Assessment-Driven Course Design - Fair Play Patterns

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Important aspects of assessments in education are that they are fair and relevant for the targeted learning outcomes. Patterns as descriptions of tested ways can help university teachers with reaching these goals, as these teachers are often not trained in these specific aspects of education. The patterns on fair assessments presented in this paper have been mined by a group of practicing educators during the first EduPLoP. They build on the foundational assessment patterns and address aspects such as transparency on what and how will be assessed and respecting the diversity of the student population.

1. INTRODUCTION

Assessment—the formative and summative activities teachers use to gauge student progress and to help them learn—is one of the most important parts in education, they should be fair and relevant for the targeted learning outcomes. While these are honorable goals, many university teachers are not trained in assessment strategies and the underlying principles. Patterns—as a way of capturing tested and working good practices— offer support in this situation. They provide teachers with the required knowledge to improve their work.

In earlier work [Bergin et al. 2015], we presented the following set of foundational patterns for Assessment-Driven Course Design (ADCD): Constructive Alignment, Learning Outcomes, Assessment Criteria List, Criteria Refinement, and Rubric. Summaries of these patterns can be found in the appendix.

In this work we explore patterns for fair assessment that build on these foundational patterns. All patterns are summative but can partly also be used for formative assessments. All patterns were initially mined during the first EduPLoP workshop 2015. See for more details on the process [Bergin et al. 2015].

Both Rubrics and Reference Solutions can be used for TRANSPARENT ASSESSMENT, i.e. letting students know how you provide scores, what you expect and in which ways you evaluate by providing the Assessment Criteria List and/or the Rubric. This transparency supports fairer grading. Another way to explain scores is to use a REFERENCE SOLUTION. A REFERENCE SOLUTION is not the only correct answer to a given task. But it divides a task into components and defines reference scores for each of the potential achievements. It can also exemplify which skills are tested and which expected learning outcomes are probed. However, since we appreciate the diversity of students, fairness must not be reduced to "treating everyone the same way". Rather, we need to accept MULTIPLE RIGHT WAYS, offer ASSESSMENT DIVERSITY to ensure that we measure the skills rather than the student's ability to cope with a specific type of assessment instrument. Sometimes HIDDEN BONUS CRITERIA can be used to reward high performance in areas that have not been stated as explicit learning outcomes (for example, to avoid distracting or misleading students). While there is a risk that HIDDEN BONUS CRITERIA counter transparency they are also an opportunity to honor a wide range of skills without making the core learning outcomes fuzzy. The assessment itself should be made transparent by using a PERFORMANCE SHEET.

1.1   An Assessment Language

The foundational patterns for assessment and the fair assessment are just the beginning of a larger language of assessment patterns. We have already identified many existing (and documented) patterns that can be integrated into the language. Moreover, we have outlined new patterns that we have already tested in our own teaching activities, including PERFORMANCE ASSESSMENT, LEARN BY FAIL, MISCONCEPTION ASSESSMENT, HIDE NAMES, FAIL FAST, STUDENT CONFERENCE, GAMING THE LECTURE, GAMIFICATION, SELF ASSESSMENT, MANDATORY PEDAGOGICAL TEACHER TRAINING, BITCOIN, REFINEMENTS 'TIL DONE, THIS IS FEEDBACK, and POLL & COMMENT. These will be described in future work.

1.2   The Format of These Patterns

Each pattern opens with its name and optionally any recognized aliases. Then comes a pattern summary in italics, followed by the context. Following a sequence of asterisks you find the forces followed by the problem addressed in the patterns. Immediately after the second sequence of asterisks is the solution and then any commentary, discussion, implementation details, etc. The key parts of the problem and solution are in bold. Near the end of the last part you will find the resulting context, both positive consequences ("You will find...") and negative consequences ("However...").

We also include, at the end, such things as examples, related patterns, and references. These are labelled. The "patlet" (problem-solution pair) closely contains ("hugs") the second sequence of asterisks.

TRANSPARENT ASSESSMENT

Also Known As: Open Instruments of Assessment; Visible Assessment

Ensure that your assessment scheme is visible to your students, from the criteria to the actual tools you use to apply them.

You are teaching in a structured educational situation and have a clearly defined ASSESSMENT CRITERIA LIST.

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Students often do not reflect on their work or evaluate it, either because they do not know how to do it or they don't see value in doing so. This leads to unproductive work on both the student's and the teacher's side, as they didn't do it right, didn't do the right thing, or even both.

On the other hand, if students have the idea that they are on the right track but assessment shows they aren't, then this can be very frustrating and demotivating for them. In that case students *think* they know how they will be assessed or *assume* that the assessment will match the way they validate their work themselves.

In some cases, students actually are on the right track, but still could perform better. But they often do not know how to improve their performance.

Students often have misconceptions about what you require of them. If students don't know where you want them to go, how will they get there?

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Therefore, share all elements of your assessment scheme with the learners, from the ASSESSMENT CRITERIA LIST, through the patterns you use to apply them and the tools you use to implement those. Instruct learners to use these tools to self- and peer-assess their work, and encourage them to debug them, i.e. point out any ambiguities or inconsistencies.

Before the course (or learning activity) starts, provide students with the ASSESSMENT CRITERIA LIST. These criteria are implemented through your ASSESSMENT INSTRUMENTS: provide the students with these as much as you can of without compromising the integrity of your assessment. Explicitly demonstrate the CONSTRUCTIVE ALIGNMENT of your ASSESSMENT CRITERIA LIST and your ASSESSMENT INSTRUMENTS.

In order to maintain your autonomy, you may include elements of DISCRETIONARY BONUS. Sometimes you can give students access to the actual instruments you will use. For example, if you use a RUBRIC, you can provide it as is. However, some instruments, such as an exam, rely on concealment. In that case, you can provide equivalent examples such as a MOCK EXAM.

You may expect: Knowing the details of the assessment reduces student anxiety. Students will perceive the assessment as more fair.

"Sunlight is said to be the best of disinfectants"[1]: your students have a clear interest in your assessment criteria and instruments. If these are unclear, ambiguous, incoherent, inconsistent or misaligned - they are sure to point this out to you.

Understanding the rationale behind the assessment will help students align their work (their epistemic practices) with the learning objectives.

Students will reduce their misconceptions of the assessment strategy and by extension of the content to be learnt. Disputes over assessment will be reduced to to a clearer understanding of the assessment criteria and procedures.

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[1] https://en.wikiquote.org/wiki/Louis_Brandeis

If your ASSESSMENT CRITERIA LIST and ASSESSMENT INSTRUMENTS are well thought, they should be a good example for students to follow. By studying these, and using them for SELF ASSESSMENT and PEER REVIEW, students will develop their meta-cognitive skills.

However, If your ASSESSMENT CRITERIA LIST and ASSESSMENT INSTRUMENTS are not carefully designed, exposing them will narrow the students' learning to the cases captured in the assessment tools, and reduce the transfer of knowledge to unknown situations. In some cases, students may even "game" the assessment instruments, thus achieving high marks but missing the learning objectives altogether.

Related Patterns

—Used ASSESSMENT CRITERIA LIST and CONSTRUCTIVE ALIGNMENT.

—Used by GRADED PEER ASSESSMENT and SELF ASSESSMENT.

—Essential for COMBINED SELF-PEER-TUTOR ASSESSMENT.

Examples

—The University of Surrey provides students free access to Turnitin's[2] originality checking service.

—Christian Köppe provides students with a MOCK EXAM in the introductory programming course. This mock exam also contains a grading scheme which is similar to the one used in the real exam.

—OU UK's course "H817: Openness and innovation in elearning"[3] included a design studio component. Students were provided with the rubric used to assess this component.

—University of Haifa's course on "Games and Learning"[4] provided students with the scheme that the tutor would use to mark them, and asked them to use the same scheme to mark themselves. The grade they gave themselves was factored into their course grade.

See Also

John Hattie's book on *Visible Learning* [Hattie 2008].

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[2] http://turnitin.com
[3] http://www.open.ac.uk/postgraduate/modules/h817
[4] https://sites.google.com/a/edtech.haifa.ac.il/games/

REFERENCE SOLUTION

Use one potential solution as a reference to relate scores to (partly) correct solutions.

You are planning how to mark an upcoming student assignment or task. You expect a correct answer, but realize there are MULTIPLE RIGHT WAYS.

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A student solution can be technically wrong, but the student may still be on the right track. A binary measure does not account for the actual performance.

A student might start out on a different path to a solution than you expected. It might prove fruitful, so simple measures don't account for creativity.

If there is only one standard solution it is easy to score the performance by simply considering which parts of the standard solution are fulfilled. However, if you see only parts of an alternative solution it is hard to tell whether this solution is correct.

Even if the parts of a solution are correct, the parts likely require different amounts of effort and/or creativity.

Some of the key parts of the solution might be correct, but others less so.

All correct solutions score hundred percent but you have to find scores for partly correct solutions as well. **Deciding what is partly correct becomes very difficult if a student uses an unexpected, yet potentially correct, solution approach.**

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Therefore, write one reference solution and identify the core functional elements of the solution. Assign scores to each solution part. When a student has given a partial solution then you can provide the scores for each solution part that has been found. It does not have to be the same solution as you use in your reference.

This is a divide and conquer approach to identify solution parts. The reference solution helps you to identify which essential parts are needed and you can also evaluate the difficulty of the approach, e.g. do students have to apply standard mechanisms (e.g. a for loop), apply a trick, have to understand a new model or develop a new solution. Both the essential parts needed and the standard mechanisms students have to apply should have direct connections with the LEARNING OUTCOMES. These LEARNING OUTCOMES are therefore also leading in the process of writing the reference solution, which in consequence ensures CONSTRUCTIVE ALIGNMENT.

The reference solution does not set up the one right answer but can be used as a reference to map scores to partial correct solutions.

It can also help to identify requirements or steps that are required in any potential solution approach. If you have already several solution alternatives in mind you may write down several reference solutions and map the scores between them as well.

You may expect: Scoring becomes easier as you do not have to decide each time whether some solution fragment scores or not. If you identify a solution fragment you can easily assign a score based on the reference solution.

This leads to fairer scoring and it makes it easier to explain the scores to students and provide feedback. You can also publish a reference solution for a MOCK EXAM to demonstrate to students how you assign scores. You can also publish the reference solution after a written text to help students check how they performed right after the test - but make sure to communicate that it is not the only right solution.

This approach helps to map solution parts to a score if these parts are easily identified as correct.

However, if some part cannot be mapped to the reference solution this does not necessarily mean that it is wrong. Rather it needs to be evaluated for its correctness and a score needs to be found.

Related Patterns

—is based on the ASSESSMENT CRITERIA LIST

—can be part of a MOCK EXAM for allowing students' SELF ASSESSMENT

—should take MULTIPLE RIGHT WAYS into account

—helps with realizing CONSTRUCTIVE ALIGNMENT bu focusing on the LEARNING OUTCOMES

Examples

—A reference solution may store data in an array. Identify the need to store data somewhere can be assigned 2 points. If a student finds any alternative ways to store the data this counts 2 points.

—The reference solution identifies that at some point a new thread needs to be created. The correct syntax of creating the thread is scored one point. If a student has a different solution approach (correct or even incorrect) the creation of a thread at some point scores one point.

—A reference solution may need to fulfill some requirements. The reference solution shows that these requirements can actually be fulfilled. However, all other solution that fulfill the requirements score equally.

MULTIPLE RIGHT WAYS

Allow different solutions or different paths to good solutions to be correct. If some solutions or paths are better than others, make criteria that lead to higher scores transparent.

You are assigning a task to students - in projects, written exams, practice sessions etc. and you have to decide which answer is right. The task can be solved in multiple and identifiable ways.

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It is a fact that in almost any area there are multiple ways to solve a problem. Even if you ask students to solve a problem using a specific method there can be a variation of implementation.

You may be familiar with several alternative solutions but students may come up with many unexpected solution approaches. Sometimes these solutions are clumsy, at other times they are innovative and even better than expected.

You may say that "anything goes" but actually some things go better! Some approaches may plainly be wrong that is they do not fulfill the assignment. Some approaches may be partly wrong: they lead to the right direction but have some flaws in it.

Some approaches reach the goal but have negative side effects. Correct solution should be graded better than partly correct solutions. Better solutions should be graded better than weak solutions. But it becomes tricky to grade better solution approaches that are only partly correct.

If you allow only one solution to be correct then you are not fair to students who have found equivalent or even better alternatives. However, some alternatives may work correctly but are still not good solutions. Grading weak solutions lower seems unfair to students.

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Therefore, allow multiple alternatives as correct answers. Be open to unexpected approaches and individually evaluate their correctness and quality. Clearly state the goal and expected outcome. Clearly state which additional criteria you expect from the solution (efficiency, innovation, easy read, fulfilling standards).

To test the correctness clearly define the expected outcome, for instance a mathematical result, a computed outcome, or features of an artefact. To test the quality and requirements state explicitly which requirements you expect to be fulfilled. You can use an ASSESSMENT CRITERIA LIST for that. If you use a REFERENCE SOLUTION, then look for the aspects where different correct alternatives are (hypothetically) possible and identify the core elements of these alternatives which need to be present.

It is good to collect information on alternative correct answers and to use this knowledge during the following running of the course.

If correctness and all requirements are satisfied then rate the outcome with 100% of the potential score. Provide bonus scores for innovative or high quality solution approaches and use the bonus scores to compensate mistakes in implementing that solution.

You may expect: A diversity of approaches and fairer scoring of these different approaches. A decrease of students learning standard solutions by pure repetition or drill & practice. An encouragement for students to become more creative.

However, an unknown solution is hard to evaluate for its correctness. Sometimes you have to process the solution step by step and even then you cannot be 100% sure whether the solution works in all cases. Exchange with colleagues and documenting such unknown solutions and how they were evaluated for future use helps with lessening this problem.

Related Patterns

—is based on ASSESSMENT CRITERIA LIST

—needs to be taken into account when writing a REFERENCE SOLUTION

Examples

—In computer science, students can be assigned to write some code in order to solve a problem. The solution may require some list data structure and some running through the list, making use of all elements in it. The most important part here that the students are working with list-implementation and some loop structures, but there are multiple applicable list implementations (such as LinkedList, ArrayList, or a simple Array) and multiple applicable loop-constructs (such as do-while, for, or a while loop). All of these might be correct if applied in an appropriate way.

ASSESSMENT DIVERSITY

Use a variety of assessment techniques in each course to account for different learning modalities and to increase the richness of student experience.

You are designing the assessment structure for a new course.

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Every student is different. Some students are better test takers and some are better writers, speakers, ... Students need to learn to express themselves in a variety of ways.

Some students may do especially poorly on some assessment instruments independent of their learning. If every such measurement uses that mode they will do poorly overall, even with good learning.

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Therefore, use a variety of assessment vehicles within the course. Don't depend on just exams. You can evaluate project work, writings, presentations, etc. Even within exams, use a variety of question types.

Almost any variety here is good. Flash quizzes, tallying participation, peer review along with formal exams as required. Use YOUR CHOICE, MY CHOICE to make sure that the activities cover all the aspects that you want.

Each measurement should not have a large impact on the overall assessment of the student. Let grades be determined by the overall performance.

You may expect: You will tend to assure that if a student is somehow disadvantaged by a particular vehicle it will have low impact on overall performance measurement.

However, this takes a bit of thought and exploration, of course, but otherwise, few negatives.

Related Patterns

—Used by CONSTRUCTIVE ALIGNMENT

—REDUCE RISK

—KINDS OF EXAM

Examples

—Iteratively grading a project as it is developed + a couple of exams + an oral presentation of the project (can also be part of CONTINUOUS ACTIVITY).

—In the programming courses at HAN University of Applied Sciences, the students have to do two exams for grading and an additional practical assignment in order to address different aspects of the content.

HIDDEN BONUS CRITERIA

Have some additional criteria that can improve the overall grade of students but are not communicated to them upfront.

You are using an ASSESSMENT CRITERIA LIST to grade student achievements.

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Special problems can arise in the course of a term. Students should be rewarded for working effectively, even though the stated criteria could not be met.

The stated course criteria might seem pedestrian and boring to your best, most creative, students.

Even the typical student can be led to doing the minimum to fulfill the criteria by focusing on the communicated ASSESSMENT CRITERIA LIST only. They don't know if additional efforts will be rewarded.

Some assessment criteria may distract or misguide students in their learning.

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Therefore, evaluate hidden criteria that can lead to better gradings but are not communicated upfront to the students. These hidden criteria are not communicated to students because they should not be distracted or misled by them.

While the hidden criteria are not communicated to the students, you should also document them and make them available to students if they need to understand their grade. So you can justify the grade later and make the base for your evaluation transparent - even with hidden criteria. Hidden criteria should not lead to poorer marks because the communicated criteria list is some kind of contract you do with your students. For example, if a team has created a great artefact but always missed the deadline, you should only lower the grade if you explicitly stated that time management is a criteria for assessment.

You may want to point out that there are some additional (bonus) criteria (without making these criteria explicit). Students may guess them, or you may state generally that high performance in areas that are not stated explicitly may improve the total result. However, make clear that these criteria are really additional and can't be used for compensating unfulfilled standard ones.

It should be possible to get a good, even perfect, grade with only the stated criteria.

You may expect: to have even better conditions for students than in the original assessment contract. This leads to less complaints and students feel treated more fairly. Students are happy that they perform well.

However, hidden criteria should not lead to minus scores.

Students may feel treated unfair if other students or groups are rated better even if they perform equally on the criteria list that is accessible to all students. It therefore is obligatory to communicate all used criteria after grading and also why some of the criteria weren't communicated upfront.

Related Patterns

—are an element in FLEXIBLE CRITERIA

—can be part of MULTIPLE RIGHT WAYS to allow different achievements to reach the goal

—a PERFORMANCE MATRIX makes explicit in team work who was responsible for what

Examples

—Efficiency: students should explore multiple approaches rather than only have look for the "best outcome in minimal time". However, if a group has achieved outstanding results in short time, this is a bonus.

—Conflict resolution: if teams perform well in resolving conflicts—or productively navigate the conflict—this is a bonus. However, teams should not be encouraged to have unproductive conflicts...

—Self-guidance: if a team achieves results without much guidance from the supervisor this is a better achievement. However, students should not be encouraged to avoid advice or support.

—Overall performance: sometimes a team performs only average on each of the criteria but if you consider the outcome as a whole it is much better - it feels just better. This could lead to better grading. However, students should not be encouraged to treat the communicated criteria as less important.

—Learnings: Sometimes you observe a real jump in the learning curve and only at the end of the project the teams performs very high. In this case you may want to grade the high performance. But of course you don't want to encourage students to perform low in the beginning.

PERFORMANCE SHEET

Also Known As: Assessment Contract

Rate all refined criteria on a sheet.

You have an ASSESSMENT CRITERIA LIST and found already CRITERIA REFINEMENT.

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Fairness requires that there be at least rough correspondence between your evaluation of one student and another.

If you must evaluate work at different times, such as a performance or presentation, it can be hard to keep track of how you evaluated the earlier ones. It is possible to get inconsistent.

Some students will surprise you, doing something out of the ordinary, either better or worse than expected.

Undocumented assessment criteria are both unfair and impossible to apply.

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Therefore, prepare a sheet (digital or print-out), that lets you easily enter the performance for each of the finer level criteria.

Have fields that let you aggregate the finer level criteria of CRITERIA REFINEMENT. By making the performance sheet available to student you support TRANSPARENT ASSESSMENT. However, you may consider to skip the criteria refinement to not overwhelm the students. You should also not put HIDDEN BONUS CRITERIA on published sheets so that the students are not distracted or misguided by them.

Be sure not to forget any criteria.

You may expect: It is easy to compare between students. Having a standardized performance sheet makes it easier to grade work by two independent reviewers.

However, be aware of mechanic scoring that does not take the individual cases and skills into account.

Related Patterns

—Students Define Criteria

—Guess Criteria

—Flexible Criteria

—Multiple Paths (allowing different achievements to reach the goal.)

—Performance Matrix (making explicit in team work who was responsible for what)

—Realized by Open Instruments of Assessment.

Examples

—One of us used the printed out sheet shown on the left in Figure 1 to write down the detailed performances of teams presenting their project results. The presentation was one criteria of the overall performance.

Using an Excel sheet (shown on the right in Figure 1) he rated the project results according to several criteria. Another tutor used the same sheet and rated the students independently.

Fig. 1: Performance Sheet examples

2. ACKNOWLEDGEMENTS

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APPENDIX

Summary of Existing Patterns

The patterns with references are already described in detail, the other patterns will be described fully in future work. The patterns are given in alphabetical order.

Pattern Name	SUMMARY
ASSESSMENT CRITERIA LIST [Bergin et al. 2015]	Clearly communicate to students what the criteria for assessment are.
ASSESSMENT-DRIVEN COURSE DESIGN [Bergin et al. 2015]	Use assessments as drivers for developing your course to ensure that the course content, learning outcomes, and the way the outcomes are tested match.
ASSESSMENT INSTRUMENTS	Develop a set of instruments that implement the ASSESSMENT CRITERIA LIST while ensuring CONSTRUCTIVE ALIGNMENT.
COMBINED SELF-PEER-TUTOR ASSESSMENT	Combine your assessment with self and peer assessment to form the final mark.
CONSTRUCTIVE ALIGNMENT [Bergin et al. 2015]	Create authentic assessment activities by first defining your learning outcomes.
CRITERIA REFINEMENT [Bergin et al. 2015]	Refine assessment criteria to a detailed level.
DISCRETIONARY BONUS	Define criteria which you will use at your discretion to award points beyond the full mark.
LEARNING OUTCOMES [Bergin et al. 2015]	Set clear and measurable learning outcomes to help students organize their study and to ensure you capture all elements you need.
PEER REVIEW	Develop your students as autonomous and self-regulated learners by asking them to review each other's work and provide feedback..
RUBRIC [Bergin et al. 2015]	Rate each Refined Criteria on a sheet and aggregate the mark.
SELF ASSESSMENT	Require the student to do a self assessment of performance.
YOUR CHOICE, MY CHOICE	Create a menu of assessments that are designed to cover all of the required elements and add simple rules to how the learner can choose the tasks they wish to tackle in such a way that they will always have a balanced diet.

Table I. : Summaries of referenced patterns

Table II contains summaries of all other referenced patterns (in alphabetical order).

Pattern Name	SUMMARY
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.
KINDS OF EXAM [Pedagogical Patterns Editorial Board 2012]	Use different kinds of exam. The exams should respect the different approaches, which serve the students learning capabilities.
MOCK EXAM [Pedagogical Patterns Editorial Board 2012]	Give the students a chance to prepare for the exam by permitting them to take a trial exam.
REDUCE RISK [Pedagogical Patterns Editorial Board 2012]	Take effective action to reduce your student's risk of course failure so that they not only focus on the exams.

Table II. : Summaries of referenced patterns