

Educational Design Patterns for Student-Centered Assessments

Christian Köppe, Utrecht University, the Netherlands

Mary Lynn Manns, University of North Carolina Asheville, USA

Rody Middelkoop, HAN University of Applied Sciences, the Netherlands

Abstract: Assessments are an essential part of education. There are many well-known and proven practices for assessments, most of them also described as educational design patterns. However, most of them focus on organizational issues or on the teacher perspective. This paper describes six educational patterns which represent good practices and put the student central. They address issues of student-driven grading, getting an overview of student progress, and increasing student motivation.

1. Introduction

Assessments are essential parts of education because they provide evidence about learning. Assessments support learners by helping them understand their current progress and shortcomings and with determining the next steps in their learning process (formative assessment). Assessments are also used for determining the level of learning goal achievement, usually at the end of a learning trajectory (summative assessment). Designing relevant assessments which are aligned with the content and teaching methods is a challenging task for teachers and educational designers. However, well known good practices can offer help. Many such practices are described as educational design patterns, solution heuristics to recurring problems in specific contexts.

Assessment Design with Educational Patterns

Educational designers can apply patterns -- or a pattern language -- when designing scenarios to help them reach their educational goals. There are many educational patterns available, e.g. for general pedagogy (Bergin et al., 2012), technology-enhanced learning (Goodyear & Retalis, 2010), MOOC Design (Warburton & Mor, 2015) and many other educational aspects.

Specific patterns for assessment design can be found in Assessment-Driven Course Design (Bergin et al., 2015a, 2015b, Warburton et al. 2016). This pattern language formed the starting point for designing the assessment elements of a semester on software engineering at HAN University of Applied Sciences in the Netherlands. Besides applying effective practices for Assessment Design, there were additional challenges the semester designers wanted to address, including: instructor feedback seems unrelated to grading, students have low self-assessment skills and low ownership of learning, big bang grading at the end encourages procrastination and results in often unpredictable results. To address these challenges, the teachers searched for existing patterns, pattern combinations, and other relevant known good practices. The concept of hybrid pedagogy served as an explicit guideline in order to widen the potential solution space (Köppe & Middelkoop, 2019). The result of the design process was the pattern language of Incremental Grading, which is described in detail in (Köppe et al., 2018) and currently applied in various institutions.

However, not all well-known practices that were applied during the design of Incremental Grading were already described as educational patterns, even though they are well known practices in education. This paper fills this gap by describing these practices as patterns.

2. New Patterns

In total there were 6 practices identified which haven't yet been described as educational patterns. Three of these new patterns focus on helping the students become responsible for determining the quality of their work as well as how to handle this as the teacher. WORK SELF-ASSESSMENT is a formative assessment which the students perform using pre-defined criteria in order to determine the quality of their (partial) work products. Based on the WORK SELF-ASSESSMENT, the students can perform a STUDENT-DRIVEN GRADING, a student-driven formative assessment which includes a justification for the requested grade. Assessments are of most value when the results and feedback are communicated in a timely manner (Chappuis, 2014) and GRADING QUEUE addresses this issue.

Two additional patterns focus on using assessment results for providing overview for both students and teachers (GRADING DASHBOARD) and for motivating students (REWARD SYSTEM).

Finally, when assessment shows that student work can be improved (even though it might be already of a sufficient quality level), then students should be encouraged to do so with GO FOR GOLD.

The patterns are described using the most common elements of pattern descriptions: context (in what context does the solution solving the problem?), problem (what is the problem that can occur in this context?), forces (what influences the problem and makes it non-trivial to solve), solution (the essence of the practice which solves or weakens the problem and balances the forces), solution details (useful information for applying the solution), consequences (what do you get when solving the problem with this solution, both positive and negative), and finally known uses (examples of successful application of the pattern solution). All referenced patterns not described in this paper are summarized in the appendix.

Pattern: WORK SELF-ASSESSMENT

Context: Students work on larger products over a considerable period of time. Quality Criteria are defined (e.g. as RUBRICS) for various aspects of the work products.

Problem: Students are mainly relying on you, the teacher, to assess their work. They often have difficulties with determining the quality of it and as a consequence have trouble with identifying the next steps.

Forces:

- Students (and people in general) are more comfortable when they understand the criteria for evaluation and whether their work meets that criteria. However, they don't learn as much when they continue to ask others for this type of feedback.
- It's important to be able to assess one's work-- to evaluate when it meets criteria and when it does not. However, we rarely give students the opportunity to learn this skill because typical grading methods see the instructor as the only person who can assess. Even if there are well-stated criteria, students do not automatically use these for determining the quality of their work.

Solution: Therefore, encourage the students to assess the current quality levels of their own work using the same assessment criteria that are used for determining the grade for the work.

Start by offering some support. Provide, if available, examples of work results with various levels of quality and let the students assess these and discuss the results. This way the students get familiar with the criteria and how to interpret and use them. If no such examples are available, then start with self assessments when students have the first parts of their work ready.

You may also wish to dedicate a portion of a class period to checking in to see how it is going, e.g. by asking students to explain the results of their self assessments, and address any questions. Make the frequency and duration dependent on how well the self assessments are done by the students.

Emphasize that it is absolutely okay if the result of the periodic self-assessment shows that the work products (or parts of it) are still of low quality because this insight helps them with learning and improving their work.

The positive effects can be enhanced by asking the students to also provide an explicit justification for their assessment results. This way they are encouraged to think deeper about the quality and provide reasoning instead of just picking a quality level they think fits best.

A nice addition to this solution might be to have the students initially determine the assessment criteria themselves, eventually matching with pre-defined ones to guarantee the desired learning outcomes. This will increase the ownership.

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.
- Students understand how their work will be assessed because they are using the same assessment criteria (which is also the basis for a TRANSPARENT ASSESSMENT).
- When having to assess their own work regularly, their self-assessment skills are likely to improve. Students play a more active role when they are encouraged to take more responsibility for their own learning progress.

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 quality level. Help students with interpreting the rubrics on specific examples and use their questions as a 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 defining clear expectations when they are in the role of evaluating others in the workplace.

Known uses:

Jan Chappuis (2014) included self-assessment as one of the seven strategies of assessment for learning and provides many examples of self-assessment applications.

Andrade & Valtcheva (2009) provide guidelines and many examples for self-assessments, such as for narrative writing where students had to circle the quality level in the rubric with one color and circle the elements in the story which relate to this quality level with the same color, hereby linking both the work product and the rubric elements.

In the course on software engineering 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 were encouraged to regularly 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.

In two project-driven courses at the University of North Carolina Asheville, students are given the rubrics that will be used to evaluate their work. They are encouraged to use each rubric as a form of checklist to help with continuous improvement while working on their assignments and as a final re-check just before they submit something for grading.

Pattern: STUDENT-DRIVEN GRADING

Context: Students work on larger products over a longer period of time. Quality criteria are defined (e.g. as RUBRICS) for various aspects of the work products. Students might already regularly apply WORK SELF-ASSESSMENTS.

Problem: Even with regular feedback, students are often unsure about the quality of their work with respect to the associated grades and whether they have a chance to earn their desired grade.

Forces:

- Not knowing where one stands makes it hard to focus on the right things in the right way. And even though students have an idea (based on a WORK SELF-ASSESSMENT), there is still some

uncertainty about the grade they will finally earn. However, students (and people in general) are more comfortable when they understand if they are heading in the right direction.

- You often hear questions such as “Is this good enough?” or “What else should I do to pass this assignment?” You may be hesitant to answer such questions in order to encourage the students to focus on quality and not grades. However, the current system in higher education is mostly based on grading and getting sufficient grades is essential for student success. Still, you do not want to simply provide them with grades, as this puts the students into a passive and reacting role.

Solution: Therefore, give students the responsibility for determining the quality of the work they submit (WORK SELF-ASSESSMENT) as well as how it fits into the overall goals. Give them the opportunity to make a grading request that requires them to identify and provide evidence for the quality and the corresponding grades they expect to earn. When their assessment is accurate, they will earn the grade.

One way of implementing the solution is require the students to submit grading requests with 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/criterion),
- a justification for the requested grades, and
- the actual evidence (such as documentation, source code, diagrams etc.).

Allow students to make grading requests for final grades or partially-finished work for partial grades. This works especially well with cumulative grading where students collect their grades or points during the execution of an educational unit such as a course or a semester. If grading requests are handled by the teachers in a timely manner (e.g. when applying GRADING REQUEST KANBAN), they also shorten 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. This forces them to regularly perform a thorough assessment of their work and in consequence improves learning. It furthermore likely leads to a higher ownership of the learning process.

STUDENT-DRIVEN GRADING is an extension of the concept of self-grading--it adds multiple increments to the process and makes the students responsible for deciding on the moment of self-grading instead of doing it once at a fixed point-- and a follow-up on WORK SELF-ASSESSMENT. It combines the formative aspects of the latter one with the summative aspects of also defining a grade for current status of the work product (parts). The responsibility for determining the grade moves from teacher to student, where the teacher of course has the final say.

Self-grading is an approach which has been shown to have potential advantages over teacher grading: logistical (time efficient, quicker and more detailed feedback for students), pedagogical (deepens students' understanding), metacognitive (awareness of own strengths, progress, and gaps), and affective (sense of shared ownership for the learning process) (Crowell, 2015). It furthermore appears to result in increased learning (Sadler & Good, 2006).

Positive Consequences:

- Students become more self aware of when their product has reached a point with certain quality (as described in e.g. a RUBRIC).
- Students may be motivated to start working on an assignment earlier because they will get feedback for part of their work. This is not possible with a fixed deadline where the assessments take place after the deadline.
- When students request grades early and often, this increases the amount of feedback they will get, as feedback is part of your assessment for the grading request.
- When students are requesting grades at periodic times, your workload is distributed. The cycles of feedback and improvement will likely increase the quality of the students' final products, creating less tedious grading for the teacher at the end of the semester.
- Self-grading may also reduce student-teacher conflict (Edwards, 2007), as students are actively involved in the grading process which leads to fewer discussions on the grading results.

Negative Consequences/Challenges:

- This might require a change in the mindset for both you and the students and. 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 into concrete elements of work. Use this as an excellent starting point for discussions about quality! As a 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.
- You may be afraid of grade inflation (students grading themselves too high). However, research shows that most students feel that they grade themselves harder when self-grading (Crowell, 2015).
- Students might see 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 WORK SELF-ASSESSMENT often and early. The worst that can happen is that students stick to their old habits and submit only one version when the final deadline has arrived, with all the 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 as also suggested in WORK SELF-ASSESSMENT.
- It requires some extra effort from the students to provide the justification. This might be experienced as overhead by them, but is actually an important element for improving their self-assessment and metacognitive skills.
- If your response to STUDENT-DRIVEN GRADING takes too long, then chances increase that student won't see much value in this approach and stop grading their own work. This can be addressed by applying GRADING QUEUE.

Known Uses:

Self-grading in general has successfully been applied in a variety of domains such as Social Statistics (Edwards, 2007), Public Health (Crowell, 2015), History of Creativity (Strong et al, 2004), or General Science (Sadler & Good, 2006).

Grading for most elements of the semester on 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).

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

Naam	@Jelle [redacted] en @Jens [redacted] 1
Opdracht	Domeinmodel 2
Welke rubrics	B_Casus1-2
Onderbouwing per rubric waarom bepaald niveau bereikt is	3 8 4 <ul style="list-style-type: none"> • Alle functionele eisen, zoals opgesteld in de functionele requirements, zijn als domein toegevoegd • Zowel de must have's als de should have's 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	Creëer een nieuwe taak op http://jira.icaprojecten.nl/secure/RapidBoard.jspa?rapidView=481 met een link naar deze Confluence pagina 6

Figure x: Grading Request template (in Dutch), elements are (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 (adapted from (Köppe et al., 2108)).

Pattern: GRADING QUEUE

Aka GRADING REQUEST KANBAN

Context: You apply STUDENT-DRIVEN GRADING and have students request grades based on their WORK 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. This enables the students to relate the feedback to their most current work and therefore use the feedback for improvement.
- 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. It might be even more difficult when multiple assessors are involved.
- On the other hand, not knowing how long it will take to get feedback can be frustrating and discouraging for students.

Solution: Therefore, provide an easily accessible overview of all open grading requests, sorted by waiting time. Handle the grading requests in a structured, timely, and transparent manner.

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, ideally in the form of a queue. 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 can also add the information in their grading request can help with providing more transparency.

In some cases it might be that some grading requests need more time for handling than others. In that case it might seem to be more efficient to handle a couple of smaller grading requests first before the more difficult ones even though they have been handed in later. This should only be done when the requests taking more time also will be handled shortly after, otherwise the positive effects of close to synchronous feedback will diminish.

Another way of handling the requests can be to use a Kanban board¹. When students add new requests in the todo-column (similar to tasks on a Scrum backlog), these are sorted automatically by date and time of submission. You should check the board regularly and assess the requests, taking the oldest ones first in order to minimize the waiting time for the students. Before assessing a request, you should move it to the in-progress column. If more than one teacher (or teaching assistant) assesses the grading requests, then in-progress columns should be added per teacher to make it transparent for the student's who's handling their requests. Following assessment, the request can be moved to the last column (labeled 'done' or 'assessed'). This should include a link to the feedback for the grading request (e.g. using a comment or feedback functionality) so that 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 Jira². There also are other free alternatives that can be used, such as Trello³.

Aim for a short period of time between the grading request and assigning the feedback on it from you (or other assessor) -- the students will then be more likely to experience grade requests as a valuable exercise. Optionally, 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.

Positive Consequences:

- You and the students always have a clear overview of the open grading requests. You will know which ones have been waiting the longest time for feedback and should be handled first. The students can also see when their requests are handled and by whom.
- Students can see how many requests are still open for assessment. This way, when they submit a new grading request, they can estimate the time it will take to get feedback. They can also check regularly if there's progress in handling the 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 assignment). So it might be that newer requests are handled faster than longer waiting requests.

¹ A Kanban board is used for managing work, having issues that move from right to left on the board according to their stage in the overall process (e.g. todo, in progress, done). See also https://en.wikipedia.org/wiki/Kanban_board

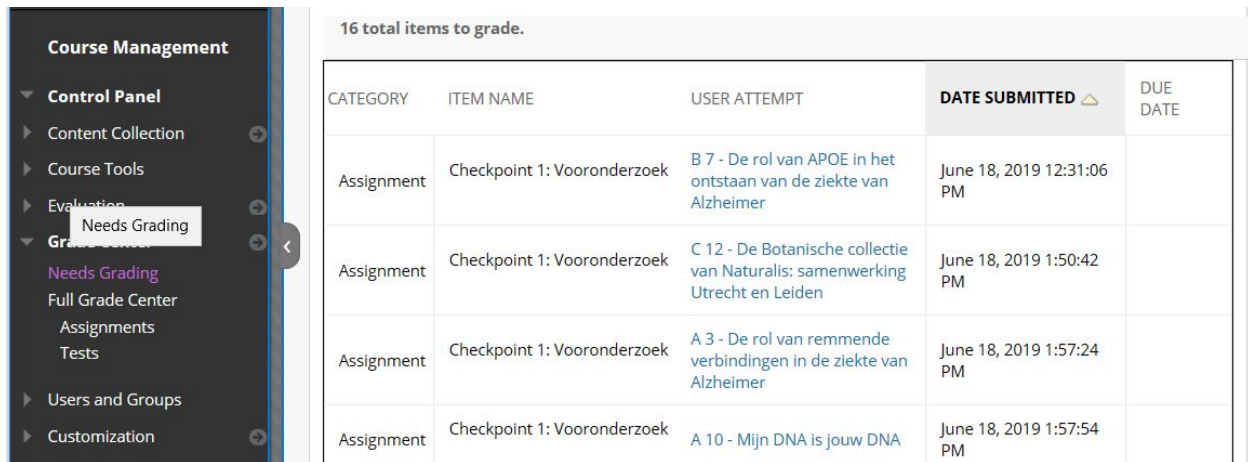
² <https://www.atlassian.com/software/jira>

³ <https://trello.com>

Make clear to the students if this is the case; otherwise they might feel treated unfairly (as some students get faster feedback than others).

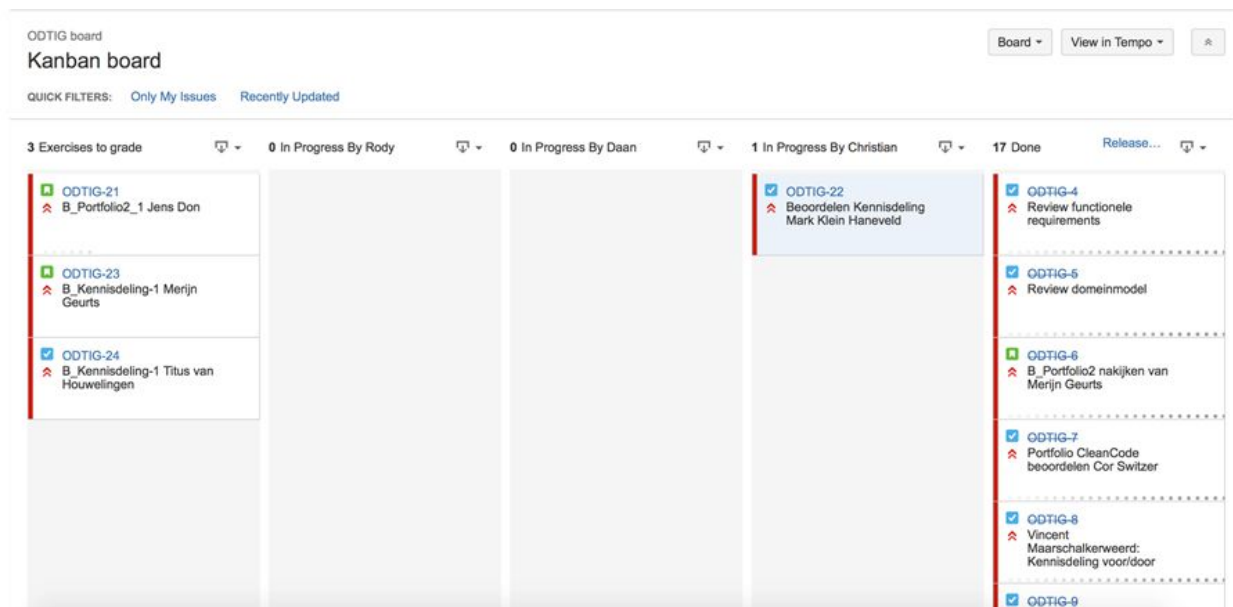
Examples:

Figure xx shows the grading center of the Blackboard LMS. Assignments which need grading can be sorted by date. The grading request information is part of the submission. However, no information is available to students on their position in the queue respectively their anticipated waiting time.



16 total items to grade.				
CATEGORY	ITEM NAME	USER ATTEMPT	DATE SUBMITTED	DUE DATE
Assignment	Checkpoint 1: Vooronderzoek	B 7 - De rol van APOE in het ontstaan van de ziekte van Alzheimer	June 18, 2019 12:31:06 PM	
Assignment	Checkpoint 1: Vooronderzoek	C 12 - De Botanische collectie van Naturalis: samenwerking Utrecht en Leiden	June 18, 2019 1:50:42 PM	
Assignment	Checkpoint 1: Vooronderzoek	A 3 - De rol van remmende verbindingen in de ziekte van Alzheimer	June 18, 2019 1:57:24 PM	
Assignment	Checkpoint 1: Vooronderzoek	A 10 - Mijn DNA is jouw DNA	June 18, 2019 1:57:54 PM	

Figure xx shows the Kanban board used in the SE 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.



ODTIG board				
Kanban board				
QUICK FILTERS: Only My Issues Recently Updated				
3 Exercises to grade	0 In Progress By Rody	0 In Progress By Daan	1 In Progress By Christian	17 Done
<div>ODTIG-21</div> <div>B_Portfolio2_1 Jens Don</div>			<div>ODTIG-22</div> <div>Beoordelen Kennisdeling Mark Klein Haneveld</div>	<div>ODTIG-4</div> <div>Review functionele requirements</div>
<div>ODTIG-23</div> <div>B_Kennisdeling-1 Merijn Geurts</div>				<div>ODTIG-5</div> <div>Review domeinmodel</div>
<div>ODTIG-24</div> <div>B_Kennisdeling-1 Titus van Houwelingen</div>				<div>ODTIG-6</div> <div>B_Portfolio2 nakijken van Merijn Geurts</div>
				<div>ODTIG-7</div> <div>Portfolio CleanCode beoordelen Cor Switzer</div>
				<div>ODTIG-8</div> <div>Vincent Maerschalkerwaard: Kennisdeling voor/door</div>
				<div>ODTIG-9</div> <div></div>

Pattern: GRADING DASHBOARD

Context: Students performed WORK SELF-ASSESSMENTS and got grades acknowledged after applying STUDENT-DRIVEN GRADING.

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:

- Students may overestimate their achievements in a course, leading to surprises and frustration when the final grade shows they did not do as well as they thought. On the other hand, some students may underestimate their in-progress achievements, leading them to become overwhelmed and perhaps give up much too soon.
- Students may 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.
- Students often want to know what assignments they have completed and those they have not started so they can plan ahead or catch up. This can help them assess the cost/benefit of completing specific assignments.

Solution: Provide each student with a clear illustration of how far they have advanced in the course requirements. This can be done with a progress control panel or “dashboard” that shows each student, or team of students, at any time throughout the course what they have accomplished as well as what they still need to do.

The “dashboard” can show all assignment elements, including the ones that are graded ones as well as the ones that are not.

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).

The commonly used approach of Electronic Grade Books⁴ 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 REWARD SYSTEM can be added to the dashboard, 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).

⁴ https://en.wikipedia.org/wiki/Electronic_grade_book

Positive Consequences:

- Students get the big picture and can clearly identify the parts of the assignments which they should focus on. They have the information they need to plan for moving forward to achieve the best grade/s possible or their desired grade/s.
- Students do not need to rely on regularly requesting the status of their grades from the instructor.
- This opens the door to helping students 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 provide students with 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 students need 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 decrease. Rubrics or other criteria can also be added to provide further details.
- Preparing such a dashboard takes time for the teacher and needs to be carefully done, especially with respect to the calculations of the grades. Providing incorrect information 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 need to learn how to use the dashboard correctly, but may be resistant especially if they are accustomed to more classical grading which is done at the end of a course or where teachers report grades in more traditional ways.

Known Uses:

Figure xx provides an example dashboard from Moodle (screenshot taken from official Moodle demo).

The screenshot shows a Moodle 'User report' for a course named 'Psychology in Cinema'. The user is Barbara Gardner. The dashboard is organized into sections: Analysis, Collaborative, and Individual. The 'Analysis' section includes 'From Concept to Reality: Trauma and Film' and 'Course discussion', both with 0.00% weights. The 'Collaborative' section includes a 'Group Project' with 0.00% weight. The 'Individual' section includes a 'Factual recall test' with 9.09% weight and a 'Dissertation: Fight club' with 0.00% weight. The 'Analysis total' is 0.00% and the 'Collaborative total' is 0.00%.

Grade item	Calculated weight	Grade	Range	Percentage	Feedback	Contribution to course total
Psychology in Cinema						
Analysis						
From Concept to Reality: Trauma and Film	0.00 % (Empty)	-	0-100	-		0.00 %
Course discussion	0.00 % (Empty)	-	Fair point-Excellent point	-		0.00 %
Analysis total Simple weighted mean of grades.	- (Empty)	-	0-100	-		-
Collaborative						
Group Project	0.00 % (Empty)	-	0-100	-		0.00 %
Collaborative total	- (Empty)	-	0-100	-		-
Individual						
Factual recall test	9.09 %	7.00	0-10	70.00 %		6.36 %
Dissertation: Fight club	0.00 % (Empty)	-	0-100	-		0.00 %

[illegible]

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 primary type of feedback they receive.

- In order to provide opportunity for continuous improvement, students need to be informed of their errors. However, it can be discouraging and demotivating if we concentrate only on pointing out errors. If their successes are also pointed out to them, this can encourage them to continue what they are doing well.
- Some students don't care much about a grade as long as they pass the course or the assignment. Their grade is seen as just a number (or letter or flag) and the difference between a

passing grade and a slightly higher grade may seem insignificant. However, this difference may represent a significant improvement in their learning.

Solution: Therefore, make all achievements on assignments -- smaller and larger ones -- visible to students in a rewarding way. These rewards should be open, ongoing, and systematic.

When grading an assignment, point out the successful work of each student, or team, in a celebratory way. Ideally, this should be in addition to simply presenting them their grades.

Clearly display their successes and show how these fit into the bigger picture of their final grade. Emphasize the positive aspects because the goal is to show progress and reward it. Share this information in a timely manner so that the students can relate their achievements to their most recent work.

A common way to add these rewards in a systematic way is through applying aspects of gamification: students can earn badges, have colours changed in overviews, unlock new options, etc. You can also show how individuals or teams performed compared to the rest of the group.

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 or the course, students can watch the big effect of many small accomplishments. The positive feedback of seeing what they've done so far can encourage them to keep moving towards even bigger accomplishments. It may even inspire them to continue improving even after they already passed an (element of an) assignment.
- Students likely gain more self confidence because they can clearly see what they have accomplished.

Negative Consequences/Challenges:

- After reaching a certain milestone, students may be tempted to settle for just enough in order to simply pass the course. You 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.

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 have already been graded sufficiently. The example below is the Moodle Completion Progress Block.



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 (ref to example of Grading Dashboard).

Pattern: GO FOR GOLD

Context: Students got grades as a result of STUDENT-DRIVEN GRADING, and some of these grades are already sufficient for passing the course or assignment.

Problem: Students often believe a passing grade means they have learned enough, even though there are still some areas where they still lack knowledge and/or skills.

Forces:

- The focus in education is often on the achievements made, not on the many things one still has to learn. As a result, students often learn less than they could have.
- Students often do not have the intrinsic motivation to aim for higher than simply a passing grade. This is especially true if a higher assignment grade does not add to the total points that have already been achieved to pass the course.

Solution: Therefore, continually encourage students to improve their work and strive for the highest possible grade, even when they have already acquired a passing grade. Keep an eye on what they are doing and point out ways it can be improved. Show that you believe they can do better and cheer them on when needed.

An appropriate moment is immediately when the student received a passing, but not the maximum

possible, grade and there is still time until the assignment deadline. In that moment, the feedback is still relevant and easy to relate to the product and its application might be less difficult as when the student already had worked on other assignments.

GO FOR GOLD is supported by using a REWARD SYSTEM that makes the improvements visible, e.g. through changing the color of a grade from light green to dark green when it has improved.

Positive Consequences:

- Students can learn more and deeper when stimulated to continue learning.
- Your encouragement demonstrates your commitment towards your students, which is an important motivator in education.
- The results of a course and the students will likely improve, both in terms of fulfilling the learning objectives and the final grades.

Negative Consequences/Challenges:

- This requires extra time because it's best when you watch how the students are doing and then personally encourage them to do more.
- 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 not have not sufficient quality.
- If students are not interested in the course subject or specific assignments, then they likely are not open for improving-- they will simply want to get a passing grade. You may then want to become a CONSIDERATE LECTURER, observing where students are working on and intervening if necessary.

Known uses:

In the semester on software engineering, 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.

3. Summary and future work

In this paper we described six practices of assessment design as educational design patterns. These patterns are applicable in various contexts and they form an essential part of Incremental Grading, a student-driven assessment approach.

Even though all six patterns are based on good practices, their validity still needs to be empirically shown. In future work, we will research the effectiveness of all the patterns (mostly as part of Incremental Grading) in larger-scale educational interventions. These patterns will then be consciously applied when defining the solution space as part of a design-based research approach.

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Appendix

In the following table, we will provide an overview of all patterns which were referenced in the paper.

Pattern	Summary
ASSESSMENT CRITERIA LIST (Bergin et al, 2015a)	Clearly communicate, in writing, to students what the criteria for assessment are so that they know what is expected.
EARLY WARNING (Bergin et al, 2012)	Give them Early Warning when you see that students are headed for trouble so that they don't

	get behind with little possibility of recovery.
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.
RUBRIC (Bergin et al, 2015a)	Rate each Refined Criteria on a sheet and aggregate the mark.
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.