

# Four practical steps to optimal testing

# How do you create a test matrix?

Test matrix? For people who do not have to deal with exams on a daily basis, this may be an unknown term. A test matrix is no more than the floor plan of an exam. An overview of the distribution of subjects and the way in which questions are asked. Why do you actually need a test matrix? And how do you make such a test matrix?



# PRACTICAL STEP-BY-STEP PLAN In 4 steps to a test matrix

# What is a test matrix?

As a test developer, you use a test matrix as a tool for drawing up an exam. Think of it as a plan of approach or a floor plan. It is a visual representation of how exam questions are divided up over the subject matter in relation to the subjects and objectives as a whole. You also determine the level at which you want to test these subjects and which form of test is best suited.

A test matrix is actually an indispensable instrument in the development of a test as it expresses the validity of the examination.

The validity is the extent to which the examination measures what it is supposed to measure. In doing so, you ask yourself the following question: is the subject matter tested at the level required according to the learning objectives? The learning objectives, also called attainment targets, make it clear and concrete what the examination candidate needs to master in terms of knowledge, insight and skills.

A test matrix can be used for both theoretical and practical tests. However, there is a difference between them. In this blog, we will only discuss the creation of a test matrix for a theory test.

# What are the advantages of a test matrix?

## For the exam

It provides a framework for every exam. You can view a test matrix as the basis for each examination. It is not only the link between the exam and the learning objectives, but also a schematic representation of what you want to see raised in the exam. As a result, each exam may consist of different questions, but it remains comparable in terms of level and content.

# For the teacher and the examining board

It gives guidance to the teacher and the examining board. As stated above, the test matrix serves to guarantee the validity of the examination. You can use it to show what you are testing and in what way. Are the subjects involved important and does the examination test the subject matter at the level required according to the learning objectives?

## For the candidate

It offers exam candidates direction in their learning efforts. After all, good preparation is half the battle won. It helps the exam candidates to understand what material will recur in the exam, so that they can make targeted preparations.

# Step-by-step plan for creating a test matrix

Below we go through a number of steps that you can follow to create a test matrix.

# STEP 1: Determine the goal

There are several goals you can pursue through an exam. For example, the goal may be to certify or to measure interim results.

In the first case of certification, it is about whether the candidate meets the requirements and has therefore obtained a certain qualification. On the one hand, the examination must contain sufficient items, on the other hand it must be valid.

In the second case, when measuring interim results, you can make use of partial tests whereby it is not a strict requirement to pass the final level. With this, you acquire an impression of whether the candidate has mastered the subject matter so that you can determine their level.

In the rest of this blog we will assume a final (summative) test, with certification as the goal.

# STEP 2: Assess whether all learning objectives fit into a theory exam

We often come across examination programmes in which not all learning objectives are easy to test theoretically. Like when testing the knowledge of complaint handling interviews. While it is not possible to have an actual conversation in a theory exam, you can test the best achievable and most meaningful solution. The candidate can, for example, explain the criteria for good complaints handling. Or even better: the candidate can assess the quality of a complaint interview. For instances like this, digital testing is ideal. Simply allow the candidate to assess a video of a complaint interview. This approach to testing has two advantages. On the one hand you get more innovative testing, on the other hand you test for level.

# STEP 3: Determine the weighting of learning objectives

Start by classifying the main topics. Suppose that the subject matter covers three areas. Then first determine the general distribution. For example: 30%, 30%, 40%. It can of course be a completely different distribution, depending on the importance and scope of the different subjects.

The distribution is based on a percentage of the total number of points to be gained. After all, this determines the weighting of a subject. It is advised to include an appropriate number of questions on that subject in proportion to the number of points. According to standard guidelines, it is also important to use a limited number of points per question. The number of points per question should preferably be as equal as possible to the number of aspects to be measured per question. When there are no facts and figures from previous exams available, it is difficult to estimate the number of points. You can then choose to include margins in your test matrix, for example that the number of questions per item can deviate by 5%.

# STEP 4: Filling in the test matrix

The more you lay down, the more guidance there is for the test developer and for the candidate. Broadly speaking there are a number of things you can stipulate:

- Mastery levels
- Open/closed questions
- Yes/no casesTime needed for the exam
- Cut-off score



## **Mastery levels**

The question is to what extent mastery levels play a role and which testing method is used. In other words: are the learning objectives divided by level? In the widely used Bloom assessment method, the theoretical exam is about knowledge, understanding and application. The classification into mastery levels is often relevant; knowledge questions are often different from comprehension questions and application questions also require different processing.

If you do want to indicate a percentage for this (such as 20% knowledge, 30% understanding and 50% application), make sure that the division corresponds to the number of learning objectives and their scope. Suppose there are two learning objectives at application level and 60% of the test has to deal with this. Then there is not much room left to cover the other learning objectives. So always check carefully whether the end product is what you have in mind.

### **Open/closed questions**

Beim Lernen ist es bedeutsam, welche Art Fragen die Prüfung The approach to studying is significantly determined by the type of question the exam contains. With open questions you have to formulate the answer yourself, and with closed questions you have to choose between given answers. Because there is no possibility to guess the answer in open questions, this is not necessarily more difficult. On the contrary. You can always get some points depending on the answer model.

With closed questions, something is right or wrong. And this is often 1 point or 0 points. It is important that you indicate in the test matrix whether there are open questions in the exam and if so, within which subjects. This gives the candidate the opportunity to prepare for this.

For the test developer the trick is always to ensure that the learning objective is properly assessed in an exam with closed questions.

See the examples below.

#### Example 1

Attainment target: the candidate can evaluate a complaints handling interview.

If you test this attainment level with a closed question, you will quickly get obvious self-explanatory answers. It is therefore best to test this with an open question including a video. See also the other example.

#### Example 2

#### Attainment target: The candidate can calculate the VAT.

This attainment level can be tested with both open and closed questions. With an open question you can also ask about the calculation. With a closed question, when choosing the wrong answers (the alternatives) you pay extra attention to the possible relevant errors that a candidate may make. It is advisable to check all the learning objectives in this way.



#### Yes/no cases

With a case study we mean several questions linked to information made available in the form of a text or a video. But why do you use or not use case studies in exams?

Many teachers feel the need to test by means of a case study, because it is a good way to achieve better mastery, also during the course. Another reason is that case studies make learning interesting. However, the following applies to the exam: it does not have to be fun, candidates mainly want to pass. Nevertheless, the level of testing must be thorough and sufficiently broad. It is a personal choice whether or not to include cases. Here are some tips on when to choose or not to use case studies:

#### When not to use case studies?

 When there might be confusion about the subject of the question or when the text might be rather distracting. Suppose the case study is about all kinds of nutritional values of food products. If you then create a case study with four different foods, a candidate must always look to see which of the four foods the question is about.

2. When the topics are not always related. The test developer then has to look for an artificial connection when drawing up the test. This is the case, for example, with legal consequences of certain events in a person's life such as marriage, birth, death or loss of employment. If the consequences of all these events have to be indicated, it is better not to use case studies.

#### When to use case studies?

1. When a lot of company data are required, for instance to draw up part of the annual accounts. It is then not useful for the candidate to have to study a different company description every time. It is therefore better to work with a case study.

2. When it is necessary to test whether the candidate can extract the relevant information from the text. In the case study text, you then deliberately include data that the candidate can incorrectly apply. This is the case, for example, when subjects such as leadership style and bankruptcy are combined. These topics have so little connection that they can be tested separately. Sometimes, however, they do occur together because they relate to a situation within a particular company. The advice here is to test these types of subjects separately.

3. When follow-up questions are necessary in order to provide sufficient level and depth to the test.

### Time needed for the exam

If you have determined the structure of the exam, you also know what kind of questions it contains and whether case questions are necessary. As with case questions, open questions and calculation questions generally require more time. Estimate and add up the time needed per question. If there is no reference material yet, it is advisable to allow plenty of time. If necessary, announce in advance that it may be revised later.

## Cut-off score

In general, a test matrix describes what the points to be obtained are and at what percentage or number of points a pass is obtained. There are many different ways to calculate this limit. Here we take two starting points:

#### Social standard

This means what is socially accepted or accepted according to the people involved. Is it 55% or should it be higher? If the risk of failure is high and the consequences of mistakes in professional practice are very great, the cut-off score is usually higher. A much quoted example is that of a doctor. The medical exams they have to take have a relatively high cut-off score.

#### Question type

If the questions are closed, there is a chance that a candidate will give the right answer without knowing the answer. This is called a 'guessing score'. For example, if there are four answer options, there is a 25% chance that the candidate will guess the right answer. It is relevant and customary to include this guessing score in the calculation of the cut-off score. However, it is not obvious to do so, because it can make the exam more difficult. For example, when the closed questions are very difficult or when a switch is made from open to closed questions and the effect of asking these questions is not yet known. In that case, choose a provisional cut-off score that you may raise later. It is advisable to make this known to candidates beforehand.

# Conclusion

Remember that setting up a test matrix is always a creative process which requires thorough coordination with content experts and those involved. This article has provided some insight into the compilation of a test matrix. Use this knowledge to your advantage and get started today.

Optimum Assessment is your partner in (digital) testing. If you have any questions about this process, please contact us. Our team would be happy to help you with your question.



Would like to know more

+31 (0)13 528 63 63 optimumassessment.com/en/ Contact:

Almystraat 10A 5061 PA Oisterwijk (The Netherlands)

