The Pattern Language of Incremental Grading

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Abstract: Assessing students' work while at the same time supporting their learning is prone to some challenges such as big bang grading, low self-assessment skills, little ownership of learning process, poor time management, inability to see grading as useful for feedback, and often workload peaks for instructors after final deadline. In this work we describe the approach of "Incremental Grading", which has the core practice that students assess their own work based on pre-defined criteria and incrementally request grades until the final deadline. We describe this approach as a collection of related educational design patterns -- a pattern language -- consisting of existing and newly identified patterns. Educators (of different fields) can configure it to address these challenges when designing or adapting courses in their own environment.

PLEASE NOTE: this is the version presented at a writers' workshop at the PLoP'18 conference. The final version will be published in the conference proceedings.
FOR THE WW PARTICIPANTS: we added some patterns in the appendix which will not be part of this publication and therefore not discussed in the WW. However, if you want to give feedback on these as well, this is highly welcome!

1. Introduction

Students who follow educational programs are usually finishing these programs with a certificate, such as a college degree, a bachelor or a master certificate. These certificates show they reached the learning objectives and have passed all required elements of the program. A common way for showing these achievements is by using grades for the different elements of the program. A grade is an indicator of the level of achievement, ranging from insufficient to excellent.

While these grades may be necessary to determine the student's progress in the program and their final achievement, they may not be seen as adequate motivators for students who simply want to pass the course with a sufficient grade (because they need to) instead of desiring to learn something in first place [Docan 2006]. If teacher's feedback is offered to improve the learning, but does not have impact on the grades, then it can be seen as less valuable to the students. When they ignore this feedback, they miss a good opportunity for deeper learning and see their experience as merely a predetermined path they must follow in order to accomplish their passing grades rather than an inspiring and thought-provoking experience. The often bureaucratic atmosphere in higher education [Magala and Zawadski 2017] seems to increase this effect rather than putting the focus on learning. It is also problematic for the teaching staff, as they have to focus on grading the student's work in first place (and in a fair manner) instead of focusing on helping students develop lifelong learning skills.

As educators, we observed in our careers a couple of recurring challenges which are still present in current course designs:

- *Grading vs. feedback* -- When we provide only a grade after some work has been finished, this does not encourage students to improve. They often experience this only as a way to look back on what they've done, rather than as a way to look forward towards improvement. But informative feedback, with time to improve, is more effective for learning and increases intrinsic motivation [Butler and Nisan 1986]. However, our experience is that if we provide such feedback without making it explicitly relevant for getting better grades, the feedback is often not seen as valuable.
- *Big Bang grading* -- Grading at the end of a course is necessary, but is assigned at a time when students are tired and ready to move on. This doesn't allow students to know where they stand during the course. It provides useful information only to students who have a desire to continue improving once they leave the course.
- *Low self-assessment skills* -- Unless students truly care about the future following the course, they are often unsure about the quality of their work and rather wait for the professor to assess it. Yet, lifelong learning requires one to understand where and how they need to improve.
- *Little ownership of learning process* -- When students struggle to learn, they may be likely to pass the responsibility, and even blame, to the instructor. Many students find it too challenging to determine for themselves when and how to learn.
- *Procrastination (aka Students Syndrome, poor time management until deadline approaches)* -- When facing a large assignment, busy students may approach it as they do in smaller assignments: they postpone working on it until the deadline approaches, usually resulting in incomplete work of not-as-good quality as it could have been (due to time pressure).
- *Heavy workload peaks for instructors after deadline* -- Big bang grading of large projects at the end of the semester creates a high, exhausting workload for professors.

As we cannot easily change the environment in current (higher) education, we were looking for a way to redesign it within the current constraints that grading is required and a variety of assignments and assessment forms is used for grading in a course or semester.

In this paper we present an approach which addresses the above mentioned challenges and which we term "Incremental Grading". The core idea is that students assess their own work (using pre-defined criteria) whenever they achieved a certain quality level. Based on these self-assessments, they request grades and have to provide justification for how they believe they have fulfilled the requirements for the requested grade. The students can request grades whenever they want (until the final deadline), on new work products and also on assignment elements that were previously graded and have been improved or corrected. This way, the requests also serve as feedback (combining grading and feedback) and help the students with directing their own learning. The number of allowed grading requests could be limited if there are other possibilities of getting feedback from the teacher. However, it is also possible to allow students sending in requests as often as they want. Our experience showed that this does not lead to an explosion of grading requests (and hence the workload for the teachers), but that the justification and evidence for the requested grades serves as a natural hurdle to just hand in something and see what happens.
We have applied Incremental Grading for a part time semester on object-oriented software engineering, but we believe that it also can be applied in various environments as long as there are one or more graded assignments that last over a longer period and have clearly defined assessment criteria (e.g. RUBRICs). It's applicable for both cumulative and proportional (in terms of percentage) grading.

Most elements of Incremental Grading are well known approaches in education. However, the combination of these elements in the proposed configuration has been shown to be successfully addressing the aforementioned challenges in our application. We decided to describe this approach as a collection of related patterns -- a pattern language, hereby making use of several educational design patterns. Patterns in general originate in architecture [Alexander et al. 1977] and also have been applied successfully in various areas of education such as MOOC-Design [Warburton and Mor 2015], Lecture Design [Köppe et al. 2015], Technology-Enhanced Learning [Goodyear and Retalis 2010], or Pedagogy in general [Bergin et al. 2012]. In the presented approach, existing patterns are combined with some newly discovered patterns that haven't yet been documented and which will be summarized in this work and described in detail in future work.

The remainder of the paper is structured as follows. In section 2, we will give an overview of all patterns that are part of the language. This is followed by the presentation of the configuration of these patterns. In section 4, we will summarize our experiences with the concrete application of Incremental Grading in a course on Object-Oriented Software Engineering at HAN University of Applied Sciences in the Netherlands. The paper concludes with a summary and outlook on future work. In the appendix, we'll give a summary of all referenced patterns which are not directly part of the pattern language.

2. Overview patterns Incremental Grading

The following table lists all patterns of the Incremental Grading Language in alphabetical order. Patterns in bold are new patterns which will be described in detail in future work.

Pattern	Summary
ACT ON FEEDBACK [Warburton et al. 2016]	Close the feedback loop by making sure you allow time for students to act on the feedback they have been given.
ASSESSMENT CRITERIA LIST [Bergin et al. 2015]	Clearly communicate to students what the criteria for assessment are.
CONSIDERATE LECTURER [Köppe et al. 2015a]	Pro-actively ask students on their progress, observe how they perform and react on what you observe in a constructive manner.
CONTINUOUS ACTIVITY [Köppe 2011]	Include regular delivery moments of appropriate artifacts to motivate and engage the students to be active over the whole time of the assignment. These artifacts should be of value for the students.
CRITERIA REFINEMENT [Bergin et al. 2015]	Refine assessment criteria to a detailed level.
CUMULATIVE GRADING	Let students accumulate points toward a total for the course, with grade breakdowns for different point totals known in advance.

EARLY WARNING [Bergin et al. 2012]	Give students an early warning when you see that they are headed for trouble or fall behind.
EMBRACE CORRECTION [Bergin et al. 2012]	Give the students the chance to improve their work.
GO FOR GOLD	Encourage the students to continue improving their work, even - or especially - when they already acquired a sufficient grade for it.
GRADE IT AGAIN, SAM [Bergin et al. 2012]	Permit your students to change and re-submit an assignment for re-evaluation and re-grading, after you have graded it and provided feedback.
GRADING DASHBOARD	Present the current status of the student's grading in an overview dashboard.
GRADING REQUEST KANBAN	Use a Kanban board for handling grading requests in a timely and transparent manner.
MULTIPLE LEARNING PATHS [Köppe et al. 2017]	Design your course to allow alternative paths, combining hybrid interactions in different ways, for reaching the learning objectives to account for diverse learner circumstances and preferences.
PEER GRADING [Bergin et al. 2012]	Make it possible for students to provide part of the grade for other students.
PEER REVIEW [Warburton et al. 2016]	Develop your students as autonomous and self-regulated learners by asking them to review each other's work and provide feedback (similar to PEER FEEDBACK).
REBEL STUDENTS [Köppe et al. 2017]	When students rebel, don't resist. Open up the space for them to reconstruct the learning experience.
REPAIR IT YOURSELF [Köppe et al. 2015b]	Let students correct their wrong or incorrect solutions, so that they understand better how to do it right.
REWARD SYSTEM	Make all students' achievements -- smaller and larger ones -- visible to them in an open, ongoing, rewarding and systematic way.
RUBRIC [Bergin et al. 2015a]	Rate each Refined Criteria on a sheet and aggregate the mark.
SELF-ASSESSMENT	Assessment criteria are given (e.g. as RUBRICs) and students rate themselves using these criteria
SITUATED FEEDBACK [Köppe et al. 2017]	In order to help students master a certain competence or skill, you design a procedure involving

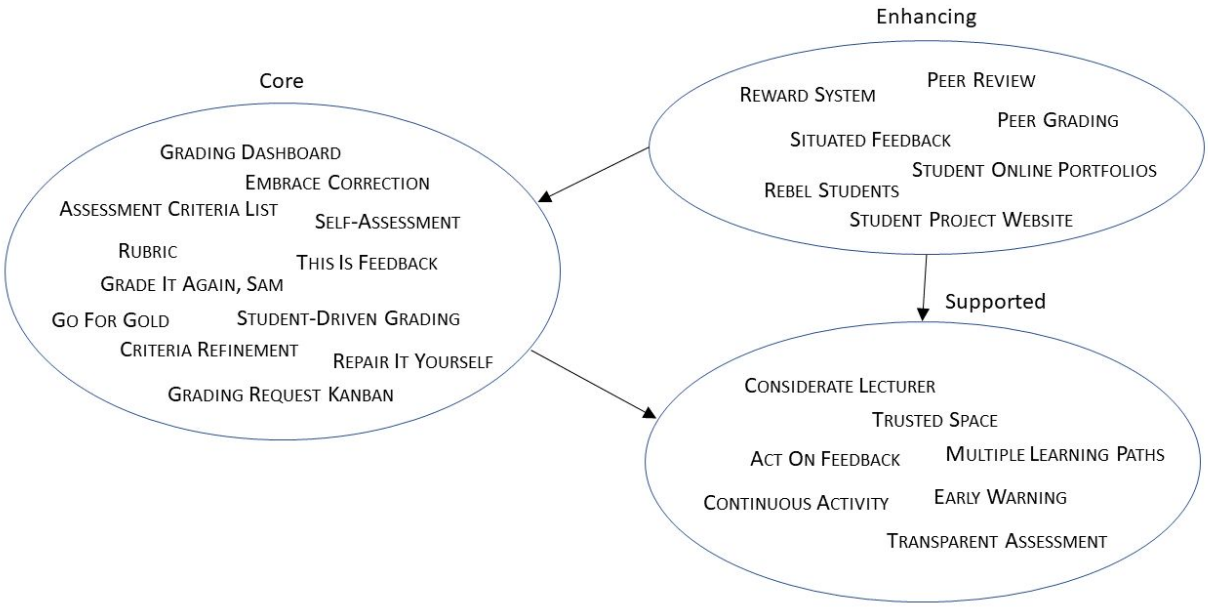
	MULTIPLE DRAFTS that receives feedback from teachers situated directly within the given text or product that the student develops.
STUDENT-DRIVEN GRADING	Give students the responsibility for determining the quality of their work and what the grade for this (part of the) work is. Let them justify and provide evidence for the determined quality and the corresponding grades. When accurate, then the students earn the grades.
STUDENT ONLINE PORTFOLIO [Bergin et al. 2012]	Provide a means for students to publish their best work, perhaps on the web. The more public this can be, the better it is.
STUDENT PROJECT WEBSITE [Köppe et al. 2017]	Encourage (or require) your students to setup a website that informs others about their project. The website could state the goals, show team members, inform about the work in progress and milestones. The final outcomes should be presented there as well.
THIS IS FEEDBACK [Warburton et al. 2016]	For learners to act on feedback they first need to recognise when it has been given.
TRANSPARENT ASSESSMENT [Bergin et al. 2015b]	Ensure that your assessment scheme is visible to your students, from the criteria to the actual tools you use to apply them.
TRUSTED SPACE [Warburton et al. 2016]	Create a space which helps supports deep learner engagement in shared review, dialogic and critiquing processes and hereby creates trust.

3. The Pattern Language of Incremental Grading

In this section we will describe how all these patterns are configured. Basically, we distinguish between three different categories of patterns:

- Core - patterns in this category are essential for implementing Incremental Grading
- Enhancing - these patterns enhance the positive effects of Incremental Grading when applied in combination with the core patterns
- Supported - these are patterns which are supported through the application of Incremental Grading, either as specific implementation of them or by enhancing their positive effects

Figure x provides an overview of the mapping of all patterns to the categories.



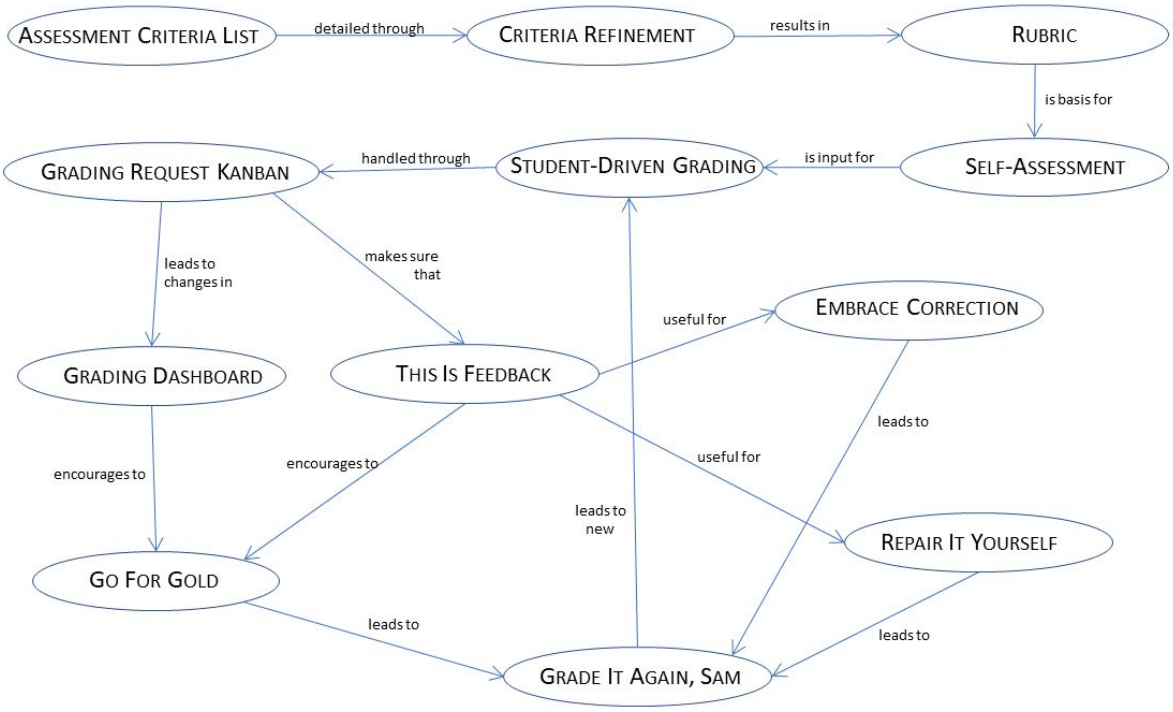
The core of Incremental Grading

Basis for Incremental Grading is a well defined ASSESSMENT CRITERIA LIST. The criteria should be specific enough for concrete assessments of student work, likely after performing CRITERIA REFINEMENT. The refined criteria should also be available, e.g. in the form of RUBRICS. These can be used by the students for a SELF-ASSESSMENT of their own work. Whenever students decide that they have fulfilled (some of) the criteria they can perform a STUDENT-DRIVEN GRADING. They can do this whenever (and in a limited or unlimited number), hereby giving them the full responsibility for their progress. This way, they incrementally work on their achievements towards passing the course.
When handing in a grading request, the students include (1) for whom the grades are requested, (2) for which assignment, (3) for which criteria and/or rubrics the grades are requested, (4) what the concrete requested grades are (per rubric/criterium), (5) a justification for the requested grades, and (6) the actual evidence (such as documentation, source code, diagrams etc.). Elements (5) and (6) will be especially useful for helping students develop their self-assessment skills. Teachers then will assess the request, making use of the provided information. The result of this assessment will be one of these options:

- Full accept - the students gave a sufficient justification for the requested grades and the provided evidence matches the quality level as described in the RUBRICS.
- Partial accept - the students requested more than one grade and not all of them were accepted.
- Not accept - the request was completely rejected, because justification and/or quality of evidence were not matching with criteria for requested grades.

After the grading request has been assessed, the students will get the result of the assessment. If the request is not fully accepted, then a short justification has to be provided explaining why the students have not met the criteria for the requested grade. This is ideally not presented in the form of a todo-list,

but should focus on the missing quality of their deliverables. This way the students have to think for themselves what



they need to do in order to fulfil the criteria, which fosters deeper engagement with the quality aspects of their work.

All accepted grades are also included in the GRADING DASHBOARD. This dashboard presents the current status of a student in an overview, including all grades for all assessment criteria (the RUBRICs) of the course. This means that the early elements in the dashboard are either empty or contain the lowest possible grade. Each time a grading request is accepted, the students will see the progress in their dashboard. This way, they are able to direct their own learning by choosing the elements they want to focus on next.

It is important to note that students will likely experience their first grading requests as failure if they are not fully accepted and they do not get the requested grades. This is because they are used to grading systems in which they receive a grade which indicates whether they failed or passed (sometimes with a one-time repairing option). However, in Incremental Grading, grading requests are also feedback moments and the absence of a grade, due to a “reject” option, provides a great opportunity for learning. When partially accepted or rejected, the feedback should not only point to the present flaws, but encourage the students to pay more attention to the quality aspects of their work, e.g. through discussing with them the differences between the quality levels they thought to have achieved and the actual level (based on the rubrics). This will likely help them to improve their self-assessment skills. It should become natural to EMBRACE CORRECTION of their current work and to repair the present flaws (REPAIR IT YOURSELF).

It is essential to make clear to the students that this process produces not only a grade, but THIS IS FEEDBACK and they have the option of making changes and requesting that the teacher GRADE IT

AGAIN, SAM before the final deadline without any negative consequences. Therefore, this is a valuable process to support their learning.
In the case of accepted requests, these offer a good opportunity for feedback even when the highest possible grade was acquired. The feedback then could focus on the missing quality aspects which are necessary for reaching the next quality level. This can encourage improvement of the current work even if a sufficient grade has already been received-- this is something which is not often done in education, but is very helpful for deeper learning. Encourage the students to GO FOR GOLD!

Figure x shows the relations between all core patterns.

Patterns for enhancing Incremental Grading

In addition to the grades, a REWARD SYSTEM can motivate the students even more to work on the assignments and to strive for higher quality (and hence higher grades). Instead of focusing only on their own work, students can also perform PEER REVIEWs to learn from others as well and to help others with their feedback. These reviews can also include PEER GRADING, based on the defined criteria. The results of such grading can easily be used as basis for STUDENT-DRIVEN GRADING, adding even more value for the students.
Students can build up a STUDENT ONLINE PORTFOLIO, which will allow information/assignment results to be easily available for both students and teachers. It may be possible to give feedback directly in the portfolio (as SITUATED FEEDBACK) and grading requests also can easily be included (e.g. a wiki-type solution such as Confluence). When working in groups on projects, a STUDENT PROJECT WEBSITE can contain all relevant information on the project work and linked from the portfolio and the grading requests.
Since Incremental Grading approaches assessments in a way that is different from what is familiar to most students, based on their earlier experiences in education, you can expect that there will be some REBEL STUDENTS. Accept this and help the students to become accustomed to the shift of responsibility and the way of interacting with the teacher. It is good to note that there may also be some rebel teachers since this approach changes the way teachers interact with students and the responsibilities everyone has.

Patterns which are supported through Incremental Grading

Receiving feedback following a grading request makes it a delivery moment of value for the student, hence supporting a CONTINUOUS ACTIVITY. Regular grading requests from the students helps the teacher become aware of where the students stand, what difficulties they have, who's not making progress etc., all valuable input for acting as a CONSIDERATE LECTURER.

It is likely that some students will overestimate their own progress; in these cases, the feedback on the first grading requests can also serve as an EARLY WARNING. The open and constructive feedback on the grading requests leads to TRANSPARENT ASSESSMENTs (it's clear to the students how their grades are determined as they have to do this themselves) and a TRUSTED SPACE. As the students get feedback often and early, it is also more likely that will and can ACT ON FEEDBACK (as opposed to feedback that is given at the end of a course).

When assessment criteria is defined, this opens the possibility of BRING YOUR OWN ASSIGNMENT. Students (and teachers) can check if it is possible to meet the criteria with the assignment. With the focus

on the quality criteria for grading and assessment, it can become less prescriptive *how* these can be achieved. This allows for MULTIPLE LEARNING PATHS.

5. Incremental Grading in Practice

5.1 Design and Execution

The full pattern language of Incremental Grading was applied for the development and first execution of a semester on Object-Oriented Software Engineering (OOSE) at HAN University of Applied Sciences in the Netherlands. This semester is part of a part-time bachelor program on Software Engineering and runs for 19 weeks. It was developed according to ASSESSMENT-DRIVEN COURSE DESIGN [Bergin et al. 2015a], starting with the definition of the learning objectives, the assignment forms, and the assessment criteria.

There are in total 8 assignments, where 7 are longer-running and applicable for Incremental Grading (the last one was a written exam). All assignments have assessment criteria described in rubrics. Per assignment, there are 1-8 different weighted criteria, all with 5 quality levels. These quality levels are mapping to grades 1, 4, 6, 8, 10 on a scale from 1 (lowest) to 10 (highest), the grade for passing is 5.5. For most assignments the students could make use of the compensation rule: the minimal required quality level was 4 given that the weighted average of all assignment elements is 5.5 or higher. Figure x shows an example with the rubrics for the case study (translated from Dutch).

Assessment dimension	Name Criterium	Weight	Min	10	8	6	4	1
B_Case1-1	functional requirements	20	4	all functional requirements complete, unambiguous, comprehensible and testable described	all important functional requirements described OR comprehensible/unambiguous and testable	most of the important functional requirements described, mostly comprehensible and testable	many requirements are missing or are not completely understandable or mostly not testable	essential requirements are missing or are not comprehensible or are not testable

In the next step the deadlines for all assignments were defined and the moments when the assignments are introduced. Figure x shows this planning: relative to the timeline (showing the weeks), the blue circles symbolize the deadlines and the yellow ones the moment of introduction. In the time between these moments (the straight lines between the sticky notes), the students were allowed and encouraged to apply STUDENT-DRIVEN GRADING and send in grading requests. The planning was also published in the E-Learning environment so students were able to see the planned workload for a certain week, but it also gave us an overview of how realistic this workload is.

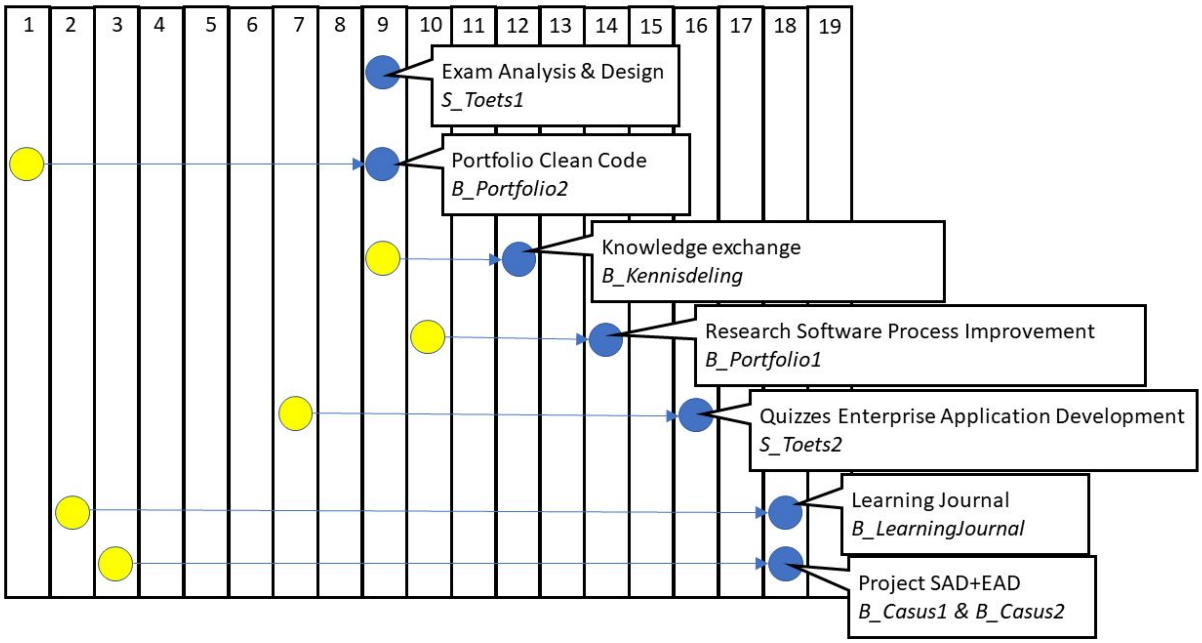


Figure x: General planning, the first assignment was a written exam (hence no starting point) and the last element comprises two assignments (two aspects of one larger project)

For the grading requests, a template (shown in Figure x) was provided that the students had to use for providing the required information:

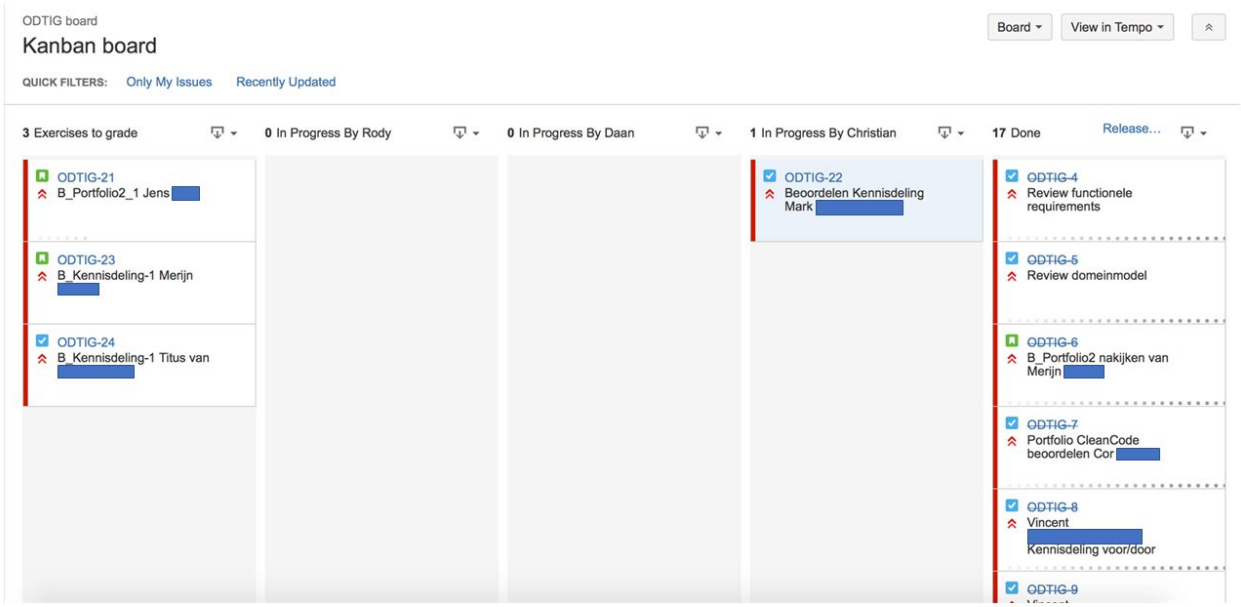
1. for whom,
2. which rubric/s,
3. which grade/s requested,
4. justification for the grade/s,
5. a link to work/evidence, and
6. how to submit the request.

Created by Jelle [redacted] last modified on Nov 30, 2017 (1)

Naam	@Jelle [redacted] en @Jens [redacted]
Opdracht	Domeinmodel (2)
Welke rubrics	B_Casus1-2
Onderbouwing per rubric waarom bepaald niveau bereikt is (4)	8 (3) • Alle functionele eisen, zoals opgesteld in de functionele requirements, zijn als domein toegevoegd • Zowel de must haves als de should haves zijn opgenomen in het model • Het model is compleet met alle relaties en beschrijvingen daarvan • Daarnaast is er sprake van documentatie voor alle elementen waarin de keuzes worden toegelicht
Referenties naar bewijs/producten (links)	http://94.124.143.61/confluence/x/FoCY (5)
Indienen	Creeer een nieuwe taak op http://jira.icaprojecten.nl/secure/RapidBoard.jspa?rapidView=481 met een link naar deze Confluence pagina (6)

We used a Jira board for GRADING REQUEST KANBAN. Students had to add issues in the todo-column, including a link to their original grading request. Teachers then picked up the oldest issues and reviewed

them. After review, the issue was moved from the teacher's column to done. This board was also openly visible for the students, hence giving them a good idea of how long it likely will take until their grading request will be handled (based on the number of earlier not-handled issues). Figure x shows a screenshot of the board.



The results of a handled grading request were added to the student's individual grading dashboards. These dashboards include all assignments, all rubrics, and the grades per rubric. Colours gave an easy indication of the progress: in the beginning all cells with grades were dark red (mapping to the lowest grade) and during the semester, more and more of the dashboard became green (from light to dark). The dashboards were Excel-sheets and were published in a public Dropbox-folder.
In every review of a grading request, the link to the updated version of the dashboard was added to the review so that students could easily access it. Figure x shows an (anonymized) example.

	Semester: OOSE-DT		Student: Bjorn									
EVL	Toets											voldoende
Software Analysis & Design	S_Toets1	S_Toets1-1.1	S_Toets1-1.2	S_Toets1-1.3	S_Toets1-2.1	S_Toets1-2.2	S_Toets1-3				Eind	
		6	6	4	4	4	8				5,8	
	B_Casus1	B_Casus1-1	B_Casus1-2	B_Casus1-3.1	B_Casus1-3.2	B_Casus1-3.3	B_Casus1-4	B_Casus1-5&6			Eind	
		1	1	1	1	1	1	1			1	
Distributed Application Development	B_Casus2	B_Casus2-1	B_Casus2-2.1	B_Casus2-2.2	B_Casus2-3	B_Casus2-4.1	B_Casus2-4.2	B_Casus2-4.3	B_Casus2-5.1	B_Casus2-5.2	Eind	
		1	1	1	1	1	1	1	1	1	1	N
	S_Toets2	Basic	Presentation	Domain	Data						Eind	
		V	V	V	V						V	
Software Process Improvement	B_Portfolio1	B_Portfolio1_1	B_Portfolio1_2.1	B_Portfolio1_2.2	B_Portfolio1_2.3	B_Portfolio1_3	B_Portfolio1_4	B_Portfolio1_5			Eind	
		6	6	8	6	6	6	6			6,4	
Craftsmanship	B_Portfolio2	B_Portfolio2_1	B_Portfolio2_2	B_Portfolio2_3							Eind	
		8	8	8							8	
	B_Kennisdeling	B_Kennisdel-1									Eind	
		1									1	
	B_LearningJournal	B_LearnJour_1	B_LearnJour_2	B_LearnJour_3							Eind	
		1	1	1							1	N
											Eind	
											3,08	

5.2 Experiences

During and at the end of the semester, data were collected in both formal and informal ways. The formal data include: data on all grading requests and their handling, the grading dashboards, and a questionnaire taken shortly after the semester. The informal data are based on direct interactions with the students and informal feedback given by the students.

According to the initial enrollment list, we expected 28 students to take part in the OOSE module. However, only 23 students actually started the semester and 6 of these dropped out due to personal or organizational reasons. 17 students finished the semester, of which 14 with a passing total grade. The 3 students not passing the course had a sufficient total grade, but had not fulfilled all minimum requirements so that the compensation possibility did not apply.

In total, 127 grading requests were handed in. 73% of them were fully approved (all requested grades matched the justification and evidence), 15% were partially approved (only some of the requested grades were approved), and 12% were fully declined (including 7 declines based on improper use of the template or missing information in the request). The distribution of the grading requests per week is shown in Figure x. This shows that 60% of the review work for the teachers was done before the last week. At the moment of the deadline passing (end of week starting on 22/01/18), there were only three open grading requests left. 14 grading requests were handed in for repairments and 2nd chances (during the week starting on 29/01/18).So there was only a small peak in the last week before the deadline. Note that the deadline for most assignments was put to one week before the semester ends. The peak could become even less if the deadlines would be more distributed throughout the semester.

week	#GR	approve	part. approve	decline
09/10/17	2			2
16/10/17	2	2		
23/10/17	2	2		
30/10/2017 (hol)				
06/11/17	1	1		
13/11/17	4	2	2	
20/11/17	3	1	1	1
27/11/17	4	3		1
04/12/17	5	5		
11/12/17	6	4	1	1
18/12/17	2	2		
25/12/2017 (hol)	2	2		
01/01/2018 (hol)	6	5	1	
08/01/18	8	3	3	2
15/01/18	20	16	4	
22/01/18	46	33	6	7
29/01/2018 (2nd)	14	12	1	1

After receiving declined or not fully approved grading requests, students could either request a lower, more realistic grade or improve their work and request the same or even a higher grade. 53% of the students requested lower grades and 47% requested the same or higher grade. In the latter case, it means that students improved their work (EMBRACE CORRECTION and REPAIR IT YOURSELF). 4 students did GO FOR GOLD and requested higher grades after already having passing grades approved.

It is interesting that the percentage of full approvements is slightly higher in the second halves of each individual student's grading requests (55%). This could be interpreted as a light improvement of the self-assessment skills of the students during the semester, but needs to be explored more thoroughly. We also observed that the students initially had trouble with interpreting the RUBRICS, leading to more declines. This could be improved in the future through introducing the rubrics earlier in the semester and practicing of how to use them for assessment.

The fear we heard from colleagues that the option to submit grading requests whenever and as often as the students want will lead to high numbers of requests is not supported by the collected data. It became clear that students worked on the assignments (or parts of it) until they were convinced that they reached a certain quality level and did not request grades for unfinished work.

A questionnaire was taken in the first week after the semester, the results are shown in Figure x. 13 students filled in the questionnaire, 3 of them forgot to fill in the question on the back side.

``	full disagree	disagree	neutral	agree	full agree	AVG
I liked the style of assessment (Incremental Grading with Grading Requests).	2	2	0	6	3	3,46
I'd like to see Incremental Grading applied in other semesters too.	1	3	2	5	2	3,31
I'd like to have been receiving more feedback.	1	1	3	5	3	3,62
Having a Grading Request not approved did not feel bad.	1	6	2	2	2	2,85
I would have preferred to being assessed by the teachers instead of having to do it myself.	0	3	4	4	2	3,38
I tried to get assessment parts done as fast as possible so that they can be graded.	1	2	2	5	2	3,23
The rubrics were easy to use.	1	6	3	0	3	2,85
The rubrics were sufficiently clear and well described.	3	6	1	2	1	2,38
Based on the rubrics, I was able to assess my own work well.	0	2	4	6	1	3,46
After a grading I always looked at my dashboard.	0	2	0	4	4	4,00
The colours in the dashboard were unnecessary, they didn't add much to the grading.	3	3	1	1	1	2,33
The dashboard helped me to keep an overview.	0	0	3	4	3	4,00

The results show that Incremental Grading was mostly seen positive. However, some students clearly disliked it. Possible reasons (based on informal discussions) are that they have trouble with taking the responsibility for their own learning instead of having the teacher telling them exactly what to do. It also shows that self-assessment is not experienced as pleasurable.
It also becomes clear that students still did not recognize the reviews of their grading requests as feedback. This needs to be more emphasized in future executions (THIS IS FEEDBACK). And even though the students had the possibility to ask for the feedback in a direct way from the teachers, not only via grading requests, the students did not make use of this very often.
It's also obvious that the quality of the rubrics is essential and how the students learn using the rubrics for their self-assessments. In this first execution, the rubrics were not explicitly introduced and there was no practice of how to use/interpret them. This needs to be more included in future executions, e.g. by having students assess some products similar to their own using the rubrics or by discussing the different quality levels in class.
The results also show that the GRADING DASHBOARD was experienced as helpful and that the use of colours was motivating. One student did send a direct message to one teacher after a grading request was handled (which resulted in a grade change in the dashboard, but not a colour change to green in the

cell due to an error in auto-formatting) asking if the colour of the cell also could be changed. The dashboards were also experienced by the teachers as helpful, as they gave a clear overview of where students stand and how they perform. Based on this information, some students were directly asked about their progress if they performed less than their peers (CONSIDERATE LECTURER). The dashboard also opens possibilities to anonymously collect and share all students' progress so every student can compare his progress to the rest of the class with some kind of trend line or planning.

Returning to the initial problems outlined above, we can summarize our experiences as follows:

- Grading vs. feedback - not solved well; students saw grading requests mostly still as grading only, not as feedback.
- Big Bang grading - most students worked incrementally on the assignments and had a good picture of where they stood and what still needed to be done.
- Low self-assessment skills - a light indication that these have improved slightly; more evidence is needed here.
- Low ownership of learning process - partially solved; some students actively made use of the possibilities for taking control of when and how they learn; the dashboard was mostly experienced as helpful tool.
- Low motivation (until deadline approaches) - some students made extensive use of the STUDENT-DRIVEN GRADING and started working early and regularly on the assignments, handing in grading requests whenever they had a part finished. However, some students stuck with their old habit and started working on the assignment as the deadline started to approach. It therefore worked well for some students, but not all.
- Heavy workload peaks for instructors after deadline - this is certainly solved, but increases the time the lecturers must be available throughout the term.

One question that came up after the semester was if Incremental Grading also scales and is applicable for larger student groups as well. We believe that it does, but we have no proof for this. The amount of work for each of the 3 teachers involved in this semester was comparable to the amount of work if the semester would have been executed in the usual way (which involves two of the teachers in the same semester using standard grading at the end, so they can compare both execution).

6. Summary and Future Work

We believe that Incremental Grading is a promising approach to address the challenges mentioned in the first section. By describing it as a pattern language we hope to help educators with applying and adapting the approach in their own environment. It is also possible to select just a few elements (or patterns), but we think that the configuration of all of them generates a valuable educational experience for both students and teachers and supports learning in a motivating way. However, given the challenges in our first instance, we recognize that this certainly requires changing mindsets. The students need to let go of the idea that it is only the teacher's responsibility to assess their work and they need to take more control of their own learning. On the other hand, the teachers also need to let go of the idea that only they determine the quality of student's work; students can do that themselves (which is also beneficial for their learning). Some teachers might feel uncomfortable with an experienced loss of control, but our experiences clearly show that this is not the case. Even better, it becomes much easier to keep an overview of students' progresses and therefore help them in a more timely manner.

There are plans to execute Incremental Grading for a second time in the upcoming semester. Some changes to the execution will be made (better introduction of rubrics, more focus on the feedback-aspects, etc.) and data will hopefully show if these changes lead to better results. In addition, one of the co-authors will use a portion of this approach, for the first time, in her course beginning in August.

We also like to encourage other educators to apply this approach or parts of it in their own environment and to share their experiences.We're interested in the applicability of it in other domains than software engineering and in other educational environments than higher education in the Netherlands.

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References

Bergin, J., Eckstein, J., Völter, M., Sipos, M., Wallingford, E., Marquardt, K., Chandler, J., Sharp, H., Manns, M. L. (Eds.). (2012). *Pedagogical Patterns: Advice for Educators*. New York, NY, USA: Joseph Bergin Software Tools.

Bergin, J., Kohls, C., Köppe, C., Mor, Y., Portier, M., Schümmer, T., & Warburton, S. (2015a). Assessment-Driven Course Design - Foundational Patterns. In *Proceedings of the 20th European Conference on Pattern Languages of Programs, EuroPLoP'15*. Irsee, Germany: ACM.

Bergin, J., Kohls, C., Köppe, C., Mor, Y., Portier, M., Schümmer, T., & Warburton, S. (2015b). Assessment-Driven Course Design - Fair Play Patterns. In *Proceedings of the 22nd Pattern Languages of Programs conference, PLoP'15*. Pittsburgh, USA.

Butler, R., & Nisan, M. (1986). Effects of No Feedback, Task-Related Comments, and Grades on Intrinsic Motivation and Performance. Journal of Educational Psychology. https://doi.org/10.1037/0022-0663.78.3.210

Docan, T. N. (2006). Positive and negative incentives in the classroom: An analysis of grading systems and student motivation. Journal of Scholarship of Teaching and Learning. https://doi.org/10.1037/tps0000072

Goodyear, P., & Retalis, S. (Eds.). (2010). Technology-Enhanced Learning: Design Patterns and Pattern Languages. Sense Publishers.

Köppe, C. (2011). Continuous Activity - A Pedagogical Pattern for Active Learning. In *Proceedings of the 16th European Conference on Pattern Languages of Programs - EuroPLoP '11* (Vol. 2011). Irsee, Germany: ACM Press. http://doi.org/10.1145/2396716.2396719

Köppe, C., Niels, R., Holwerda, R., Tijsma, L., Van Diepen, N., Van Turnhout, K., & Bakker, R. (2015). Flipped classroom patterns - Designing valuable in-class meetings. In ACM International Conference Proceeding Series (Vol. 08–12–July). http://doi.org/10.1145/2855321.2855348

Köppe, C., Portier, M., Bakker, R., & Hoppenbrouwers, S. (2015). Lecture Design Patterns: More Interactivity Improvement Patterns. In *Proceedings of the 22nd Pattern Languages of Programs conference, PLoP'15*. Pittsburgh, USA.

Köppe, C., Nørgård, R. T., & Pedersen, A. Y. (2017). Towards a Pattern Language for Hybrid Education. In Proceedings of the VikingPLoP'17 conference. Grube, Schleswig-Holstein, Germany: ACM. http://doi.org/10.1145/3158491.3158504

Magala, S., & Zawadzki, M. (2017). Performing academics: return to meritocracy? In Evolution of the Post-Bureaucratic Organization (pp. 88–104). IGI Global.

Manns, M.L. & Rising, L. (2015). *More Fearless Change: Strategies for Making Your Ideas Happen*. Boston: Addison-Wesley.

Warburton, S., & Mor, Y. (2015). A set of patterns for the structured design of MOOCs. Open Learning: The Journal of Open, Distance and e-Learning, 30(3), 206–220. https://doi.org/10.1080/02680513.2015.1100070

Warburton, S., Bergin, J., Kohls, C., Köppe, C., & Mor, Y. (2016). Dialogical assessment patterns for learning from others. In *Proceedings of the 10th Travelling Conference on Pattern Languages of Programs - VikingPLoP '16* (pp. 1–14). New York, New York, USA: ACM Press. http://doi.org/10.1145/3022636.3022651

Appendix A

The following table gives an overview of all referenced patterns in the paper which are not directly part of the presented pattern language.

Pattern	**Summary**
BRING YOUR OWN ASSIGNMENT [Köppe et al. 2017]	Students are less motivated to work on offered standard-assignments, so have them work on assignments they proposed themselves.
LEARNING JOURNAL [Köppe et al. 2017]	Promote reflection and a sense of learning community by asking learners to post regular short texts, where they share and reflect on their personal learning experience.
PERFORMANCE SHEET [Bergin et al. 2015b]	Undocumented assessment criteria are both unfair and impossible to apply. Rate each Refined Criteria on a sheet.
REBEL STUDENTS [Köppe et al. 2017]	When students rebel, don't resist. Open up the space for them to reconstruct the learning experience.

Appendix B

PLEASE NOTE: these patterns will be submitted to another xPLoP conference, so they won't be discussed in the writers' workshop at PLoP 2018. However, comments on them (written down) are more than welcome!

New Patterns

Context for all the patterns: Students are following a course that consists of one or more graded assignments which last over a significant period of time. The LEARNING OBJECTIVES and ASSIGNMENT CRITERIA (e.g. RUBRICS) are defined.

Pattern: GRADING DASHBOARD

Problem: When students don't know where they stand in a course, they may make the wrong assumptions about how well they believe they are doing.

Forces: Some students tend to overestimate their achievements in a course, leading to surprises and frustration when the final achievement shows they did not do as good as they thought. It also regularly happens that students focus mainly on the assignments they like most or which challenge them most, hereby increasing the chance that they won't be able to finish the other assignments with sufficient quality and/or in time. Because of this, they may not pass the course.
On the other hand, some students tend to underestimate their achievements, leading to unnecessary low self-confidence.

Solution: Provide each student anytime with a clear overview of what they have achieved already and what they haven't. This progress control panel -- the dashboard -- shows them how far they have advanced in the course as well as how far they have the option of moving in order to achieve the best grade/s possible or their desired grade/s.

It is important for the dashboard that all assignment elements are included, the already graded ones and the ones with no (or low) grades yet. This way students get the big picture and can clearly identify the parts of the assignments which they should focus on.

The grading dashboard can be used for cumulative and percentage grading (if calculation of final grade is done automatically in dashboard).

One effective way to implement this dashboard is with a spreadsheet, having the assignments (or assignment parts) as one axis and the assignment criteria (such as RUBRICS) as the other axis. The cells then contain the achieved grade per criterion. The total or final grade can also be provided by calculating it based on the percentage or amount of points given per assignment (element).

Figure xx shows an example of such a dashboard, having the codes for the assignments in the first two columns and per assignment the codes of the rubrics above the achieved grades. In the example, "S_Toets1-1.1" is the code for the first rubric of assignment "S_Toets1" and the student got the grade 6 for that part. At the end of each assignment row, the achieved grade for this assignment is given. At the bottom right, the total grade for the whole course is calculated. The grading system here is the Dutch one, where 1 is the lowest and 10 the highest possible grade.

	Semester: OOSE-DT		Student: Bjorn									
EVL	Toets											voldoende
Software Analysis & Design	S_Toets1	S_Toets1-1.1	S_Toets1-1.2	S_Toets1-1.3	S_Toets1-2.1	S_Toets1-2.2	S_Toets1-3				Eind	
		6	6	4	4	4	8				5,8	
	B_Casus1	B_Casus1-1	B_Casus1-2	B_Casus1-3.1	B_Casus1-3.2	B_Casus1-3.3	B_Casus1-4	B_Casus1-5&6			Eind	
		1	1	1	1	1	1	1			1	
Distributed Application Development	B_Casus2	B_Casus2-1	B_Casus2-2.1	B_Casus2-2.2	B_Casus2-3	B_Casus2-4.1	B_Casus2-4.2	B_Casus2-4.3	B_Casus2-5.1	B_Casus2-5.2	Eind	
		1	1	1	1	1	1	1	1	1	1	N
	S_Toets2	Basic	Presentation	Domain	Data						Eind	
		V	V	V	V						V	
Software Process Improvement	B_Portfolio1	B_Portfolio1_1	B_Portfolio1_2.1	B_Portfolio1_2.2	B_Portfolio1_2.3	B_Portfolio1_3	B_Portfolio1_4	B_Portfolio1_5			Eind	
		6	6	8	6	6	6	6			6,4	
Craftsmanship	B_Portfolio2	B_Portfolio2_1	B_Portfolio2_2	B_Portfolio2_3							Eind	
		8	8	8							8	
	B_Kennisdeling	B_Kennisdel-1									Eind	
		1									1	
	B_LearningJournal	B_LearnJour_1	B_LearnJour_2	B_LearnJour_3							Eind	
		1	1	1							1	N
											Eind	
											3,08	

The commonly used approach of Electronic Grade Books[1] can also be used as Grading Dashboard. This way, the students can look at their Grading Dashboard inside of the Learning Management System. Another input for a GRADING DASHBOARD could also be a PERFORMANCE SHEET, where the assessment criteria are rated and the grades can be taken over from.

A way for extending the dashboard is a REWARD SYSTEM, using different colours for different grades (depending on the cultural meaning of the colours, in many European countries red is very negative and green is very positive; therefore consider using red colours for failing grades and light green to dark green colours for passing grades).

Positive Consequences:

- Students do not need to rely on regularly requesting the status of their grades from the instructor because they can easily keep track of where they stand in a course.
- This opens the door to becoming more self-regulated learners when they understand and take more responsibility for what they still need to accomplish or where they could improve.
- The dashboard can also be used for giving an EARLY WARNING.

Negative Consequences/Challenges:

- The dashboard does not tell the complete story -- it is only an overview that does not provide details of exactly what the student needs to do. This can frustrate students who keep pushing forward in the wrong direction, and therefore do not see progress on their dashboard. However, if the students are encouraged to ask for feedback regularly, either directly or by sending in a grading request, the chance of focussing on the wrong things will become smaller. The students can also use the rubrics (or other criteria) to determine themselves what needs to be done for pushing forward.
- Preparing such a dashboard costs time for the teacher and needs to be carefully done, especially with respect to the calculations of the grades. Providing wrong or different information here than in the actual student administration can be problematic.
- As a teacher, you can't force students to look at the dashboard or to use it for self-directed learning. Students have to learn how to use the dashboard, especially if they are used to more

[1] https://en.wikipedia.org/wiki/Electronic_grade_book

classical grading which is done at the end of a course or where only the teachers are responsible for grading.

Known Uses:
The example in Figure xx comes from the implementation of a semester on Object-Oriented Software Engineering at HAN University of Applied Sciences. Every time after a grading request, the dashboard was updated and a link to the latest version (using Dropbox) was sent to the student.

Learning Management Systems such as Moodle often offer functionality such as activity completion records or grade exports which also can serve as grading dashboards.

Pattern: REWARD SYSTEM

Problem: Student grading often focuses on marking the items that must be corrected. While this is helpful for showing where improvement is needed, it can be discouraging, and even overwhelming, when this is the only type of feedback they receive.

Forces:

In order to provide opportunity for continuous improvement, students need to be informed of their errors. However, if we concentrate only on pointing out errors, this can be discouraging and demotivating. However, if their successes are also pointed out to them, this can encourage them to continue what they are doing well.
A grade is just a number (or letter or flag), and the difference between a just passing grade or a slightly higher than just passing grade does not seem big to students, even though it might be a significant improvement in their learning. Some students also don't care much about a grade as long as they pass the course (or the assignment).

Solution: Therefore, make all students' achievements -- smaller and larger ones -- visible to them in an open, ongoing, rewarding and systematic way.

After new achievements, students should get the rewards in a timely manner. These rewards should ideally be additional to just presenting them their achieved grades, e.g. by showing them their achievements in the bigger picture or making it more explicit how well they have performed.

A common way for adding rewards in a systematic way is through applying gamification aspects: students can earn badges, have colours changed in overviews, unlock new options etc. The students can also get the information on how they perform compared to the rest of the group. However, the goal is to reward achievements, so they always should emphasize the positive aspects. This way, gamification is used as stimulating extrinsic motivator, not as an enforcing one.

Students can even be encouraged to celebrate their Small Successes (Manns & Rising) and/or the instructor may wish to schedule some type of a celebration when students reach specific milestones.

Positive Consequence:

- Rather than being overwhelmed with all that they still need to do to complete the project, students can watch the big effect of many small accomplishments. The positive feedback of seeing what they've done so far may encourage them to keep moving towards even bigger accomplishments.
- It might encourage students to continue improving even after they already passed an (element of an) assignment. It's about showing the progress and rewarding it.
- Students likely gain more self confidence.

Negative Consequences/Challenges:

- After reaching a certain milestone, students may be tempted to settle for just enough. Instructors can watch for this, provide encouragement for these students to advance to the next level (to GO FOR GOLD), while at the same time, know when to back off and allow the student to simply settle.
- However, if the students just go for passing a course (in order to get the points or a certificate) instead of really learning something new, then they're likely not responding to the REWARD SYSTEM at all. The rewards should also be given in a very timely manner, so that the students can directly relate them to their latest achievements.

Known Uses:

One type of REWARD SYSTEM is to make use of colours in a GRADING DASHBOARD, making it easily identifiable which (elements of) assignments already have been graded sufficiently. Starting with a dashboard with only dark red cells and incrementally getting them to light green on more and more places with the goal of ending up with a total as dark green as possible has shown to be very motivational for students. Especially the difference between light green (just passed that part) and dark green (getting the highest possible grade for that part) can lead to improvement of already sufficient parts.

For the GRADING DASHBOARD in the course on Object-Oriented Software Engineering at HAN University of Applied Sciences, a colouring scheme was used for the cells in the dashboard. That scheme contained dark red (not graded or with major obstacles), orange (a serious try, but mostly still insufficient, light green (fulfilling the minimum quality requirements), green (solidly fulfilling most the quality requirements), and dark green (excellent quality). An example is shown in Figure xx.

Pattern: STUDENT-DRIVEN GRADING

Problem: Students often are unsure about the quality of their work, asking the teacher for feedback. But even with the feedback, students are often not sure where they stand when it comes to grading which might lead to surprises when the final grading is done. Not knowing where one stands makes it hard to focus on the right things in the right way.

Forces: Students (and people in general) are more comfortable when they know that they're heading in the right direction. Teachers often hear questions such as "Is this good enough?" or "What else should I do to pass this assignment?". The teacher can help the student by answering this types of questions but this causes students to stay in the passive and reacting role; they don't learn how to determine the quality of their work themselves.

Solution: Therefore, give students the responsibility for determining the quality of their work and what the grade for this (part of the) work is. Let them justify and provide evidence for the determined quality and the corresponding grades. When accurate, then the students earn the grades.

The desired quality aspects of the student's work are described in the ASSESSMENT CRITERIA LIST and the RUBRICS and provided by the teacher. But instead of having the teacher assessing the student's work, the students do it themselves, using the same criteria as the teacher. This might require a change in the mindsets of both students and teachers. In the beginning, it might be difficult for some students to do this determination based on the criteria, as they are used to handing their work in and then getting the grade and (hopefully) some feedback on the quality. When using the criteria themselves, questions might arise on how to interpret them or how to translate them to concrete elements of work. Use this as an excellent starting point on discussions about quality! As teacher you have to accept that you're not the only one responsible for grading. Assessing the work changes into assessing the justification of the requested grade.

One way of implementing the solution is to have the students handing in grading requests as result of their self-assessment. Such grading request should contain the following information:

- for whom the grades are requested,
- for which assignment,
- for which criteria and/or rubrics the grades are requested,
- what the concrete requested grades are (per rubric/criterium),
- a justification for the requested grades, and
- the actual evidence (such as documentation, source code, diagrams etc.).

Grading requests can also be for partially finished work, requesting partial grades. This works especially well with cumulative grading. It also shortens the feedback cycles, hereby supporting the students more effectively.

You may wish to encourage students to request grades early and often before the final deadline.

Positive Consequences:

- Students become more self aware of when their product has reached a point at which they reached a certain quality (which is described in e.g. a RUBRIC).
- When having to assess their own work regularly, their self-assessment skills are likely to improve. Students are encouraged to take more responsibility for their own learning progress, they start to play an active role.
- Students are encouraged to start working on an assignment earlier, as they also can get grades for (parts of) it earlier and even are able to finish it before the deadline (incl. acquiring a passing grade). This is not possible with a fixed deadline where the assessments take place after the deadline.
- Having students request grades early and often increases the amount of feedback they will get, as this feedback is part of the teacher's assessment of the grading request.

- When students are requesting grades regularly, then also the workload for teachers of assessing them is distributed, leading to less peak moments at the end of a course.

Negative Consequences/Challenges:

- Students might experience this as doing the work of the teacher and become REBEL STUDENTS. Accept it and explain to them that they will learn more when doing SELF-ASSESSMENT often and early. The worst which can happen is that students stick to their own habit and submit only one version when the final deadline has arrived, with all negative consequences of this approach.
- It requires additional effort to teach students how to use the ASSESSMENT CRITERIA LIST or RUBRICS. It might help to include some exercises in using the criteria on some examples of varying quality.

Known Uses:
Grading for most elements of the semester on Object-Oriented Software Engineering at HAN University of Applied Sciences was student-driven. Students had to hand in a grading request, using a template to ensure that all required elements are present (see Figure x).

#4

Created by Jelle Pals, last modified on Nov 30, 2017

Naam	@Jelle Pals en @Jens Don
Opdracht	Domeinmodel
Welke rubrics	B_Casus1-2
Onderbouwing per rubric waarom bepaald niveau bereikt is	8 • Alle functionele eisen, zoals opgesteld in de functionele requirements, zijn als domein toegevoegd • Zowel de must haves als de should haves zijn opgenomen in het model • Het model is compleet met alle relaties en beschrijvingen daarvan • Daarnaast is er sprake van documentatie voor alle elementen waarin de keuzes worden toegelicht
Referenties naar bewijs/producten (links)	http://94.124.143.61/confluence/x/FoCY
Indienen	Creeer een nieuwe taak op http://jira.icaprojecten.nl/secure/RapidBoard.jspa?rapidView=481 met een link naar deze Confluence pagina

Pattern: SELF-ASSESSMENT

Problem: Students are mainly relying on the teacher to assess their work. They have difficulties with determining the quality of it and therefore what grade they could expect.

Forces: It's important to be able to assess one's work-- to know when it meets criteria and when it does not. But typical grading methods see the instructor as the as the only person who can assess; we rarely give students the opportunity to learn this skill. Yet, without well-stated criteria, this can be difficult to do.

Solution: Therefore, let the students assess their own work using the same assessment criteria that are used for determining the grade for the work.

Start by providing some support. Provide examples of effective and ineffective assessments. You may also wish to dedicate a portion of a class period to checking in to see how it is going and address any questions.

Positive Consequences:

- When students are given clear guidelines to rate and to understand how well they are doing so far, they have the opportunity to become more comfortable with learning how to assess their own work.

Negative Consequences/Challenges:

- By definition, rubric tables do not contain significant details. This can be challenging for students who want to know exactly what they need to do in order to reach a specific level. Help students with interpreting the rubrics on specific examples and use their questions as starting point for discussions on how to determine quality.
- Giving students criteria in advance may not prepare them for life beyond their university courses, where they won't often have such criteria. In addition, providing the criteria in advance could predispose them to look for only those things even though any complex work product may have many other things that are relevant for judging quality. However, it can also be argued that exposure to such criteria helps students understand the importance of and prepares them for defining clear expectations when they are in the role of evaluating others in the workplace.

Known uses:
One way of such a SELF ASSESSMENT is to provide a MOCK EXAM with corresponding grading scheme. This mock exam should be similar to the real exam, both in form, types of questions, content covered, and difficulty level.

Another common form for SELF ASSESSMENTS are QUIZZES: a series of questions students can answer on a specific topic. The correct answers give an indication on how good the topic has been learned.

Students can also be asked for reviewing their own work, applying the same criteria as the teacher. In the course on OO at HAN University, all assessment criteria were published in the form of rubrics and made available to the students via the learning management system. The students had to assess their own work. When the result of this assessment was satisfying, the students could use it for STUDENT-DRIVEN GRADING, handing in a grading request.

Pattern: GO FOR GOLD

Problem: Students often believe a passing grade means they have learned enough, even though there are many parts where they still lack knowledge and/or skills. They have learned less than they could have!

Forces:
The focus in education is often on the achievements made, not on what one still has to (or could) learn. There is in many cases also not much extrinsic incentive given to strive for higher grades than the

passing ones, especially if all credits for e.g. a course are given independent of the grade as long as it is sufficient for passing.

Solution: Therefore, encourage (or motivate) students to continue learning, improving their work and to strive for the highest possible grade if time still allows, even - or especially - when they already acquired a sufficient grade for it.

This can often be best done with a personal message or discussion that opens the students eyes to your belief that they can and should do more.

Positive Consequences:

- Students can learn more and deeper when stimulated to continue learning.
- Being encouraged by the teacher also clearly demonstrates them the commitment of the teachers towards her students, which is an important motivator in education.
- The results of a course and the students will improve, both in terms of fulfilling the learning objectives and the final grades.

Negative Consequences/Challenges:

- While focusing on improving some parts, students might forget to work on other parts which are not yet of sufficient quality. This could lead to some parts with high quality, while other parts do have not sufficient quality.
- If students are not interested much in the course subject or specific assignments of a course, then they likely are not open for improving, they just want to get the passing grade and continue. It is therefore necessary to be a CONSIDERATE LECTURER, observing where students are working on and intervening if necessary.

Known uses:
In the semester on Object-Oriented SE, students were encouraged to make use of the improvement possibility until the final deadline. One way of encouragement was as part of feedback on their grading requests where they were made aware of the next quality level according to the rubric and what they're missing for reaching that level. 4 (out of 17 students) requested higher grades for 8 criteria, even though they already had passing grades for all of them.

Pattern: GRADING REQUEST KANBAN (alt: RAPID DEQUEUING HANDLING)

Context: You apply STUDENT-DRIVEN GRADING and have students request grades based on their SELF-ASSESSMENTs.

Problem: Students will see grading requests as worthless and stop handing them in when they have to wait too long for getting feedback on them. The positive effects of Incremental Grading and the student's trust in you as their teacher will diminish.

Forces:
Feedback is most valuable when it is given in close proximity to the work done. The more present the work is, the better the students can relate the feedback to it.

However, keeping track of which grading requests still need to be assessed and which ones were already handled might become difficult if there are larger student groups and a high amount of different assessment criteria.
Not knowing how long it will take to get feedback can be frustrating and discouraging.

Solution: Therefore, handle grading requests in a structured, timely, and transparent manner.

The shorter the distance is between handing in a grading request and getting feedback on it from the teacher (or some other assessor), the more the students will experience requesting grades as valuable. If students can see how many grading requests still are waiting for feedback helps them to estimate how long it will take before their request is being handled.

As teacher, always try to handle the oldest grading requests first in order to minimize the average waiting time for the students (first in, first out). This requires that there is a structure where it can be easily identified when a grading request was handed in. A kind of inbox with a timestamp can help here, but using e.g. the mail inbox does not provide transparency, students are not able to see how many open grading requests there are at the moment (and hence how long they likely have to wait before their request is handled). Combining the inbox with an open online document (e.g. with Google Docs) where students also can add the information that they've handed in a grading request can help with providing more transparency.

Another way of handling the requests can be to use a Kanban board[2]. When students add new requests in the todo-list on the left, these are sorted automatically by date and time of submission. Teachers should check the board regularly and assess the requests, taking the oldest ones first in order to minimize the waiting times for the students. Before assessing a request, the teacher should move it to the in-progress column. If more than one teacher (or teaching assistant) assesses the grading requests, than in-progress columns should be added per teacher to make it transparent for the student's who's handling their requests. After assessment the request should be moved to the last column (done or assessed), including a link to the provided feedback (which should be provided as reaction to the grading request, e.g. using a comment or feedback functionality). This way the students can easily go to the assessment result.

Kanban boards are widely available and often also part of other software systems that are used in education, e.g. in Jira[3]. There also are other free alternatives that can be used, such as Trello[4].

Positive Consequences:

- You keep an overview of all grading requests and can easily see which ones are waiting the longest time for feedback and should be handled first. The students can also see that their requests are handled and by whom.
- Students can see how many requests still are open for assessment. This way, when they submit a new grading request, they can estimate the time it will take for getting feedback on it. They can also check regularly if there's progress in handling the grading requests.
- As teacher you always have a clear overview of the open grading requests.

Negative Consequences/Challenges:

- It might be that some grading requests can only be handled by teachers with appropriate background (e.g. when there's a research paper assignment and a software implementation

[2] A Kanban board is used for managing work, having issues that move from right to left on the board according the their stage in in the overall process (e.g. todo, in progress, done). See also https://en.wikipedia.org/wiki/Kanban_board
[3] https://www.atlassian.com/software/jira
[4] https://trello.com

assignment). So it might be that newer requests are handled faster than longer waiting requests. Make clear to the students if this is the case, otherwise they might feel treated unfairly (as some students get faster feedback than others).

Examples:
Figure xx shows the Kanban board used in the OOSE semester at HAN University of Applied Sciences. There were 3 teachers who did the assessments. One of them (Christian) did as only one the assessments of the learning journals, which was communicated upfront to the students.