no standardized or normalized method of evaluation applicable to all situations and all times within the context of jury sessions [...] The objectivity of the evaluation criteria is always arguable. So is the objectivity of the evaluators” (Tural & Tural, 2006, p. 485). The process of providing 'critics' is time-consuming, gives “feeling of fear to most of the students and is ineffective to give substantive feedback to:

- the design.
- the design reasoning
- the oral and visual presentation techniques” (Proveniers, A. & Westra, J., 2009).

“Although some criticisms are well founded, the jury system nevertheless survives because it accomplishes goals otherwise impossible to obtain: it stimulates to some extent the reality of making presentations in practice; it reinforces the importance of meeting deadlines; it provides a forum for students to see each other’s work and for the faculty to see the work of students other than their own; and it encourages and reinforces development of both graphic and oral presentation skills. Most important, the intellectual discourse during a lively and thoughtful jury review is as valuable for students as any lecture or seminar. Insightful jurors pose vital and probing questions, challenge conventional

¹ such as the progress test (Vleuten van der, Verwijnen, & Wijnen, 1996), essay exams, oral and structured oral examinations, patient-management problems, clinical reasoning exercises (Wood, Cunnington, & Norman, 2000), problem-analysis questions (Des Marchais, Dumais, Jean, & Vu, 1993), and standardized patient-based tests

² such as the triple-jump-based exercises (Smith, 1993), Medical Independent Learning Exercise (MILE) (Feletti, Saunders, Smith, & Engel, 1984), the fourstep assessment test (4SAT) (Zimitat & Mifflin, 2003), and formative assessment (Neufeld, Woodward, & MacLeod, 1989)

thinking and assumptions, raise issues perhaps overlooked, and stimulate new thinking. Jury discussions can surprise not only the studio students but also the studio critic.

Like it or not, the architectural jury, which represents one of the unique, recurring experiences in architectural education, is here to stay.” (Lewis, 1998, p. 84).

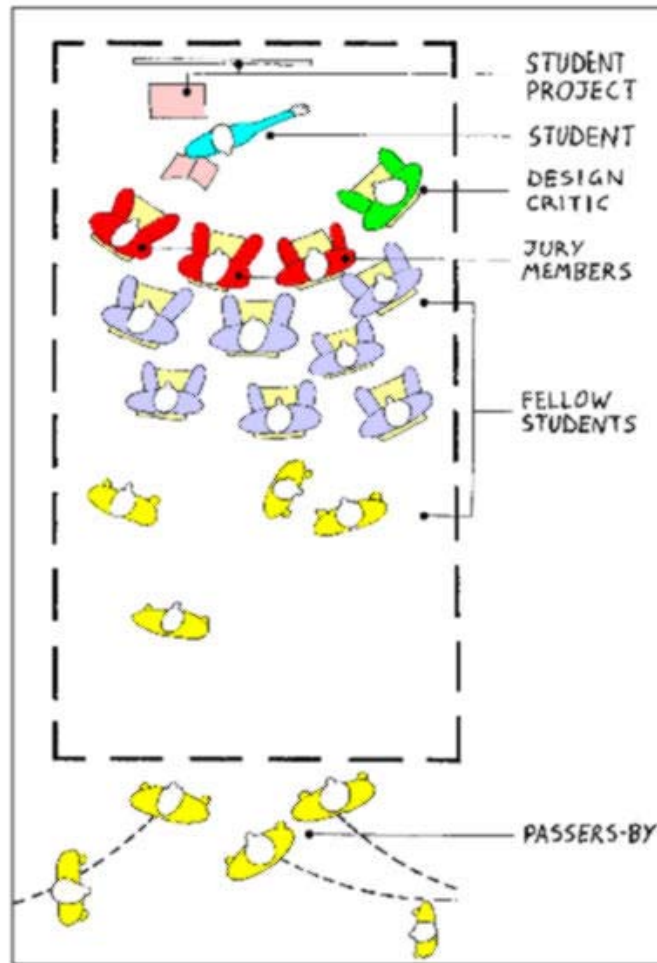
Assessing Design-Based Learning by a jury system

As discussed before, there is no uniformity in assessment systems and there is also no uniformity in jury systems. According to Anthony (1991) a differentiation is made between *closed* juries and *public* juries.

- The *closed* jury is the earliest jury used in PBL. A closed jury deliberates over the students' works (often regarding results as well as process) behind closed doors. In general a student's project is judged after much debate, however in most cases, the feedback to a student is just a grade that is accompanied with no more than a few comments for the student to read.
- A closed jury can criticize a students'
 - o presentation or
 - o pin-up / writing
- At present closed juries are still a major pedagogical method used in DBL in the form of *desk criticisms* given by tutors. Desk criticism has its drawback in providing feedback since this is often confined in practice; both in quality as well as quantity.

- Assessing in front of a *public* jury involves the presentation of students' work in an open meeting towards a jury. The public or open jury can consist of tutors, professors, faculty, classmates, as well as professionals from industry or prospective clients. A public jury allows for open criticism of students' works by the faculty but also leads to a kind of competition between students (and also tutors). Notes and grades are generated during the presentations. Public juries can be organized in different settings, such as:
 - *formal*: students direct their presentation towards a jury and receive feedback immediately after the presentation.
 - *informal*: students usually present in front of only classmates and tutors / professors. Feedback about the work is often provided by tutors / professors as well as classmates following the presentation.
 - *pin-up / writing*. In this type of review there is no verbal explanation of the results or process but a student simply prepares a presentation of his work by placing posters, models, drawings, et-cetera or by sending a report to the jurors. Jurors individually review the work without the presence or explanation of the student: the work must speak for itself (Anthony, 1991).

Although a public or open jury system usually provides more feedback compared to a closed jury system, the effect is debatable in both the qualitative as well as quantitative point of view. A primary reason is that most students feel that a jury presentation is a stressful way of presenting final work. Even though many students consider the informal review friendlier, it is still stressful. Since feedback is given directly after the presentation, when a student is still influenced by the excitement of the presentation and is still in the dark about the mark, feedback can be considered to be quite inefficient. Asking a student some time later to recall the criticisms on his work, most students find it difficult to restate a brief yet comprehensive outline of the comments received.



1. Scheme of the traditional review of PBL with “a presentation to rows of seated individuals” (Doidge, Sara, & Parnell, 2000), critics are seated in the front rows

A common argument for the public jury system is that juries openly state opinions and criticisms on student works to classmates and faculty. Even though this is a strong pro, in practice the effect is often disappointing since the set up and pressure of time does not allow a profound explanation of a given criticism. It is also noticeable that students who listen at open presentations are less motivated especially when their own presentation is already over and done. Students with feelings of nervousness and anxiety and the many students, who are fatigued when entering into a critique, make the educational revenue of the critique (generally) disappointing. Also, being in a set-up where there is little interaction between jury and listeners does not help to motivate.

Since the jury system in itself is an adequate way to review a project in DBL an alternative evaluation tool has been developed, called the Evaluation Assessment Carousel. This is an open jury system with a combination of the informal and “pin-up”-setting. The Evaluation Assessment Carousel was developed especially to generate much more feedback by the jury, both qualitative as well as quantitative. The Evaluation Assessment Carousel is explained in the next paragraph.

Evaluation Assessment Carousel

The Evaluation Assessment Carousel can be considered as an open jury system with a “pin-up”-set-up while the jury is split up and attends the presentations in a parallel yet very organized way.



2. Evaluation Assessment Carousel in an informal setting. This student team (1 of 20 participating teams) has pinned up posters and drawings and placed models on a table. Two jurors (from 7 tutors + 3 guests) are seated at the middle of the table and are listening. Other students are free to watch a presentation. (Also shown in figure 6 and 19)

Figure 2 shows a medium-sized Evaluation Assessment Carousel in an informal setting with 20 student-teams and 5 itinerant teams of jurors, while figure 3 shows a large-sized Evaluation Assessment Carousel with about 80 individual students and about 25 individual jurors (some of the critics are present in the full carousel, while others just participate in a part of the carousel). Proveniers et al (2009) describes the atmosphere of an Evaluation Assessment Carousel held in 2008 as a kind of admittance assessment for a Master's degree program in which about 120 students and about 25 critics participated, comparable with the setting showed in figure 3 [...] "the first students to arrive put their posters and models at the most eye-catching spots. Later [...] teachers and the first guests critics arrive who want to have a first preview to be better prepared. There is an air of light excitement [...]. For the teachers there is also some excitement: it is more or less a kind of assessment for them, too [...]. Beside academic and / or professional Guest Critics, [...] citizens are also invited. There is a growing excitement when starting time is near" (Proveniers, A. & Westra, J., 2009).

Both examples (figure 2 and 3) show that there are many variations possible; further details of variations can be found on page 15, 16 and 18.



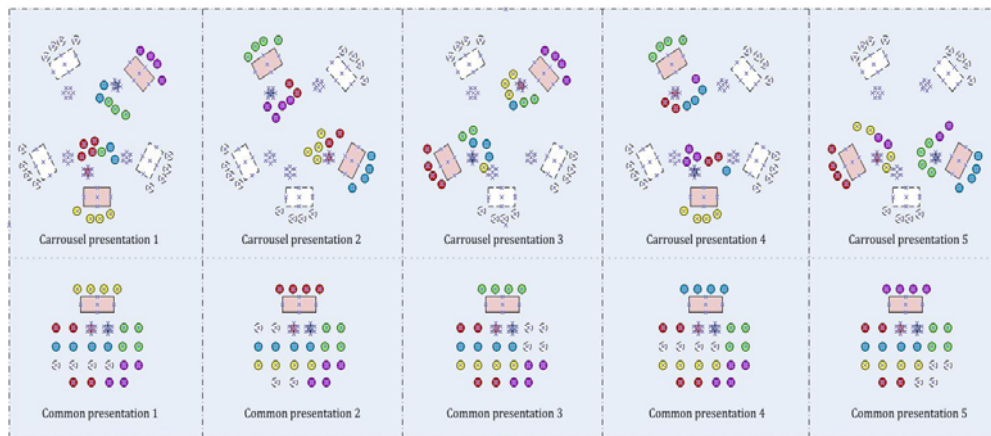
3. Example of an Evaluation Assessment Carousel in a more formal setting. About 80 students have pinned up posters, drawings and show models and there are about 25 jurors (5 tutors + about 20 colleagues and alumni as guest critics). The carousel starts with instructing all (photo left) followed by a series of rounds where individual critics attend presentations of individual students (same carousel is also shown in the figures 5, 9, 12, 15, and 18)

Basic principle of the Evaluation Assessment Carousel

The essence of the Evaluation Assessment Carousel is that students are appointed a fixed place to pin-up their results while critics move (rotate) to the presentations in a strictly organized manner. From a students' point of view, a good carousel is organized in such a way that, every presentation is followed by a round without a presentation (so the student can reflect immediately after the presentation, make notes, prepare adjustments to a presentation for a later round, or attend other students' presentations). Crucial to a proper carousel is a stringent time management with a time-referee to force critics to rotate strictly on time to a new presentation of the next round (and to keep track on the critics' individual program). Especially at the beginning of the carousel, critics tend to have warm discussions that have to be choked off by the time-referee to enable enough time for debates during the following rounds.

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The basic principle of the Evaluation Assessment Carousel can be best explained with a simple variant in which we consider five design teams who simultaneously present their ideas in the five positions of a hall (visualized in figure 4, top row). "Suppose there are two jurors who each visit a specific group. Both jurors act separately to each other because they attend two different design teams, both giving a parallel presentation. Then the jurors provide separate feedback to the two teams. At the end of the first session, the jurors move to other positions and the second session of presentations starts. After five sessions both jurors 'have made a full circle', and all design teams have received specific feedback from both jurors separately. In general, each presentation takes about ten minutes. After one round, a team has 'a time-out' of one round, to make notes regarding additional comments and ideas. The total time needed for this type of assessment equals the total time in a set-up where both jurors would have sat together to attend all presentations in a regular presentation sequence (figure 1 and 4).



4. Scheme of Evaluation Assessment Carousel (top row) compared to a traditional setup (bottom row, similar to the set-up sketched in figure 1). In this example both relate to 5 different teams (of 4 students) and 2 jurors. This scheme makes clear that the total time needed to assess all 5 teams is equally long (both have 5 timeslots for presenting).

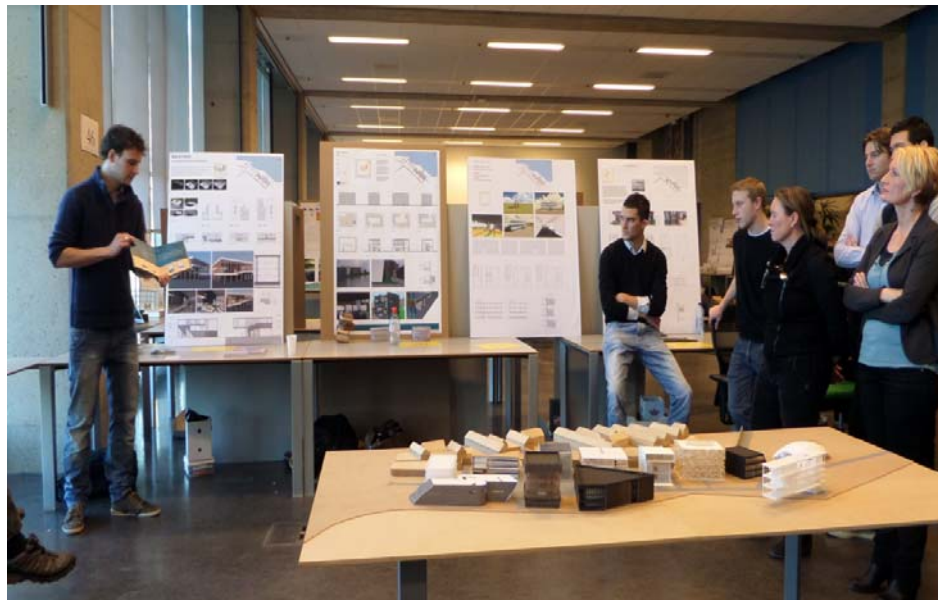
In figure 4 the two jurors are represented by ★ and all students with ○. The five design teams of four students can be distinguished by the different colours of the ○. In the traditional set-up (bottom row) all students are seated in a room with two jurors listening to a presentation by one team. In this example of five teams, five rounds are needed to enable all teams to present their results. In the equivalent set-up for the Evaluation Assessment Carousel (top row in figure 4) there are also five rounds needed to enable all design teams to present their work twice to both jurors. So here, each design team gives two presentations in the same time span. Each design team also receives (independent) feedback two times. In the scheme of the Evaluation Assessment Carousel students may choose which presentation by an other group they would like to attend (or to skip a presentation round to make notes

about their own presentation and feedback)" (Moonen, S.P.G. & Veeger, T.T., 2013). The scheme shown in figure 4 can also be interpreted as if a student team of four members is much bigger or smaller. Presentations by individual students can also follow the same scheme. The jurors can also be individuals (as shown in figure 4) or teams of jurors of any size (as elaborated on page 18).

The carousel in the top row of the scheme of figure 4 is just a simple carousel. However, "it really gets beneficial - and also exciting - when you scale it up to 20 or more presenters with 10 or more parallel Page | 8 presentations and you can also make a random mix of the jurors. Several different types of scheduling are possible, so that all presenters present their work 2, 3 or 6 times and the jurors make a double number of 'Carousel rounds'" (Proveniers, A. & Westra, J., 2009).

Providing feedback

Assignments of Design-Based learning can be solved in many ways and it is important to recognize that different teams can produce multiple appropriate results in the same DBL project. "The paradox of teaching design is that designers know things, but they can't tell others about them in a way that novices will understand. In other words, this stuff can't simply be written down and told to people, and *voila!* They become the experts. We also have to recognize that experts are unique, they don't know the same things in the same way. We need, then, to get a better grip on what experienced designers know in whatever sense of the word-and come up with effective, reproducible ways of getting novices to a similar stage, such that they understand the general ideas that all expert designers share, and develop their own unique ways of understanding and applying those ideas" (Hoadley & Cox, 2009, p. 19). Therefore, assignments in Design-Based Learning are based on the principle that learners gain knowledge of how to design by solving design problems with the guidance of an experienced designer. Providing feedback is already a key ingredient of any educational method, it can be considered to be the core ingredient of Design-Based Learning. The need to optimize feedback in a system of learning by doing was the main reason why the Evaluation Assessment Carousel was developed and gradually improved some 20 years ago at the Department of the Built Environment, Eindhoven University of Technology (Proveniers, A. & Westra, J., 2009).



5. Presenting a plan to critics and fellow students.

A basic aspect to evoke useful feedback by experts is by presenting plain ideas, results and processes of a PBL-project. However, presenting the outcome of a design in plain language and visualizations has to be learnt as well. The major advantage of the Evaluation Assessment Carousel is considered to be the combination of multiple presentations and multiple amounts of feedback, while the design teams do this in the same amount of time that is needed in a traditional set-up. The total number of presentations of one design team equals the number of jurors' teams (in the case shown in figure 4 each team presented their work two times in about one hour, while each team in figure 8 presents five times in a half-day). After every presentation they receive feedback (so two times in the example of figure 4 and five times in the example of figure 8). And because this feedback is provided without knowing what kind of feedback other jurors give, students receive a more objective criticism about their work. "Because students have to present their work more than once, they are more actively involved compared to the traditional set-up [...]. And by repeating the presentation, students grow in their ability to find the right words to explain their design" (Moonen, S.P.G. & Veeger, T.T., 2013). Page | 9

Examples of using the Evaluation Assessment Carousel

Figure 2 and 6 show a photo of the Evaluation Assessment Carousel in a midterm evaluation of a design-project (March 2013) with 20 teams involved (in total 130 students). Since this carousel was a midterm presentation, the critique was meant for the design teams to receive a lot of feedback to help the design teams to improve their designs during the last phase of the project. Due to the large number of students involved, we organised the Evaluation Assessment Carousel in two shifts of 4 hours, inviting 10 teams to each shift. There were 5 couples of two jurors so all teams had to present their presentation five times during the shift. Despite the many students involved in the presentation in figure 2, the setting exudes an atmosphere of small-scaled education in an informal setting and the design teams really received a lot of input to improve their designs. Figure 3 shows a carousel of the final evaluation of a design project (January 2014). Here, (left photo) one can see that there are many presenters and jurors involved (about 80 individual presenters and 25 individual jurors). Yet again, there is an informal setting in a hall with an atmosphere of small-scaled education (left photo).

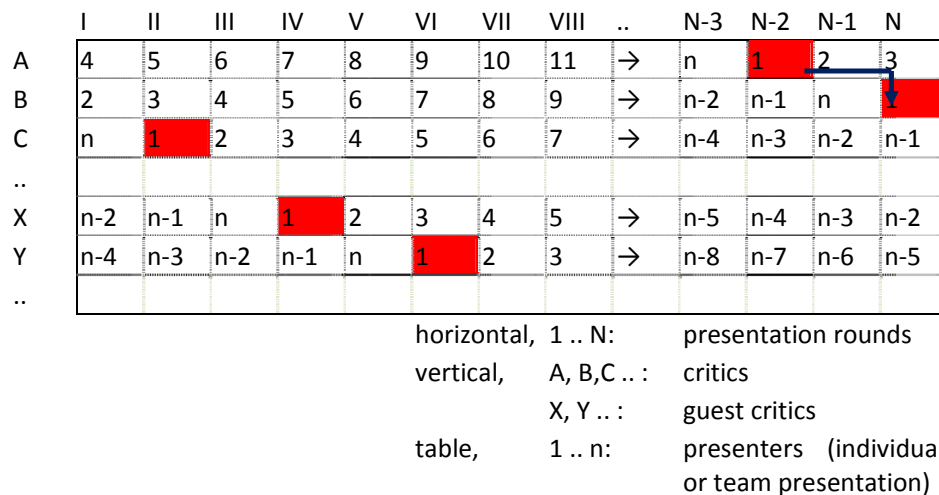


6. Part of the hall of the Carousel in figure 2. This photo shows 5 teams (of 10 teams) who prepared a presentation with three parallel presentations going on at the same time.

In the midterm evaluation of a design project (March 2013 shown in figure 2 and 6) every presentation round took 15 minutes (10 minutes presentation and 5 minutes for discussion and feedback). The jurors acted in couples of two, according to the scale levels in an architectural design: urban embedding, design of buildings and feasibility. In general, each design team prepared a general presentation for that round of the carousel of about 5 minutes to explain the vision, concept, and design results and about 5 minutes to explain more about each of the specific scale levels. So in the five presentations given by a design team, there was a different focus towards the jurors in regard to team results and consequently, other aspects were discussed per round by jurors and team. In this set-up, the design teams received quite a lot of feedback and suggestions on different levels and aspects. Each design team had to write down all criticism (and remarks) directly after a round, when the couple of jurors had left to go to another table to listen to the presentation by another team. The design teams had to use a given format for writing down their feedback with items such as general remarks by the jurors regarding the product as well as the process, positive and negative aspects of the design results and the indicated mark by the jurors. The description of the feedback after the five presentations took about 2 pages of A-4 in total. This description was sent by the teams to all tutors to document the Evaluation Assessment Carousel. In the past, there have also been experiments with guest jurors involved in this midterm evaluation, sometimes by making couples consisting of a regular tutor with a guest juror, sometimes with teams of tutors and guests apart. In some years we had 6 or 7 couples involved, so accordingly the design teams had to repeat their presentation 6-7 times and also received feedback 6-7 times.

Using a smart open ended scheme for Evaluation Assessment Carousels

To organize an Evaluation Assessment Carousel looks like a hell of a job. However when one uses a smart open ended scheme as shown below it is actually quite simple.



7. Principle of the Evaluation Assessment Carousel organisation scheme.

Figure 7 shows the Evaluation Assessment Carousel organisation scheme for a group of 'n' presenters and a number of critics as well as guest critics. The first step is to set the number of timeslots. There are as many timeslots needed as the number of presentations. So, in the scheme, there are also 'n' presentations rounds plotted on the horizontal axis of figure 7. The next step is to decide on the number of critics (or teams of critics) and also on the number of guest critics (as individuals or in teams). The different groups of critics and/or guest critics (the itinerant jurors) are plotted in the scheme on the vertical axis. If the total number of jurors is less than half the number of presentations (such as $n/2$ in

figure 7) it is possible to give every team a ‘time-out’ of at least one round after each presentations. This is not possible if the number of juror groups is larger than $n/2$.

With both axes of the table for the organisational scheme fixed, the total scheme can be filled in. Just put a first number of a presenter in a random field in the top row and number the other presenters consecutively. When a last field in a row is completed continue numbering in the first field of the same row. The second juror’s program is made by placing the same number of the first presenter in a kind of ‘knight’s move’, (as shown in figure 7), thus moved two places sideward in the row under the first row. Moves of at least two fields are required to allow presenters to have a time-out after each presentation. Next, programs of all other itinerant jurors can be made likewise until the entire program is completed.

Figure 8 shows an example of the organisation schema for an Evaluation Assessment Carousel that is comparable to the presentations shown in figure 2 and also in figure 6. In this carousel, there were 5 teams of jurors. Since 29 design teams were also involved in this carousel, 3 half-days were needed to provide enough possibilities to give floor space to all teams to present. The numbers in a row in figure 8 could have been numbered consecutively over the three half-days. However, this would have resulted in a scattered scheme (where several teams have to present some of their 5 presentations on the next day). From an educational point of view it is preferable to have all presentations in a one half-day block, so the total scheme was constructed as three consecutive schemes.

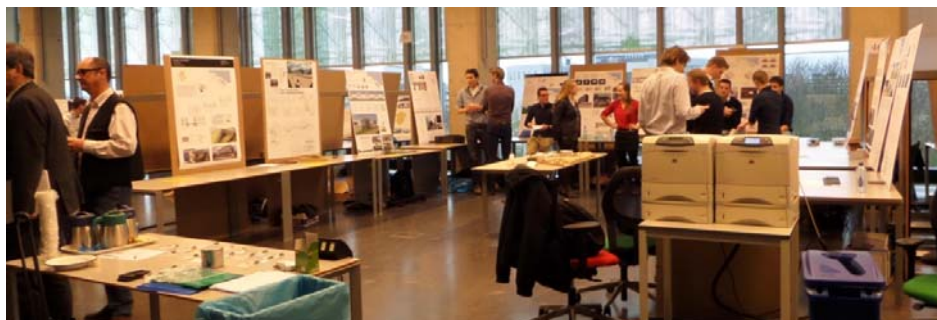
Carousel presentation autumn 2014

	Monday October 20 th										Tuesday October 21 st										Wednesday October 22 nd														
	11.30-13.45	13.45-14.00	14.00-14.15	14.15-14.45	14.45-15.00	15.00-15.15	15.15-15.30	15.30-16.00	16.00-16.15	16.15-16.30	16.30-16.45	09.30-09.45	09.45-10.00	10.00-10.15	10.15-10.30	10.30-11.00	11.00-11.15	11.15-11.30	11.30-11.45	11.45-12.15	12.15-12.30	12.30-12.45	12.45-13.00	09.30-09.45	09.45-10.00	10.00-10.15	10.15-10.30	10.30-11.00	11.00-11.15	11.15-11.30	11.30-11.45	11.45-12.15	12.15-12.30	12.30-12.45	12.45-13.00
assessors team 1	7	8	9		1	2	3		4	5	6	19	10	11		12	13	14		15	16	17	18	22	23	24		25	26	27		28	29	20	21
assessors team 2	5	6	7		8	9	1		2	3	4	17	18	19		10	11	12		13	14	15	16	20	21	22		23	24	25		26	27	28	29
assessors team 3	3	4	5	break	6	7	8	break	9	1	2	15	16	17	break	18	19	10	break	11	12	13	14	28	29	20	break	21	22	23	break	24	25	26	27
guest team 1	1	2	3		4	5	6		7	8	9	13	14	15		16	17	18		19	10	11	12	26	27	28		29	20	21		22	23	24	25
guest team 2	8	9	1		2	3	4		5	6	7	11	12	13		14	15	16		17	18	19	10	24	25	26		27	28	29		20	21	22	23

8. Example of an Evaluation Assessment Carousel (autumn 2014) with 29 student teams (181 students in total) and 5 juror teams. Since this group was so large, the presentations were divided over three blocks (one afternoon, two mornings). Here, it was decided that all presentations per team would be on one day, so in fact, this schema shows three consecutive carousels of 9 or 10 presenting teams and 5 juror teams.

Facilities needed for an Evaluation Assessment Carousel

The Evaluation Assessment Carousel does not require specific conveniences. A large hall is recommended (as shown in figure 9) but not necessary. Presentations can be divided over multiple rooms but in all cases, a clear allocation of the different places is essential, especially with a large group of presenters or if there are many jurors.



9. Setup for an Evaluation Assessment Carousel with about 80 presenters of which there are 12 presenters shown in this part of the hall.

What is really needed is a good organization; however this is not new for educational programmes. An adequate organization is particularly needed when running the carousel itself to direct the program. A strict time-referee is needed to keep track of the planned time schedule and who signals the rounds of presentations. A critical task for the time-referee is to exhort jurors to finish a discussion when the time is up.

Since a lot of parallel actions take place the carousel seems time consuming, but in fact it is not. Figures Page | 12 4 and 7 show that the overall time needed depends on the number of presentations. To enable every presenter to present once in a traditional setup takes a certain time span and so does this Evaluation Assessment Carousel. So, in exactly the same time span as a traditional set up, there are just many extra opportunities to present the results of a PBL project and to receive feedback.



10. Preparations of a carousel with many participants (same carousel as in figure 3). There is a room plan in front on the table and there are numbered markers (to know which presenters are present). There are also badges provided for critics (here teachers, alumni, professionals and interested guests) and of course there is coffee and tea.

Organization

The organization needed depends for the most part on the intention and on the number of participants. For all carousels, it is important to start on time to make a set-up, to consider who to invite and to make a scheme. A carousel that is meant to foster improvements and ideas at a midterm evaluation (explained on page 15) without marking requires a different approach than a carousel to provide formal marks at the end of a PBL project. And, a carousel with only staff involved is different than a carousel with many guests (explained on page 16).

The scheme in figure 8 (with photos shown in figure 14, 16, and 17) is a final evaluation where marks are also given, so this has to be strictly organized by a precise scheme. This scheme is made with it's auxiliary instructions so that every student knows the exact location to pin-up the documentation and models that are asked, knows the exact times to be ready for each presentation, and also knows which critic to address for each presentation.

This example is a sharp contrast to the example shown in figure 9 and 10. Here, the carousel is not meant to give marks but critics were invited to provide lots of feedback. Following the carousel, there

was an evaluation with all teachers involved, however, these teachers were the same teachers who did the marking of the assessments: “after two hours of rounds of the Carousel, the critics were invited to a lunch, and also for an informal evaluation. In the afternoon the 'one to one' student -teacher assessments took place where marks [...] were given” (Proveniers, A. & Westra, J., 2009).



11. Balloting for presentations. Presenters receive a number on arrival to allocate the location for the presentations. There is a token for each presenter with the same number put on a plate (photo above, here tokens are made of plexiglass). The first round starts by picking a token for each critic from this plate. The critic now knows which presentation to visit and he puts this token back on the other plate.

In contrast to the strict schema of figure 8, the carousel shown in figure 9 has a well organized, yet loose scheme that enables non-shown guest critics (and also absent presenters). The presenting scheme here is not prepared in advance, but comes into being during the carousel by means of balloting the presenters. Since not only many critics were involved but also many students, a scheme was developed that is able to anticipate on possible absent presenters (for instance because of illness or for those who are delayed by public transportation). Therefore, presenters are not allocated a location in the hall in advance but receive a number at arrival. This number allocates a specific place in the hall.



12. Example of an Evaluation Assessment Carousel with a presentation of an individual design. A presenter is assigned a place on arrival; the presenter in this photo was allocated position 46.

One may conclude from the numbering system shown in figure 10 that there were already 54 presenters present at that time (out of the 80 expected presenters). Every time a presenter takes a number, a token with the same number is put on a plate (figure 11 and 13).

To start a carousel, every critic takes a token from the plate, registers the number and puts the token back on another plate. After all critics have drawn a number, the carousel round can start. If a delayed presenter arrives somewhat later, he just can take a number to know his allocated place and adds the matching token to the plate. During that particular round he can prepare his presentation and may join in the following round. Page | 14

As a carousel round takes place, the organizer puts all tokens corresponding to those presentations aside (these are the tokens in the second plate). Thus, all remaining tokens on the plate correspond to presenters who are available for the next carousel round and don't have a presentation in the ongoing round. Tokens that are put aside in a draw will be placed back after a new draw is completed. So, someone who gives a presentation in a round always skips the following round but gets new chances to be picked in later draws. This system of putting tokens aside for one round prevents presenters having to present two times in a row. Having one round off, gives a presenter some time to write things down and also to adjust the presentation.



13. This Evaluation Assessment Carousel uses a scheme that is an instant put-together scheme. Here, all critics draw a token with a number from a plate that is presented to them by the organizer, then they register the number and return the token to another plate.

When the organizer observes after some time that a number of discussions are at a finishing stage, he gives a signal to finish all debates of that round. All critics will then return to the organizer to draw a new token so as to enable a new carousel round. Since schemes in this set-up are 'instant put-together' schemes, there is no need for a strict time plan, so the organizer can decide on the duration of every round and also on the total duration of the carousel. The organizer may adjust the length of time to establish different educational and communicational goals.

Another advantage of making the presentation schemes 'instant put-together' schemes is that a guest critic doesn't need to attend a complete carousel. A guest critic who comes later just picks a token for the next round (and someone who needs to leave earlier just doesn't pick a new token after a round). "So the Carousel can turn 'round and round' even when students and expert critics arrive late or don't show up at all (Proveniers, A. & Westra, J., 2009).



14. Different type of media can be used in Evaluation Assessment Carousels (This carousel is the same carousel as shown in figure 16 and 17)

Diversity in Evaluation Assessment Carousels | stages in an assessment

The setup of an Evaluation Assessment Carousel largely depends upon the stage of an assessment where the carousel is situated. Known options are:

- very close to the beginning of a PBL-project (for instance to promote the developing of alternatives and/or to speed up early days of designing);
- mid-term evaluations (for instance to provide a lot of feedback for later improvements or to generate mid-term marks);
- final evaluations (for instance to provide lots of feedback and/or to mark).



15. Example of an Evaluation Assessment Carousel that is meant for generating feedback (preceding the final marking; this carousel did not affect the marking)

A major distinction is whether or not an Evaluation Assessment Carousel plays a part in a marking procedure. Figure 14, 16, and 17 shows photos of a carousel of a final presentation where marks are given by three teams of two assessors (while each juror team focuses on a different scale level of the design). Figure 5, 9, 12, 15, and 18 shows an example of a final presentation in which critics in this example are not involved in marking the PBL project. Here, the Evaluation Assignment Carousel is mainly meant to provide a comprehensive discussion, with ample feedback and increased objectiveness (as comments are received apart in several rounds of the carousel) because this PBL project is a main part of a pre-master course. The discussions in the various rounds of the carousel provide students, who are

at the beginning of a new master course, a clear picture of where they stand. Feedback provided by various non-biased professionals in combination with feedback as well as a mark by the tutor (who also takes the process into account) enables a student to make a well-balanced decision on the direction of the new master.

Figure 2, 6, and 19 shows the Evaluation Assessment Carousel at an intermediate presentation, no marks are awarded here, just suggestions on how to improve the design in a later phase.

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16. This photo shows an Evaluation Assessment Carousel used as final presentation. Three students (from a design team of 6 students) present their results.

As the three photos show, there is not much of a difference in the set up for an intermediate or a final presentation. Of course the effect of the feedback provided is quite different and so is the role of guest critics. Feedback can be provided on conceptual ideas as well as on the quality of the further execution of conceptual ideas and the technical detailing of those ideas.

The major difference, however, is the choice for marking during the Evaluation Assessment Carousel or in a separate process, thus, deciding whether the Evaluation Assessment Carousel requires a formal or informal procedure. For a final presentation, a strict schedule is required (shown in figure 8) while a presentation without marking may use a scheme that is 'instant put-together' by means of drawing tokens preceding every round (pictured on page 13).

There are opportunities to invite guest critics for Evaluation Assessment Carousels in every stage of a course; however, the role of the guest critics can be quite different depending on the purpose of the evaluation. To avoid uncertainties, the role of guest critics needs to be specifically explained to all guest critics as well as all students involved.

Diversity in Evaluation Assessment Carousels | just staff or many guests

An advantage of the Evaluation Assessment Carousel is that it is quite simple to invite guest jurors. More guest jurors simply mean more parallel presentations by design teams. Guest jurors can be colleagues from the Department (with the by-effect that this strengthens mutual understanding, intern peer review and intern discussion). Guest jurors from adjacent fields are especially meaningful in intermediate evaluations, since the design teams can choose whether they incorporate these suggestions or not in the following phase of their design. Here, direct feedback from alumni and professionals from industry may also inspire a design team to make a great mental leap. In some cases, the opinion of a guest juror is asked to advise studio assessors about marking individual work. "Having guest jurors involved in the Evaluation Assessment Carousel may lead to a more objective assessment. And considering that all

assessors give feedback independent of the others, gives us another argument why we consider this procedure more objective compared to the usual setup” (Moonen, S.P.G. & Veeger, T.T., 2013).



17. Photo of the same critic as in figure 16. In this new round of the carousel, the critic has moved to a new location, where another design team present their results

Guest critics can be colleagues from the department for example professors, or fellow tutors. Well instructed members from the supporting staff can be guest critics as well. Inviting colleagues and other faculty members (or even members from other departments to make a mix of different academics) as guest critics improves the understanding in a department or even beyond.

Guest critics can also be found among classmates, or senior students. Inviting professionals from industry creates an extra dimension to the feedback, as well as prospective clients who might be involved in using results of a design.

A carousel with a scheme that is ‘instant put together’ (by means of drawing of tokens, explicated on page 13) permits the participation of guest critic who only contributes to a part of the carousel. The changing of guest critics will impede a carousel with few (guest) critics but is hardly noticed in a carousel with a lot of critics (as shown in figure 3, 5, 9, 10, 11, 15, and 18) where transient guest critics can have a constructive participation.



18. photos of the same round. Left: 4 critics (a tutor, a colleague and 2 professionals/alumni) are debating with individual students. Right: 5 critics (among them an expert in education from the auxiliary educational office and fellow teachers from other -technical- disciplines) are debating with individual students

Figure 18 shows two photos of an Evaluation Assessment Carousel with many guest critics. In total about 25 critics took part (some only partially). Among these critics were 5 fellow tutors of the same assignment (since there were about 80 students involved), 3 colleagues from other (mainly technical) disciplines, 3 members from the supporting staff (2 educational experts, but also a secretarial worker), 2 members of the Department Board, 2 members from other Departments of the University, and about 10 alumni, in chief professional experts. Since the objective of this carousel was to generate as much feedback as possible (without marking, so students were completely free as to how to interpret the critique) this large and mixed bunch of people fitted well to the purpose.



19. Example of a carousel in a PBL assignment with multidisciplinary teams

Diversity in Evaluation Assessment Carousels | teamwork or individuals

As indicated before, the Evaluation Assessment Carousel can be used for all kind of PBL assignments from multidisciplinary teamwork to individual design results. As the accompanying photos show, the set up is hardly changed by group or individual work.

Experiences

The Evaluation Assessment Carousel was developed at the Department of The Built Environment of Eindhoven University of Technology and has run for more than 20 years. “The educational aims were sharpened and organizational problems were tackled through the development of the flexible organizational scheme” (Proveniers, A. & Westra, J., 2009). Many variations have been tried out depending on the specific group, the preference of tutors, the place in the design sequence, the objectives of the tutors, with or without guest critics, and (with a large influence) whether a carousel is part of marking or not.

The development of the Evaluation Assessment Carousel was inspired by more widely known ‘exhibition systems’ and more specifically in a system that is used in University of Oregon, School of Architecture and Allied Arts (A&AA), Eugene, OR, USA.

The Exhibition Evaluation uses a ‘market’ principle where every student is able to pitch a project from a permanent location in a hall. Critics may choose their own ‘path’, however they have to attend all pitches. A presenter starts pitching after the arrival of a critic (sometimes called ‘client’).

The system of the School of Architecture and Allied Arts in Oregon uses a variation of this, called Dance Card Evaluation, also based on the market principle. Here, every student presents from a permanent spot and pairs of two critics visit all or part of the presentations. Both systems allow guest critics to participate and results in multiple pitches by a student.

The Evaluation Assessment Carousel is a much more organized version of these market principles resulting in more feedback received by students.

In some literature it can be found that Jury Critics without marking function hardly has any educational assessment function: “The attention required for marking also allows many students to feel that their efforts are valued. In our experience this perceived attention to individuals’ work by tutors has been sorely missed when assessment has been removed (...) Researchers have suggested that if reviews are

removed from the marking system perhaps they can take a more educational role (Hall Jones, 1996). But then doesn't the review just become another form of tutorial? What will then fulfill the valid functions of the traditional review?" (Doidge, Sara, & Parnell, 2000, pp. 68-69). The dilemma of coaching versus marking is a well-known issue in PBL, especially in traditional evaluations. However, from experiences with the Evaluation Assessment Carousel, this fear seems groundless. "During several presentation rounds students learn to make their conceptual idea more complete, as they learn from comments from the mix of different academic and / or professional specialists" (Proveniers, A. & Westra, J., 2009). Page | 19

Also presenters in an Evaluation Assessment Carousel appreciate the set-up as can be concluded from student questionnaires. Students filled in questionnaires after finishing a multidisciplinary assignment (as shown in figure 2, 6, and 9) with a carousel as mid-term evaluation for 6 consecutive projects. An average of 45 students responded per project (Moonen & Veeger, 2014). One of the many questions in these questionnaires was: "do you consider the Evaluation Assessment Carousel as a positive contribution to the progress in your design team" with an average appreciation of 3,6 on a 5-point scale. Also the question: "do you consider the Evaluation Assessment Carousel as a proper assessment tool for this design project" scored on average also 3,6 on a 5-point scale.

The main experience with the Evaluation Assessment Carousel is that it has to be well explained by new participants (and also to new students) since at first glance the carousel seems to be a complex system. However, by turning a carousel all participants (students, teachers and guests) appreciate the system. The Evaluation Assessment Carousel also offers a fine opportunity to keep track with alumni and professionals from industry.

Advantages

Benefits of the Evaluation Assessment Carousel are according to Proveniers and Westra (2009):

- "It frees the so feared traditional Jury Critics from its 'darker side' and makes it a motivating and inspiring happening.
- It increases the developmental role: during several presentation rounds innovators learn to make their conceptual idea more complete.
- It gives all the participants the opportunity for a quick scan of quality of the other innovations.
- It creates more insight and involvement by the different academic and / or professional expert guest critics.

[...] During several presentation rounds students learn to make their conceptual idea more complete, as they learn from comments from the mix of different academic and / or professional specialists.

Design Studio teachers use it as a quick scan of quality of the other studios and for the other guests it also leads to increasing commitment.

[...] So - in a wider scientific educational perspective - the Evaluation Assessment Carousel can serve as a suitable educational assessment model for other innovative interdisciplinary scientific practice." (Proveniers, A. & Westra, J., 2009)

As explained, main advantages of the Evaluation Assessment Carousel are:

- "each design team gives the same presentation several times in the same time that is needed to spend in a traditional setup. The number of presentations given by one design team is equal to the number of jurors or teams of jurors. At the end of each presentation they receive feedback (multiple times, from individual critics who are not informed of earlier feedback from other critics).
- this multiple, yet separated feedback (with a student asking for clarification if there is a discrepancy between two reactions) results in clearer explained criticism in a way that a student understands.

- it also creates more objective criticism about their results.
- because students have to present their work more than once, they are more actively involved compared to a traditional setup.
- by repeating a presentation, students grow in the ability to find the right words to explain a design”
- [...] “different jurors can focus on different levels in scale [...]. In this way, the design teams receive feedback on various aspects of their design”.
- [...] “the comprehensive discussion together with the intermediate mark by each tutor provides the teams with a clear picture of where they stand at that specific stage in the design process” (Moonen, S.P.G. & Veeger, T.T., 2013).

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