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EVALUATION ASSESSMENT CARROUSEL; PROVIDING FEEDBACK IN DIFFERENT STAGES OF A PROBLEM BASED LEARNING-ASSINGMENT
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ABSTRACT: Design-Based Learning (DBL) as 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 that is suitable for evoking abundant feedback to students. The method, called 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 briefly the method and explains how this is used in different set ups.

Keywords: design-based learning, DBL, assessment, integral design, feedback

1. INTRODUCTION

“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). One method is to incorporate practical assignments in engineering education using Problem-Based Learning (PBL) or its derivative Design-Based Learning (DBL). DBL is “a method of learning in which learners first encounter a problem, followed by a systematic, student-centered 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). Design-based learning is broadly accepted, however the method used to assess (outcome and process) often calls for a heated debate. “In literature, there are 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).

1.1 Different methods of assessing Design-Based Learning

There are many different methodologies developed, as assessing DBL is both important as debatable. The 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, there are outcome-oriented instruments, as well as process-oriented instruments, and tutor, peer, and self-assessment”(Hung, et al., 2008).

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 judgments and evaluations from tutors to students”(Graham, 2003). “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). 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 & Westra, 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 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." (Lewis, 1998).

1.2 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 "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.
- 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

Figure 1. Scheme of the traditional review of PBL with “a presentation to rows of seated individuals” (Doidge, et al., 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.

1.3 Alternative evaluation system for Design-Based-Learning

The jury system in itself is an adequate way to review a project in DBL, yet lacks in providing adequate feedback. This was the main reason for developing an alternative evaluation tool at Eindhoven University of Technology, called the Evaluation Assessment Carousel. EAC is an open jury system with a combination of the informal and “pin-up”-setting. The main idea is that the jury is divided to attend presentations that run in parallel settings. There are as many students giving a presentation in the same time slot as there are (groups) of assessors. So in case there are 3 separate assessors involved, each student will give three times a presentation and also receives three times feedback. In this set-up a student will learn from the first presentation and is able to make little changes in the following presentations to improve the performance. And every time, the student receives feedback from a tutor. Compared to a traditional situation where several tutors sit together and where the other tutors listen as one tutor speaks, this system generates more feedback.

The Evaluation Assessment Carousel is explained in the next paragraph.
2 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.

Evaluation Assessment Carousel can be used for small as well as large groups of students. Figure 2 shows a medium-sized Evaluation Assessment Carousel in an informal setting. At that time, there were 20 student-teams and 5 itinerant teams of jurors. Figure 3 shows a large-sized Evaluation Assessment Carousel with 80 individual students and 25 individual jurors (colleagues plus alumni as guest critics). In this carousel, some of the critics were present in the full carousel, while others just participated in a part of the carousel.

![Figure 2. Evaluation Assessment Carousel in an informal setting.](image)

2.1. 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 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).

![Figure 3. Example of Evaluation Assessment Carousel in a more formal setting.](image)
The basic principle of the Evaluation Assessment Carousel is explained with a simple variant (Figure 4 and 5) in which we consider five design teams who simultaneously present their ideas in the five positions of a hall (visualized in figure 4, left row, and figure 5, 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’ (Figure 5), and all design teams have received specific feedback from both jurors separately. 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, (as shown in Figure 5).

In figure 4 and 5 the two jurors are represented by ★ and students by ○. The five teams of four students can be distinguished by the different color in ○. In the traditional set-up (right row, figure 4) all students are seated in a room with two jurors listening to a presentation of a team.

Figure 4. Scheme of the first round of the Evaluation Assessment Carousel (left) compared to the first presentation in a traditional setup (right, similar to the setup sketched in figure 1). Here, both relate to 5 teams (of 4 students) and 2 jurors

Figure 5. Scheme of Evaluation Assessment Carousel in a full circle (top row) compared to a traditional setup (bottom row).
This example with five teams needs five rounds to enable all teams to present their results. The equivalent set-up for the Evaluation Assessment Carousel (top row, figure 5) needs also five rounds to enable all teams to present their work twice to both jurors.

In this Evaluation Assessment Carousel, each 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 another group they would like to attend (or to skip a presentation round to make notes about their own presentation and feedback)"(Moonen & Veeger, 2013). The scheme shown in figure 4 and 5 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 or teams of jurors of any size.

Figure 6. Presenting a plan to critics and fellow students.

The carousel in the scheme of figure 4 and 5 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 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 & Westra, 2009).

A 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 and 5 each team presented their work two times in about one hour, while each team in figure 9 presents five times in a half-day). After every presentation they receive feedback (so two times in the example of figure 4 and 5 and five times in the example of figure 9). 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 traditional set-ups. And by repeating presentations, students grow in their ability to find the right words to explain their design.
3 EXAMPLES OF USING THE EVALUATION ASSESSMENT CAROUSEL

Figure 2 shows 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 organized 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, the setting exudes an atmosphere of small-scaled education in an informal setting (figure 2) 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.

In the midterm evaluation of a design project (March 2013 shown in figure 2 and 6) each presentation round took 15 minutes (10 minutes presentation, 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. 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.

4 OPEN ENDED SCHEME FOR EVALUATION ASSESSMENT CAROUSELS

To organize an Evaluation Assessment Carousel looks complex. However with the open ended scheme as shown below (Figure 7) it is actually quite simple. Figure 7 shows the Evaluation Assessment Carousel organization scheme for a group of ‘n’ presenters and a number of critics plus guest critics. The first step is to set the timeslots. There are as many timeslots (N) needed as the number of presenting students (n). 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 $\frac{n}{2}$ 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 $\frac{n}{2}$. 
With both axes of the table for the organizational scheme fixed, the total scheme can be filled out. 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 reached 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', (shown in figure 7), thus moved two places sideward in the row under the first row. Moves of at least two fields sideward are required to allow presenters to have a time-out in between each presentation they give. Next, fill out lines of other itinerant jurors likewise until the program is completed.

Figure 8. Example of Evaluation Assessment Carousel that didn't affect marking

Figure 9 shows an example of the organization schema for an Evaluation Assessment Carousel shown in figure 2 (with 5 teams of jurors). Since there are 29 design teams, 3 half-days are 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.
5. DIVERSITY IN EVALUATION ASSESSMENT CAROUSELS

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).

5.1 Diversity in formal or informal assessments

A major distinction is whether or not an Evaluation Assessment Carousel plays a part in the marking procedure. Figures 11 and 12 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). Figures 6, 13 and 14 show 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 shows the carousel at an intermediate presentation, no marks are awarded here, just suggestions on how to improve the design in a later phase.
As all photos show, there is little 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 technical detailing of those ideas.

Figure 11. Different type of media can be used

There are opportunities to invite guest critics for the carousel 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 guests as well as all students involved.

5.2. Diversity in jurors: 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. Because all assessors give feedback independent of the others helps to be more objective compared to the usual setup.

Figure 12. Photo of the same critic as in figure 10. In this new round, the critic has moved to a new location, where another design team presents.
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.

Figure 13 shows two photos of an Evaluation Assessment Carousel with many guest critics. In total about 25 critics took part. 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.

Figure 13. Four critics (left) are debating with individual students, while (right) five critics are debating with other students in the same round in parallel settings.

5.3 Diversity students groups; teamwork or individuals

As indicated, the Evaluation Assessment Carousel is used for all kind of PBL assignments from multidisciplinary teamwork to individual designs. As seen on photos in this paper, the set up is hardly changed by group or individual work.

Figure 14. The Evaluation Assessment Carousel with an individual presenter.
6. EXPERIENCES

The Evaluation Assessment Carousel, developed at the Dept. of the Built Environment of TU/e runs for more than 20 years. “The educational aims were sharpened and organizational problems were tackled through the development of the flexible organizational scheme” (Proveniers & Westra, 2009). Variations have been tried out depending on the specific group, the preference of tutors, the place in the curriculum, 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 by a system that is used in University of Oregon, School of Architecture and Allied Arts (A&AA), USA, that uses a ‘market’ principle (a student pitches a project from a permanent location in a hall and critics choose their own ‘path’).

Yet, 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). 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 & Westra, 2009).

Also students appreciate the Evaluation Assessment Carousel as is concluded from student questionnaires of 6 consecutive semesters (from 2009 – 2013) with on average 45 students per semester. In a survey, students were asked about their experiences with the carousel as mid-term evaluation. A question in the survey 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 (Moonen & Veeger, 2013).

CONCLUSION

The Evaluation Assessment Carousel benefits according to Proveniers & Westra
- “because it frees the so feared traditional Jury Critics from its ‘darker side’ and makes it a motivating and inspiring happening.
- because it increases the developmental role: during several presentation rounds innovators learn to make their conceptual idea more complete.
- because it gives all the participants the opportunity for a quick scan of quality of the other innovations.
- because 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” (Proveniers & Westra, 2009).

Additional advantages of the Evaluation Assessment Carousel are:
- each design team gives the same presentation several times in the same time needed for 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. This might create more objective criticism about the results of a student’s work.
- 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 main drawback of the Evaluation Assessment Carousel is the number of tutors that is needed. In principle, any jury system requires several tutors (at least 2) to reduce subjectivity with regard to evaluations. Yet, today's pressure on staff and budget are non-negligible constraints for running this system. A good solution is to involve alumni and/or partners from industry in the carousel. And by contacting alumni, the evaluation system offers a good opportunity to keep track with alumni. Our experience is that alumni can be very well involved and that they respond very well to an invitation to participate in a jury. Another drawback is the space needed to run the system effectively. Groups can be split over separate rooms, yet this is not ideal in organizational perspective. The complexity of the system is a major disadvantage, too. This complexity makes it difficult for those who are unfamiliar with the system. Yet, also for those who are familiar require a system that is good prepared before the starting of presentations (to explain to students as well as to tutors where to go at each new turn) as well as a strict time management during the presentations. Our experience with turning carousels is that explaining is critical for everyone who participates (tutors and students) to make this into a success. Further work is needed to obtain reliable data regarding the efficacy of this system.

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