

A NEW BLENDED ASSESSMENT SYSTEM FOR A BASIC ELECTRONICS COURSE

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ABSTRACT

We must educate and prepare our engineering students for their future careers. They need life-long learning skills in order to keep in pace with the fast developing world, and this requires versatile and various skills. The students need to be able to work in different ways. They have to take care of schedules and they need to divide their working time in a proper manner between different tasks. In addition, complex problem solving skills are essential for future engineers. In order to achieve the required level in problem solving skills for future engineering tasks the students need strong understanding of the subject matter (theory) combined with firm hands-on working skills (practical work).

In this study, we developed and implemented a blended assessment system for a basic electronics course. With this system we wanted to familiarize the students with different ways of working and assessment in order to increase and diversify their learning skills. Furthermore, we wanted the students to clearly recognize the importance of even workload throughout the whole course. We collected written student feedback specifically concerning the assessment system in the course. In this study, we describe the blended assessment system in the basic electronics course and the results of the student feedback concerning it.

INTRODUCTION

1.1 Blended assessment

Blended assessment (continuous assessment, embedded assessment) can be defined as an assessment that occurs as graded assignments that are distributed

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throughout the course [1]. As a summative assessment, which measures students' achievements, this means that instead of one final exam the course grade is determined by various assignments distributed along the course [2]. It has been shown that continuous assessment can have several benefits for learning. It can motivate students to study and make them to adopt a more continuous working style [3]. With continuous assessment students can learn e.g. presenting, problem solving and handling equipment [1]. Continuous assessment thus enables teacher to design assignments so that they train important work life skills. Continuous assessment is also suited for large student groups as the assignments or some of the assignments can be carried out as online activities [1]. This supports the idea of blended learning, which on the other hand brings further benefits for learning, such as pedagogical richness and flexibility [4]. Continuous assessment, however, also has challenges. It requires more time from teachers, it may increase students' anxiety due to the feeling of being constantly assessed and it may offer possibilities of cheating [1]. Careful design of the various assignments and the overall workload are thus needed [5].

1.2 The blended course assessment system

A basic electronics course in Tampere University has been using a new blended assessment system (BAS) for a couple of years. The course is implemented in the first year's second study period (duration 7 weeks). In addition to the extremely important theoretical subject matter knowledge the students need generic skills, e. g. various working and studying skills, scheduling and in the electrical engineering also strong measurement, simulation and prototyping skills. We kept all these in mind when the new BAS was developed. With this system we wanted to boost students' learning and provide them with necessary theoretical, practical and generic skills.

The BAS was designed to be continuous. This way the students learn to work continuously, and they can concentrate on the issues in smaller pieces. In addition, we wanted to combine continuous training of practical skills with the problem solving skills. These skills also have a strong effect on the final course grade.

The course contains four main subject areas. An exam question (EQ) is after every main subject area. The EQs are comparable to the course's previous traditional end exam questions. This way we could efficiently increase students' continuous working along the course and familiarize them with important scheduling skills. The theoretical knowledge is tested in an electronic exam (EE) at the end of the course. Each student can book a suitable time for the EE. With the EE we wanted to familiarize the students with doing on-line exams, and we also wanted to do the BAS more flexible concerning time and place. In addition, there are weekly exercises (EX) during the course. The EX contain calculations, simulations and circuit prototyping with measurements. The students have BYODs (Bring Your Own Device), with which they can do circuit prototyping and measurements wherever and whenever they like.

The compulsory parts in the course assessment as well as the minimum requirements and the maximum points for each compulsory assessment part are gathered in Table 1. If a student does not exceed every minimum requirement, the student does not pass the course. However, the student has usually 3 possibilities to redo all the compulsory parts and to increase one's points. The minimum requirements of each assessment part ensure that all the students passing this course will have at least the minimum required level of knowledge and skills in each course area.

Table 1. The compulsory parts in the course assessment.

COMPULSORY PART IN COURSE ASSESSMENT	MINIMUM REQUIREMENT
EQs (4 altogether, 6 point max each)	2 points in every question
EE (at the end of the course, 14 points max)	4 points
EX (six times along the course, 2 exercise points available in each weekly exercise set, total max 12 exercise points)	6 exercise points

A student gathers course points (CP) of each compulsory part. The CPs from different compulsory assessment parts are shown in Table 2. At the end, all the student's CPs are added, and the course grade is determined based on them. Table 3 describes how the course grade is formed based on the CPs. The students see their points in Moodle along the course. This way they can do self-assessment during the course, plan their working properly and aim to a certain course grade. Furthermore, the students' self-regulation skills develop when they plan and schedule their own doing in this course.

Table 2. The CPs from each compulsory assessment part after the minimum requirements have been passed.

EX POINTS	CP / EX	EQ POINTS	CP / EQ	EE POINTS	CP / EE
6	0	8-9	0	4	0
7	1	10-11	1	5-6	1
8	2	12-14	2	7-8	2
9	3	15-17	3	9-10	3
10	4	18-20	4	11-12	4
11	5	21-22	5		
12	6	23-24	6		

Table 3. Course grade based on the CPs.

CP	COURSE GRADE (scale 1 to 5)
0-2	1
3-6	2
7-10	3
11-13	4
14-16	5

2 METHODOLOGY AND RESULTS

Every student taking the compulsory EE had to give feedback from the BAS. The students wrote freely the original feedback. The total amount of students was 128. The written feedback was analysed using simple thematic qualitative text analysis. The original feedback was categorized to six main categories (C). The categories were formulated inductively based on the frequently risen issues in the feedback. One original written feedback of one student can be included into many of the categories, if it contained many of these issues.

The results of the feedback analysis are in Table 4. The results clearly indicate that overall the BAS was good (C1 to C5). All the other assessment parts got clearly positive feedback from the students except the EE (C5). The opinions of the EE were divided quite equally to those who liked it and to those who thought it was unnecessary. The course includes a large amount of subject matter and has quite a lot to do. This is clearly seen in the results in Table 4 (C6). The students especially liked that the assessment was divided into many parts along the course (C2). In addition, some students did notice the importance of the minimum requirements in ensuring them at least the minimum level of knowledge at each important course area (C3). The importance of practical doing is noticed by the students (C4). In Table 5 there are some freely translated answers from the student feedback.

Table 4. Categorized written feedback.

CATEGORY	YES	NO
1. The assessment system was good.	49	1
2. Good that the assessment was distributed to many parts / was continuous.	77	3
3. Good that this system ensures that all have at least the minimum level of knowledge in each course area after this course.	10	8
4. Good that I could have an effect to my grade by collecting CPs from exercises. / Good that practical doing has an effect on the course grade.	34	4
5. The electronic exam was good.	11	10
6. The workload in the course/exercises was too big.	26	0

Table 5. Some freely translated quotations from the written feedback.

<i>"I hope the coming courses have an assessment system something like this. My learning is much better this way, when I don't have to study the whole course content at one time, and I also think that I have a better chance to a good grade this way."</i>
<i>"Good that the exercises were in a significant role in the course assessment. It motivated me to do all the exercises."</i>
<i>"The assessment system is motivating. You can see your own CP accumulation along the course and you can adjust your doing according to the aimed course grade."</i>
<i>"One disadvantage is that multiple different parts in assessment increases significantly the student's performance stress."</i>

3 SUMMARY

In this study we introduced a new BAS for a basic electronics course. We collected freely written feedback of the BAS from all the students passing the course. The results show that the BAS is working as we have planned: the students' workload is distributed more evenly along the course, the students learn, and like to learn, practical skills, and the students' learning in general is increased. In the feedback there were also opinions against this BAS, but they were in clear minority. Furthermore, we found issues for future development, e. g. how to reduce the workload so that the course still includes all the necessary skills and knowledge. The role of the EE must also be taken into consideration. As a conclusion we think this BAS is good and BASs should be taken into use also in other courses.

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