



School of
Management and Law

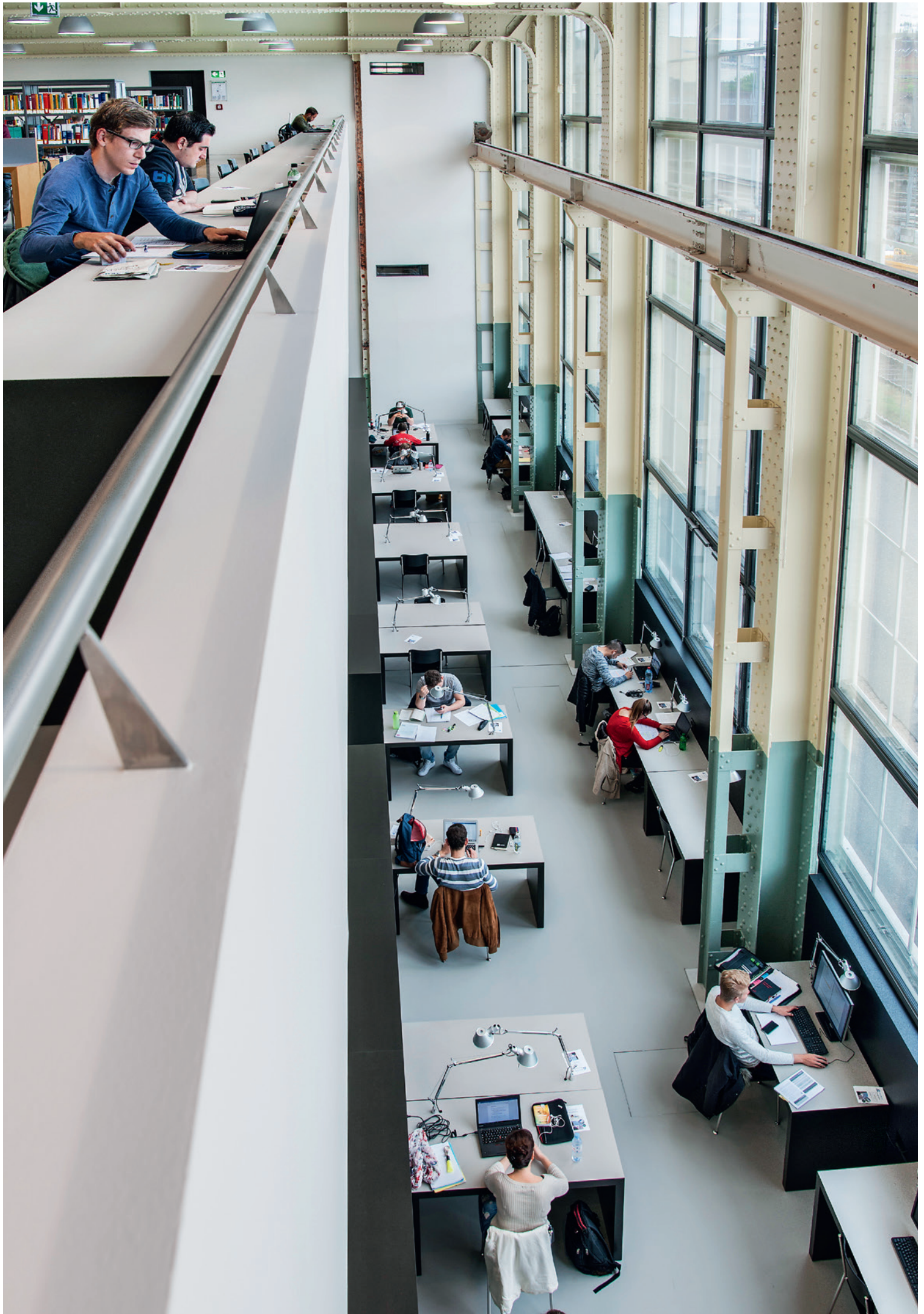
Multiple-Choice Questions

A Teaching Guide for Higher and
Professional Education

Center for Innovative Teaching and Learning



Building Competence. Crossing Borders.



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1 Introduction

Application

Multiple-choice questions are used for formal and overall assessment.

Evaluation

Multiple-choice questions are quick and easy to mark.

Requirement

Acceptance is a prerequisite for the successful use of multiple-choice questions.

1.1 BACKGROUND

Multiple-choice questions (MCQs) are usually employed at universities to achieve a high evaluation efficiency. In contrast to open question formats, the answers can be evaluated quickly or, if performed digitally, even automatically. They are particularly suitable for e-learning because an electronic learning management system can continuously and efficiently provide instructors and students with feedback on the acquired competencies and thus with information for adapting the teaching and learning process in the sense of formative assessments. The regular use of formative assessments makes sense since university didactic research has found that frequent and competent feedback is a critical element of effective university teaching (Hattie, 2015).

The use of MCQs for summative assessments – i.e., in examinations with assessments in the form of pass/fail grades or letter/number grades – is the topic of much discussion both among teachers and the wider learning community. Critics argue that MCQs can only check factual knowledge and the correct answers can be guessed by the formal structure of the answer options (Lindner, Strobel, & Köller, 2015). To some degree, this is supported by empirical research findings (see, e.g., Bücker et al., 2015), although the reasons are not fundamental but lie more in multiple-choice practice. Creating good MCQs which do more than test factual knowledge and prevent candidates simply guessing the correct answer is challenging and time-consuming.

This teaching guide is designed to assist lecturers in the design of MCQs and aims to ensure the highest possible quality standards in their use at our university. For this purpose, the quality requirements are presented in [Chapter 1.2](#) and the procedure for creating MCQs and multiple-choice exam papers in [Chapter 1.3](#). In [Chapter 2.1](#), the elements of an MCQ are explained, and in [Chapter 2.2](#), the different types of questions are presented. [Chapter 3](#) discusses the cognitive levels of difficulty that can be addressed by MCQs. [Chapter 4](#), finally, deals with the practical design of MCQs and discusses the substantive and formal principles for the preparation of MCQs.

In this English language version, [Chapter 5](#) gives additional guidance not only on the conventions of writing MCQs but also on writing in English.

1.2 QUALITY REQUIREMENTS FOR MCQs

An essential prerequisite for the successful use of MCQs in formative – but above all also summative – learning assessments is their acceptance, both by students and instructors. Such acceptance is more likely if MCQs are perceived as fair, and particularly so if they meet the quality criteria of test theory.

OBJECTIVITY, RELIABILITY, AND VALIDITY

The quality criteria of test theory are objectivity, reliability, and validity. Objectivity exists when all students solve the MCQs under the same conditions, and all questions are assessed under the same conditions. The objectivity of MCQs is significantly higher compared to open questions since the evaluation and interpretation of the answers to MCQs is largely independent of the person marking the exam and completely independent in the case of automated evaluation.

The concepts of reliability and validity can be illustrated using the image of a target (see [Figure 1](#)). Reliability is a measure of how reliable that measurement is. Using the target as an example, this means that if several shots were fired, they would hit the same point reliably every time. In the figurative sense of a multiple-choice exam, this means that a five-question exam would reliably test for the same competence, such as math skills. The reliability of an exam is reflected in the fact that the students' answers are neither randomly right or wrong. To achieve greater reliability in MC tasks, it is vital that the difficulty of the task has been properly determined for its target group. Careful development of MCQs in terms of content and format also contributes to the reliability of an MCQ because, for example, unintentional solutions can be avoided. Corresponding design guidelines can be found in [Chapter 4](#).

Objective

Who measures the results?
(The results must be objective).

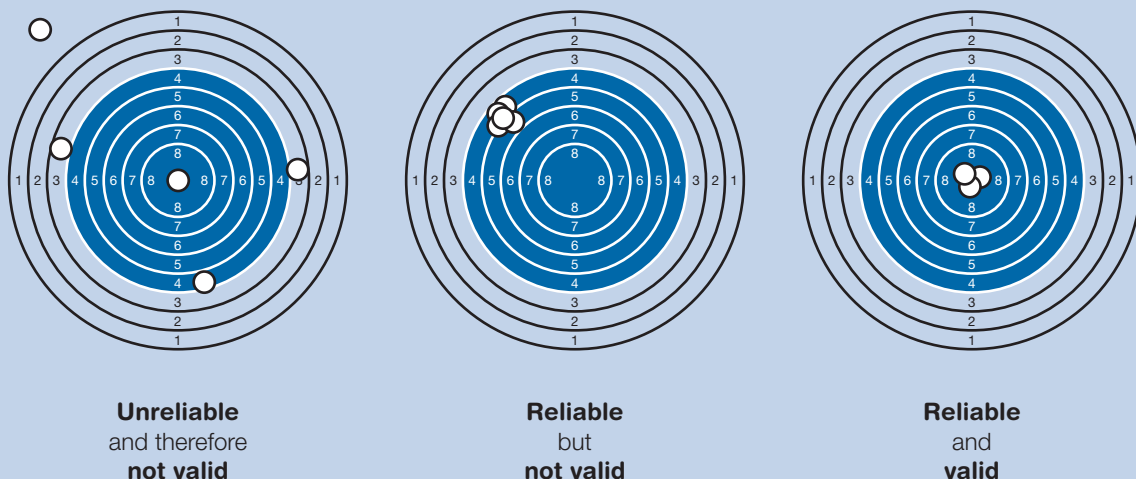
Reliable

How are the results measured?
(The results must be reliable).

Valid

What do we measure?
(The questions must yield valid results).

FIGURE 1: RELIABILITY AND VALIDITY USING THE EXAMPLE OF A TARGET



Alignment

Constructive alignment promotes validity.

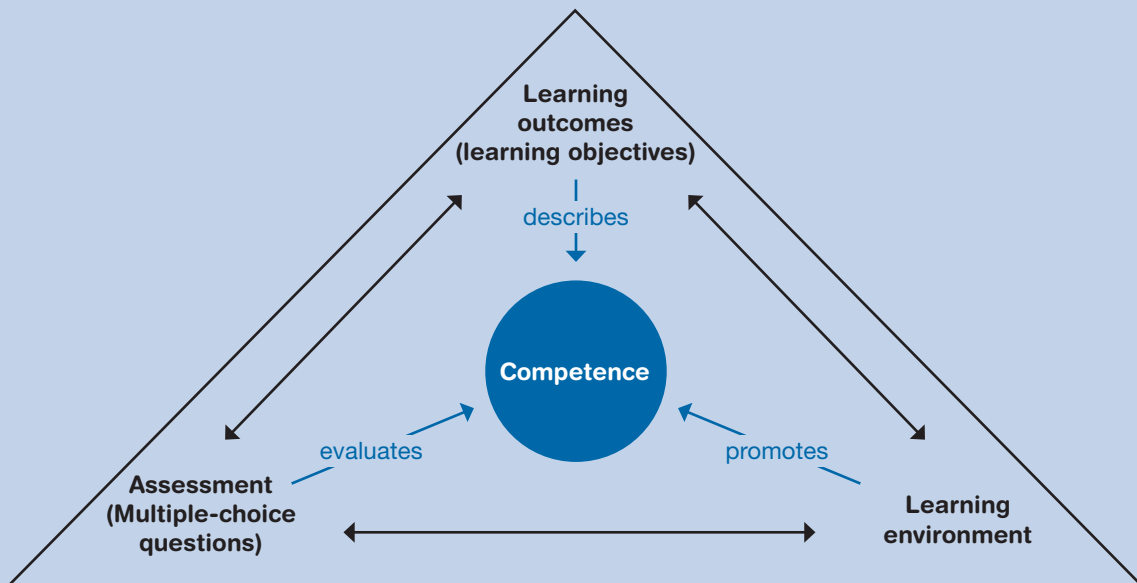
Learning Context

The content level of a statement depends on the learning context.

Finally, validity is conferred when a measurement reliably measures what is under scrutiny rather than something different. Reliability is, therefore, a prerequisite for validity. Again, using the target as an example, this means that the shots fired hit the center of the target reliably without fail. In the figurative sense of a multiple-choice exam, a five-question math exam will effectively test a student’s math skills rather than his or her language proficiency owing to the complexity of the questions. The validity of an MCQ is strengthened if the content to be tested – in the sense of constructive alignment (Biggs, 1996; see [Figure 2](#)) – is in alignment with the learning objectives, the respective level of difficulty, and the learning environment. This means that an application-oriented MCQ should only be considered if the learning objective is also located at the corresponding taxonomic level of “application” and the students have had the opportunity to practice the transfer of knowledge in the classroom.

For exam papers, the following must be taken into consideration: If challenging questions are used to test students in the classroom which are then asked in an identical form during the exam, the exam is no longer a demanding transfer task because the correct solution simply needs to be remembered.

FIGURE 2: CONSTRUCTIVE ALIGNMENT



1.3 PROCEDURE FOR CREATING MCQs AND MULTIPLE-CHOICE EXAMS

For the creation of multiple-choice questions and exams, a procedure which can also be used for any other type of examination is recommended (see [Figure 3](#)).

- (1) **Choosing the content and the level of difficulty of the questions:** As stated in [Chapter 1.2](#), it is important to align the examination tasks with the learning objectives and the planned learning activities (learning environment; for the learning objectives, see [Chapter 3](#)). In doing so, it is essential, on the one hand, that sufficient questions are formulated to cover the learning objectives and, on the other hand, that the weighting of the learning objectives is in line with the weighting as taught (see also Roloff, 2012). In the end, the relevance and representativeness of the issues addressed in the questions are critically reflected. An instructor with limited experience in writing exam papers is strongly advised to discuss the process with colleagues.
- (2) **Formulating questions:** Universities often set challenging learning goals that go beyond the recalling of factual knowledge. Although answering MCQs requires only a simple action – ticking a correct answer – they can be used to test challenging learning objectives, as discussed in [Chapter 3](#). However, essential design principles must be observed, which also apply to cognitively less demanding MCQs. These design principles are discussed in detail in [Chapter 2](#) & [Chapter 4](#). A form for creating MCQs can be found in [Appendix 1](#).
- (3) **Critically evaluating questions:** Once the individual MCQs have been created, they must be critically reviewed. It makes sense to review the MCQs yourself and to ask colleagues for feedback. Assessment by an outside person is recommended because he or she will be unbiased. In this way, shortcomings that the person writing the exam will overlook can be identified. A checklist for such a review can be found in [Appendix 2](#).
- (4) **Compiling the examination:** Once a selection of questions has been assembled and reviewed, these are put together in a meaningful way to form an exam paper. Care must be taken to begin with gentler, so-called icebreaker questions, and to group questions on the same topic together. In addition, questions of the same type (see [Chapter 2.2](#)) should be grouped within a topic. The reason for this is that continually having to switch to a new type of task is more demanding from a cognitive point of view than answering, for example, all single-choice questions for one topic before answering all multiple-choice ones.

FIGURE 3: HOW TO CREATE MCQS AND MULTIPLE-CHOICE EXAMS



2 MCQs

2.1 ELEMENTS OF AN MCQ

MCQs are made up of two elements: the stem and the responses offered (see [Table 1](#)). For the creation of the stem, there are two options, which are explained in more detail below. For the response options, a minimum of four, ideally five, homogeneous responses should be formulated. Homogeneous options can be said to exist when they all address the same content area and are structurally similar (Haladyna, Downing, & Rodriguez, 2002; see [Chapter 4](#)).

Option 1: The stem consists of a question or instructional statement. Additional information indicates how many points the question is worth and how the points are awarded. This option is particularly suitable if you want to use an MCQ to check factual knowledge (for the cognitive level of difficulty of MCQs, see [Chapter 3](#)).

Option 2: In addition to the question or instructional statement, the stem contains further information necessary for processing the MCQ, such as the description of a situation or specific problem. The information presented should reflect an application-oriented context that is as authentic as possible and factually undisputed. Shorter and longer stems (e.g., describing a case) are possible. Stems may also contain tables, images, or – in the case of an electronic presentation – multimedia elements such as animations, audio, video clips, or HTML (Ehlers, Guetl, Höntzsch, Usener, & Gruttmann, 2013). This option is suitable if the understanding, application, or analysis of knowledge is to be tested (for the cognitive level of difficulty of MCQs, see [Chapter 3](#)). In such a situation, the problem presented should be complex and as close to reality as possible.

TABLE 1: STRUCTURING AN MCQ WITH A SINGLE/TWO-PART STEM

		Single Stem (Option 1)	Two-Part Stem (Option 2)					
Stem	Information	<ul style="list-style-type: none"> – Question or instructions – Information on the number of points and grading (if required) 	<ul style="list-style-type: none"> – Situation or problem – Question or instructions – Information on the number of points and grading 					
	Example (add. examples, see Chapters 2.2 and Chapter 3)	Which of the following investments is not an example of a foreign direct investment (FDI)? (1 point)	<p>In the financial accounting of a retail company, stocks are undervalued by $\frac{1}{3}$ compared to those in the business accounting.</p> <table border="1"> <thead> <tr> <th></th> <th>Purchase of goods</th> <th>Increase of stocks</th> </tr> </thead> <tbody> <tr> <td>Product Group A (in USD):</td> <td>3,225,600</td> <td>102,400</td> </tr> </tbody> </table> <p>What is the cost value of the goods sold in Product Group A (in USD)? (1 point)</p>		Purchase of goods	Increase of stocks	Product Group A (in USD):	3,225,600
	Purchase of goods	Increase of stocks						
Product Group A (in USD):	3,225,600	102,400						
Answer Options (at least 4 or, if possible, 5 homogenous answer options)		<ul style="list-style-type: none"> <input type="checkbox"/> Purchase of a foreign textile plant <input checked="" type="checkbox"/> Purchase of foreign securities <input type="checkbox"/> Purchase of asset components of a foreign company <input type="checkbox"/> Purchase of foreign land for operational purposes <input type="checkbox"/> Purchase of a participation in a foreign joint venture 	<ul style="list-style-type: none"> <input type="checkbox"/> 3,379,200 <input type="checkbox"/> 3,328,000 <input checked="" type="checkbox"/> 3,123,200 <input type="checkbox"/> 3,072,000 <input type="checkbox"/> 3,225,600 					

If Option 2 is applied and a detailed, two-part stem formulated, more time will be needed to answer the question compared to Option 1. For this reason, it makes sense to use one problem presentation as the basis for between three and five MCQs, each of which tests different aspects. For an example of a complex MCQ (also called a scenario-based MCQ; see Azer, 2003), refer to [Appendix 3](#).

The examples of MCQs in this guide (see Chapter 2.2) are sometimes deliberately shorter in length for reasons of clarity.

2.2 MCQ TYPES

MCQs are selection tasks, meaning they are questions that are not answered by formulating an answer. Instead, one or more answers must be selected from a set of given options. We distinguish between two main categories of tasks: best-answer questions and right-wrong tasks. In general, best-answer tasks allow different plausible answers to be weighed against one another, while right-wrong tasks usually ask for purely factual knowledge (Schrock & Coscarelli, 2007). For this reason, best-answer questions should be more frequent in multiple-choice exams than right-wrong questions.

Within these two overarching categories, other task types can be identified. The names of the question types are based on the definitions of the National Board of Medical Examiners, which originally proposed a selection of over ten types (Case & Swanson, 2002). Over time, these have been reduced to a few types for quality considerations (Krebs, 2004), which are presented in the following two chapters.

For methodological reasons, it is advisable to use mainly best-answer questions with a positive or negative single choice (single choice of Types A+ and A-) for grade-relevant performance measurement (summative assessment). Alternatively, questions with a quadruple right-wrong decision (Kprim question type) can also be used. Other MCQ types are not recommended for summative exams but can be employed as part of formative assessment.

2.2.1 BEST-ANSWER QUESTIONS

With best-answer questions, a distinction is made between the “single selection” and “multiple selection” types. In the task presentation, candidates are told in each case how many answers need to be selected: With single-selection questions it is only one, but with multiple-choice questions it is several.

These tasks are referred to as best-answer questions because candidates must choose the best answer from several plausible possibilities. Incorrect answer alternatives – so-called distractors – serve to distract students and do not have to be completely wrong. Indeed, the distractors must be plausible answers to prevent students from deducing the correct answer simply by excluding illogical answers.

These MCQs include the types “positive single-choice” (A+) and “negative single-choice” (A–), “assignment question” (B), and “positive multiple-choice” (N). They are illustrated below in [Tables 2](#) & [Table 5](#), each with an example.

TABLE 2: EXAMPLE OF A “POSITIVE SINGLE-CHOICE” BEST-ANSWER QUESTION (TYPE A+)

Positive Single-Choice MCQs (Type A+)	A question or instructions are followed by four or five answer options or ends of sentences, from which students must choose either the only correct answer or the best from several plausible ones. The answers should be as homogeneous as possible in content and format and relate to the stem in a similar way. If there are several correct answers, but only one best answer, there must be no doubt as to which one it is.	
	Possible evaluation	Correct answer = 1 point
	Recommended application	Summative and formative assessment
Example		
Stem Option 2	<p>Dreamland AG sells its “Soft” cushion for USD 20 per unit. One pillow requires 1 kg of raw materials and takes one working hour to manufacture. The raw materials cost USD 6/kg, and the labor costs USD 4/hour. The fixed costs per month are USD 2,000. In addition, Dreamland AG pays USD 2,000 per month in rent for its premises.</p> <p>Calculate how many cushions have to be produced and sold per month for Dreamland AG to achieve a monthly profit of USD 1,000. (1 point)</p>	
Answers	<input type="checkbox"/> 400 <input checked="" type="checkbox"/> 500 <input type="checkbox"/> 600 <input type="checkbox"/> 700 <input type="checkbox"/> 800	

TABLE 3: EXAMPLE OF A “NEGATIVE SINGLE-CHOICE” BEST-ANSWER QUESTION (TYPE A-)

Negative Single-Choice MCQs (Type A-)	A question or instructions are followed by four or five answers options or ends of sentences, from which students must choose the exception or the least applicable one. Recognizing the important difference is vital here. The negation must be marked in bold or <u>underlined</u> in the stem or question. All answers read as positive to avoid a double negative. Options such as “None of the above” are not allowed.	
	Possible evaluation	Correct answer = 1 point
	Recommended application	Summative and formative assessment
Example		
Stem Option 2	<p>Swisscom entered the digital TV market in 2006. With a basic Swisscom TV package, customers can receive TV and radio stations and watch films (video on demand) and Teleclub Sport Live events.</p> <p>Decide which of the following services is not part of the Swisscom TV package (core product). (1 point)</p>	
Answers	<input type="checkbox"/> Remote programming <input type="checkbox"/> Voice control <input type="checkbox"/> Video on demand (VoD) <input type="checkbox"/> Stations and movies in HD quality <input checked="" type="checkbox"/> Recording	

TABLE 4: EXAMPLE OF A “MATCHING EXERCISE” BEST-ANSWER QUESTION (TYPE B)

Assignment Questions (Type B)	Four to five answer options (a–e) relate to two or more questions or instructions. For each of them, the only correct answer or the best answer must be chosen from among the answer options. This produces a series of several questions that are assessed separately. Care should be taken to exclude implausible answer options. One answer option may be the correct or best more than once.					
	Possible evaluation	Correct answer = 1 point				
	Recommended application	Only formative assessment				
Example						
Stem Option 2	<p>The following protocols apply to transport and application services: (a) FTP (b) HTTP (c) NNTP (d) SMTP (e) Telnet</p> <p>Decide for each of the content options (1–3) below which of the above protocols (a–e) is used for transmission via the Internet. (3 points)</p>					
Answers		(a)	(b)	(c)	(d)	(e)
	1. E-mails:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2. Multimedia information:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3. Remote control commands:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

TABLE 5: EXAMPLE OF A “POSITIVE MULTIPLE-CHOICE” BEST-ANSWER QUESTION (TYPE N)

Positive Multiple-Choice (Type N)	<p>A question or instructions are followed by four or five answer options or sentence endings, from which more than one, usually two “best” answers must be selected. The number of best answers is indicated in the task. This option is suitable for problem cases in which several correct answers differ significantly from each other.</p> <p>You are advised to develop the answer list first, followed by the problem description and associated question. The answer options should be homogeneous in content and as short as possible. The question type “Kprim” is recommended for simpler true-false decisions (see Table 6).</p>	
	Possible evaluation	<p>For each correct answer = 1 point (max. 2 points)</p> <p>1 incorrect answer = 0 points</p>
	Recommended application	Only formative assessment
Example		
Stem Option 2	<p>The Volvo Ocean Race (a sailing regatta) took place from October 2014 to June 2015. From the start in Alicante to the finish in Gothenburg, seven teams fought for victory under the toughest conditions. IWC Schaffhausen was the official timekeeper of the regatta and created a special watch for the occasion: the sporty Portuguese Yacht Club Chronograph “Ocean Racer.” There had previously been very few sports watch models in the IWC range. The new watch was to be sold exclusively in the previously undeveloped market of the Arab Emirates.</p> <p>According to Ansoff, there are four product-market strategies. Which two of these strategies are most likely to be pursued with the Portuguese Yacht Club chronograph “Ocean Racer”?</p> <p>(Evaluation: 2 correct answers = 2 points; 1 correct answer and no others checked = 1 point; 1 or more incorrectly checked = 0 points)</p>	
Answers	<ul style="list-style-type: none"> <input checked="" type="checkbox"/> Diversification <input type="checkbox"/> Product development <input checked="" type="checkbox"/> Market development <input type="checkbox"/> Market penetration <input type="checkbox"/> Brand development 	

2.2.2 TRUE-FALSE TYPES

In this type of MCQ, candidates must decide whether each answer alternative is true or false. It must, therefore, be possible to evaluate each option on its own merit. The alternatives that do not apply are not distractors but false statements.

These types of MC items include true-false decisions with four answer options (Type Kprim¹) and questions that have a causal link (Type E). They are illustrated in [Tables 6 & Table 7](#) below, each with an example.

TABLE 6: EXAMPLE OF A “QUADRUPLE TRUE-FALSE DECISION” QUESTION (TYPE KPRIM)

Quadruple True-False Decision (Type Kprim)	A question or instructions are followed by four or five answers or sentence endings. The answers must be related to each other in terms of content rather than addressing different concepts. Students must decide whether each suggested answer is true or false. The wording of the stem does not indicate how many of the four statements are correct. Each answer option must, however, be undisputedly true or false. An answer option must not contain more than one statement.																																																												
	Possible evaluation	4 correct answers = 2 points 3 correct answers = 1 point Fewer than 3 correct answers = 0 points																																																											
	Recommended application	Summative and formative Assessments																																																											
Example																																																													
Stem Option 2	Kunner is a profitable bakery in the heart of Winterthur. However, the owner of the bakery suspects that not all the products on offer contribute equally to turnover. For this reason, he asks you to analyze his range of bakery products, giving you the data on current unit prices and annual demand. You decide to carry out an ABC analysis of the products.																																																												
	<table border="1"> <thead> <tr> <th>Baked Goods</th> <th>Unit Price in CHF</th> <th>Annual Demand in Units</th> <th>Sales in CHF</th> <th>Share of Total Sales</th> <th>Cumulative</th> <th>Share of Annual Demand</th> <th>Cumulative</th> </tr> </thead> <tbody> <tr> <td>Croissant</td> <td>1.50</td> <td>31,877</td> <td>47,815.50</td> <td>39.97%</td> <td>39.97%</td> <td>49.82%</td> <td>49.82%</td> </tr> <tr> <td>Baguette</td> <td>3.80</td> <td>7,403</td> <td>28,131.40</td> <td>23.52%</td> <td>63.48%</td> <td>11.57%</td> <td>61.39%</td> </tr> <tr> <td>Bun</td> <td>1.00</td> <td>21,040</td> <td>21,040.00</td> <td>17.59%</td> <td>81.07%</td> <td>32.88%</td> <td>94.28%</td> </tr> <tr> <td>“Zopf”</td> <td>8.00</td> <td>2,453</td> <td>19,624.00</td> <td>16.40%</td> <td>97.48%</td> <td>3.83%</td> <td>98.11%</td> </tr> <tr> <td>Pain au chocolat</td> <td>2.50</td> <td>1,208</td> <td>3,020.00</td> <td>2.52%</td> <td>100.00%</td> <td>1.89%</td> <td>100.00%</td> </tr> <tr> <td></td> <td></td> <td>63,981</td> <td>119,630.90</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Baked Goods	Unit Price in CHF	Annual Demand in Units	Sales in CHF	Share of Total Sales	Cumulative	Share of Annual Demand	Cumulative	Croissant	1.50	31,877	47,815.50	39.97%	39.97%	49.82%	49.82%	Baguette	3.80	7,403	28,131.40	23.52%	63.48%	11.57%	61.39%	Bun	1.00	21,040	21,040.00	17.59%	81.07%	32.88%	94.28%	“Zopf”	8.00	2,453	19,624.00	16.40%	97.48%	3.83%	98.11%	Pain au chocolat	2.50	1,208	3,020.00	2.52%	100.00%	1.89%	100.00%			63,981	119,630.90					<p>For each of the following statements, decide whether it is true (T) or false (F). (Evaluation: 4 correct answers = 2 points; 3 correct answers = 1 point; 2 or fewer correct answers = 0 points)</p>			
Baked Goods	Unit Price in CHF	Annual Demand in Units	Sales in CHF	Share of Total Sales	Cumulative	Share of Annual Demand	Cumulative																																																						
Croissant	1.50	31,877	47,815.50	39.97%	39.97%	49.82%	49.82%																																																						
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		63,981	119,630.90																																																										
Answers	<p>T F</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> The butter croissant is not an A article.</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> The pain au chocolat is a C article.</p> <p><input checked="" type="checkbox"/> <input type="checkbox"/> The baguette accounts for 11.57% of the total annual demand in units.</p> <p><input type="checkbox"/> <input checked="" type="checkbox"/> The “Zopf” accounts for 32.88% of the total annual turnover of goods.</p>																																																												

¹ Kprim denotes an MCQ that has four answer options of which one or several can be correct/incorrect (Krebs, 2004).

TABLE 7: EXAMPLE OF A “CAUSAL LINK” TRUE-FALSE QUESTION (TYPE E)

Causal Link (Type E)	The first statement makes a claim that is justified by a second statement. A causal link (e.g., the word “because”) connects both statements. Students must first evaluate the two statements individually to decide whether each is true or false. If both statements are correct, they must also decide whether the causal link is also correct. This means there are five answer options. Sufficient information must be provided to enable students to determine the veracity of the statements.	
	Possible evaluation	Statements evaluated correctly, including correct link = 2 points Statements evaluated correctly, not incl. correct link = 1 points All other answers = 0 points
	Recommended application	Only formative assessment
Example 1		
Stem Option 2	<p>Below is a statement A which makes an assertion. Statement A is substantiated by a second statement B. Assess to what extent the two statements and the reasoning (causal link) apply and choose an answer option accordingly.</p> <p>(A) The Ansoff diversification strategy should achieve growth (B) because novel products are developed and novel markets are explored.</p> <p>(Total points awarded: 2. Evaluation: statements correctly evaluated, incl. correct link = 2 points; statements correctly evaluated, but not correct link = 1 point; all other answers = 0 points)</p>	
Answers	<p><input checked="" type="checkbox"/> + because + Both statements [A and B] are true, and the causal link (“because”) is correct.)</p> <p><input type="checkbox"/> + / + Both statements [A and B] are true, but the causal link (“because”) is incorrect.)</p> <p><input type="checkbox"/> + / - The first statement [A] is true, and the second statement [B] is false.)</p> <p><input type="checkbox"/> - / + The first statement [A] is false, and the second statement [B] is true.)</p> <p><input type="checkbox"/> - / - (Both statements [A and B] are false.)</p>	
Example 2		
Stem Option 2	<p>Below is a statement A, which makes an assertion. Statement A is substantiated by a second statement B. Assess to what extent the two statements and the reasoning (causal link) apply and choose an appropriate answer alternative.</p> <p>(A) Operating cash flow does not include depreciation (B) because decreases in the value of fixed assets affect liquidity.</p> <p>(Total points awarded: 2; evaluation: statements correctly evaluated, incl. correct link = 2 points; statements correctly evaluated, but not correct link = 1 point; all other answers = 0 points)</p>	
Answers	<p><input checked="" type="checkbox"/> + because + Both statements [A and B] are true, and the causal link (“because”) is correct.)</p> <p><input type="checkbox"/> + / + Both statements [A and B] are true, but the causal link (“because”) is incorrect.)</p> <p><input type="checkbox"/> + / - The first statement [A] is true, and the second statement [B] is false.)</p> <p><input type="checkbox"/> - / + The first statement [A] is false, and the second statement [B] is true.)</p> <p><input type="checkbox"/> - / - (Both statements [A and B] are false.)</p>	

3 The Cognitive Level of Difficulty of MCQs

MCQs must be tailored to the underlying learning objectives in terms of the level of cognitive difficulty (see also [Chapter 1.2](#)). According to Anderson and Krathwohl (2001), a distinction is made between six levels of cognitive difficulty: on the one hand, the levels of remembering, understanding, and application often used in learning objectives as well as the

less frequently referenced levels of analysis, assessment, and creation. The six levels are illustrated in Tables 9–13. These tables also list verb forms that are typically associated with the various levels. [Table 8](#) also provides an overview of the cognitive levels of difficulty to be addressed with the types of questions introduced in [Chapter 2.2](#).

TABLE 8: SUITABILITY OF MCQS FOR COGNITIVE PROCESSES BASED ON THE TAXONOMY OF ANDERSON AND KRATWOHL (2001)

No.	Cognitive Level of Difficulty	Question Types				
		Best Choice			True-False Choice	
		<i>Type A+ / Type A-</i> (single-choice)	Type B (assignment)	Type N (multiple-choice)	<i>Kprim</i> (true/false decision)	Type E (causal link)
1	Remembering	✓	✓	✓	✓	✓
2	Understanding	✓	✓	✓	✓	✓
3	Applying	✓	✓	✓	✓	✓
4	Analyzing	✓	✓	✓	✓	✓
5	Evaluating	✗	✗	✗	✗	✗
6	Creating	✗	✗	✗	✗	✗

Please note: Only question types written in italics (*A+*, *A-*, *Kprim*) are recommended for summative assessment.

The statements above – and [Table 8](#) especially – show that MCQs have the potential to address demanding cognitive thinking processes on the levels of “understanding,” “application,” and “analysis.” This may be surprising considering that answering MCQs requires only the simple action of ticking a box. MCQs are also widely but mistakenly felt to be suitable only for confirming the existence of factual knowl-

edge – and thus the cognitive skill of remembering. The reason for this is that real-life actions rarely present a finite set of options (Scully, 2017). Nevertheless, MCQs allow us to review sophisticated cognitive processes. The prerequisite here is that when evaluating the answers offered, the simple recall of facts is not sufficient; knowledge must be applied in the context of an action.

As already mentioned in [Chapter 2.1](#), the formulation of such demanding MCQs is particularly suited to a two-part question stem (Option 2), in which a more or less complex and authentic action situation is presented as a framework for the actual question or set of instructions. The fact that the question or instructions refer to this context creates an application reference, which requires more sophisticated thought processes to answer the question than merely remembering.

The various cognitive taxonomy levels are explained below, and a selection of commonly used verbs is provided (see also Morrison & Walsh, 2001). For the formulation of MCQs, it may make sense to use the noun instead of the verb, such as in the sense of: “Which of the following lists is correct?” instead of the verb “list” or “Which of the following explanations corresponds to the facts shown?” instead of the verb “explain.” In addition, verbs can only be taken as an indication to develop MCQs that trigger a corresponding thought

process. So, the verb “recognize” from the taxonomy level “remembering” may lead to the development of an MCQ in which different definitions are mentioned and the correct one has to be identified, although the verb “recognize” is not mentioned in the task presentation.

For the taxonomy levels 1–4 (see [Table 8](#)), an MCQ is presented using the example of the “positive single selection” task type (A+, see [Table 2](#)). At this point, however, it should again be stressed that the question alone does not provide information about its cognitive level of difficulty. To determine this, additional knowledge is necessary about the material being tested since every challenging question becomes a simple memory task if it has already been addressed in an identical manner. MCQs for taxonomy levels 5 and 6 (assessment and synthesis) cannot be achieved because they would require students to produce text and thereby make a contribution to the answer themselves (see [Table 13](#)).

TABLE 9: TAXONOMY LEVEL “REMEMBERING”

Level	Learning Goal	Description	Common Verbs ²
1	Remembering	Recalling information and retrieving it in similar situations	Define, duplicate, list, name, identify, recall, repeat, reproduce, state
Example Remembering	Stem Option 1	Specify which of the following manufacturing activities is a core process according to the process hierarchy in the new St. Gallen management model. (1 point)	
	Answers	<input type="checkbox"/> Staff training to optimize a product. <input type="checkbox"/> Taking legal action to enforce trademark rights. <input checked="" type="checkbox"/> Developing a new service to support market entry. <input type="checkbox"/> Establishing a logistics center to reduce distribution times. <input type="checkbox"/> Maintaining an Internet server for network troubleshooting.	

² For a more comprehensive list of verbs, refer to [Appendix 4](#). Keep in mind that there is necessarily an overlap in the use of verbs for different purposes depending on the level at which students have been exposed to a particular topic.

TABLE 10: TAXONOMY LEVEL “UNDERSTANDING”

Level	Learning Goal	Description	Common Verbs
2	Understanding	Grasping the full meaning of a concept or idea and explaining it using one’s own words.	Classify, describe, discuss, explain, identify, locate, recognize, report, select, translate, paraphrase
Example Understanding	Stem Option 2	China exported around 134 million tons of steel in 2015. This is an oversupply of steel that threatens tens of thousands of jobs in the West. Europe is doing nothing about it. The government of the United States, on the other hand, levies a tax on imports of foreign steel. Determine which of the following consequences (ceteris paribus) will arise from the introduction of a U.S. import tax on steel. (1 point)	
	Answers	<input type="checkbox"/> The price of American steel drops. <input type="checkbox"/> The price of steel imported from China falls. <input checked="" type="checkbox"/> Employment in the American steel industry rises. <input type="checkbox"/> Employment in the Chinese steel industry rises. <input type="checkbox"/> American tax revenues fall.	

TABLE 11: TAXONOMY LEVEL “APPLYING”

Level	Learning Goal	Description	Common Verbs
3	Applying	Using information about a situation in a new situation or using information in a new way.	Choose, demonstrate, employ, illustrate, interpret, operate, schedule, sketch, solve, use, dramatize
Example Applying	Stem V2	A project manager has compiled the following earned-value management (analysis) data: PV: 12,400,000, EV: 14,500,000, AC: 14,500,000 (all amounts in USD). (PV = planned value, EV= earned value, AC = actual cost) Calculate adherence to budget and schedule as earned-value analysis. (1 point)	
	Answers	<input type="checkbox"/> The project is over budget and on schedule. <input type="checkbox"/> The project is below budget and on schedule. <input type="checkbox"/> The project is on budget, but behind schedule. <input checked="" type="checkbox"/> The project is on budget and ahead of schedule. <input type="checkbox"/> The project is on budget and on schedule.	

TABLE 12: TAXONOMY LEVEL “ANALYZING”

Level	Learning Goal	Description	Common Verbs																												
4	Analyzing	Structuring facts into individual elements, uncovering the relationship between elements, and determining structural characteristics. Distinguishing between different parts.	Appraise, compare, contrast, criticize, differentiate, examine, experiment, question, test																												
Example Analyzing	Stem V2	<p>Cosmetica AG, a cosmetics distribution company, is active in Germany and would like to expand into Switzerland. For this purpose, the best possible location for a specialist cosmetics store is determined with the aid of a cost-benefit analysis. The following evaluation criteria apply (the weighting is given in brackets): walk-in customers (30%), rental costs (50%), and parking facilities (20%). The rating was based on Swiss school grades (1–6; 1 = very poor; 6 = very good). The following locations are available for selection:</p> <table border="1"> <thead> <tr> <th>Location</th> <th>Walk-in Customers</th> <th>Rental Costs</th> <th>Availability of Parking</th> </tr> </thead> <tbody> <tr> <td>Weighting</td> <td>30%</td> <td>50%</td> <td>20%</td> </tr> <tr> <td>Sihlcity Shopping Center, Zurich</td> <td>3</td> <td>5</td> <td>6</td> </tr> <tr> <td>Marktgassee, Winterthur</td> <td>6</td> <td>2</td> <td>2</td> </tr> <tr> <td>Bahnhofplatz, St. Gallen</td> <td>5</td> <td>3</td> <td>4</td> </tr> <tr> <td>Freiestrassee, Frauenfeld</td> <td>3</td> <td>6</td> <td>4</td> </tr> <tr> <td>Ringstrasse, Olten</td> <td>2</td> <td>5</td> <td>4</td> </tr> </tbody> </table> <p>Based on the above key figures and using the procedure of a cost-benefit analysis, determine the most suitable location for the new Cosmetica AG cosmetics store in Switzerland. (1 point)</p>	Location	Walk-in Customers	Rental Costs	Availability of Parking	Weighting	30%	50%	20%	Sihlcity Shopping Center, Zurich	3	5	6	Marktgassee, Winterthur	6	2	2	Bahnhofplatz, St. Gallen	5	3	4	Freiestrassee, Frauenfeld	3	6	4	Ringstrasse, Olten	2	5	4	
	Location	Walk-in Customers	Rental Costs	Availability of Parking																											
Weighting	30%	50%	20%																												
Sihlcity Shopping Center, Zurich	3	5	6																												
Marktgassee, Winterthur	6	2	2																												
Bahnhofplatz, St. Gallen	5	3	4																												
Freiestrassee, Frauenfeld	3	6	4																												
Ringstrasse, Olten	2	5	4																												
Answers	<input type="checkbox"/> Sihlcity Shopping Center, Zurich <input type="checkbox"/> Marktgassee, Winterthur <input type="checkbox"/> Bahnhofplatz, St. Gallen <input checked="" type="checkbox"/> Freiestrassee, Frauenfeld <input type="checkbox"/> Ringstrasse, Olten																														

TABLE 13: TAXONOMY LEVELS “EVALUATING” AND “CREATING”

Level	Learning Goal	Description	Common Verbs
5	Evaluating	Comprehensively and systematically assessing certain information and facts according to self-chosen criteria. Justifying a stand or decision.	Argue, defend, judge, select, support, value, evaluate
6	Creating	Combining individual elements of a fact and putting them together to create a new product or point of view	Assemble, construct, create, design, develop, formulate, write

4 Design Guidelines

Good MCQs should be perceived as fair, make it difficult for students to “guess” the right answer, and, in particular, test more demanding cognitive processes. The design guidelines below concerning the content and format of MCQs are intended to help achieve these goals.

4.1 STEM, QUESTION FORMULATION, AND ANSWER OPTIONS

What is being tested is what students need in order to continue their studies and to meet their learning objectives. The stem contains (a) all the necessary but no irrelevant information for answering the question. The topic should be restricted to the most important learning aspect (b). The MCQ should also be answerable if no response options were available (c). Trick questions, double negation, and indoctrination (see [Chapter 4.2](#)) should be avoided, and only known terms and abbreviations should be used (d). The MCQ should not only test textbook knowledge (e) but also demonstrate that students know how to apply it. But beware! If the items are too complex, even the best students will have to guess – and if the tasks are too easy, the better students may be confused and the weaker ones rewarded (Köster, 2005). The answers should be on the same content-related dimension (f) (e.g., only causes, only measures, or only consequences). There must be agreement on which are the true or false answers (g). The distractors should be just as plausible as the correct answer and the answers encompass one thought only (h). A sound MC item consists of at least four, if possible five, answer options.

4.2 AVOIDING CUE EFFECTS

The greatest danger in MCQs is the so-called cue effect. This effect stands for hidden solution hints which allow students to answer a question correctly based on formal, logical, or substantive information even if they do not possess the specialist knowledge required (Haladyna et al., Downing & Rodriguez, 2002). All available answer options should, therefore, be grammatically in line with the question (i) so that the language does not provide any indication of the correct solution. The answers should also be formulated similarly in terms of length and complexity (j). Further, repetitions of word elements of the stem should be avoided in the response options (k). Likewise, absolute terms such as “only,” “never,” or “always” should be avoided as they expose the response options as distractors (l).

The following are some examples of MCQs and their deficiencies. To identify the deficiencies, the respective reference letter in the previous section is indicated in brackets (a–l).

Example	The Ansoff matrix ...
	<input type="checkbox"/> ... puts financial and monetary developments in relation to each other. (1) <input type="checkbox"/> ... puts market and product developments in relation to each other. (2) <input type="checkbox"/> ... puts political and social developments in relation to each other. (3) <input type="checkbox"/> ... puts ecological and environmental developments in relation to each other. (4)
Deficiencies	<ul style="list-style-type: none"> – The stem is non-existent. (a) – Question is formulated too briefly; distractors consist only of sentence supplements. (c) – Item queries textbook factual knowledge. (e)

Example	Cash flow assesses the financial health of a company. The cash flow from financing activities of a fictitious company is strongly negative. What is the cause of the financial cash loss?
	<input type="checkbox"/> Proceeds from borrowings (1) <input type="checkbox"/> Investment in tangible assets (2) <input type="checkbox"/> Repayment of borrowed capital (3) <input type="checkbox"/> Distribution of dividends (4)
Deficiencies	<ul style="list-style-type: none"> – Answers are not on the same content dimension: Answer (2) points to cash flow from investment activities and is therefore omitted as a possible answer since the stem refers to the financing sector. (f) – Answers (3) and (4) can both be correct because both trigger cash outflows in the funding area. (g)

Example	Business ethics is the application of ethical principles to economic activity. Business ethics is the science of ...
	<input type="checkbox"/> legal (1) <input type="checkbox"/> compassionate (2) <input type="checkbox"/> intellectual (3) <input type="checkbox"/> morals (4)
Deficiencies	<ul style="list-style-type: none"> – Only answer (4) is grammatically correct (noun). All other distractors are adjectives so do not fit grammatically to the stem and can be omitted as possible solutions. (i) – Information contained in the stem is not required for processing the task. (a) – Application orientation is lacking. (b/e)

Example	A benefit analysis can be used to determine the most appropriate choice for several options. Which evaluation scale can be used for a benefit analysis?
	<input type="checkbox"/> Cardinal scale (1) <input type="checkbox"/> Nominal scale with binary evaluation allows you to say whether a particular criterion is met. (2) <input type="checkbox"/> Ordinal scale (3) <input type="checkbox"/> Ratio scale (4)
Deficiencies	<ul style="list-style-type: none"> – Answer (2) is the longest and most differentiated formulated and sounds the most scientific. This suggests a correct answer. (j)

Example	<p>Investment calculation is used to decide on an investment alternative. Which form of investment calculation is a dynamic type?</p> <p><input type="checkbox"/> Payback method (1) <input type="checkbox"/> Cost comparison method (2) <input type="checkbox"/> Net present value calculation (NPV) (3) <input type="checkbox"/> Yield comparison method (4)</p>
Deficiencies	<ul style="list-style-type: none"> – Word repetition of the stem (calculation) only reappears in an answer (3) so indicates a correct response. (k) – Only known terms and abbreviations: The expression “payback” could be replaced by “amortization.” (d) – Abbreviation “NPV” could be spelled out: “Net Present Value.” (d)

Example	<p>The business environment in the 21st Century is characterized by developments such as increasing globalization, the acceleration of information processing, the growing complexity of tasks, and the progressive dynamization of companies. Which four perspectives must be considered in the “model of entrepreneurial thinking and acting”?</p> <p><input type="checkbox"/> Financial, employee, process, and client perspectives (1) <input type="checkbox"/> Financial, employee, legal, and client perspectives (2) <input type="checkbox"/> Political, ecological, corporate, and technological perspectives (3) <input type="checkbox"/> Political, ecological, social and technological perspectives (4)</p>
Deficiencies	<ul style="list-style-type: none"> – Answers (1) and (2) and (3) and (4) form two distinct blocks and mutually exclude each other. (f) (Note: Sometimes this situation may be desirable.)

Example	<p>The motivational crowding-out effect describes the relationship and interaction between intrinsic and extrinsic motivation. Which of the following statements about the crowding-out effect is correct?</p> <p><input type="checkbox"/> Extrinsic motivation is always increased by intrinsic incentives. (1) <input type="checkbox"/> Intrinsic motivation can be maintained through compensation payments. (2) <input type="checkbox"/> Intrinsic motivation is reduced by extrinsic incentives and inner attitudes. (3) <input type="checkbox"/> Intrinsic motivation is only increased by extrinsic incentives. (4)</p>
Deficiencies	<p>Answer (1) is wrong, as indicated by the absolute term “always.” (l)</p> <ul style="list-style-type: none"> – Answer (3) contains two elements. (h) – Answer (4) is wrong, as indicated by the absolute term “only.” (l)

The understanding of these design guidelines can be checked with a [test](#)

5 General Guidelines for Writing Exam Questions in English

5.1 PLANNING YOUR EXAM

For students to be able to focus fully on their task, they should already be familiar with the language used in the exam. Any specialist terminology should have been introduced, either in class or through assignments, and be used consistently. While teaching the module, consider providing your students with examples of the types of questions or tasks they will encounter in the exam.

Instructions for exam questions (usually the stem) should be as transparent as possible, never unnecessarily complex or misleading. You are trying to elicit what students have learned, not trick them into making mistakes. Although students may be nervous, they should understand exactly what

they are required to do. For the same reason, pay attention to formatting and ensure that, if possible, all the critical information can be found on one page.

5.2 READABILITY

For maximum readability, make everything as straightforward and clear as possible. Pare down questions and narratives to their bare essentials. Do not distract or confuse students with information they do not need to consider when answering the questions.

The following recommendations (1–6) may be considered when ensuring maximum readability. Examples have been provided for added clarity.

1.	Distinguish instructions from narratives by indenting or italicizing the latter.
	Write an XML document containing all the data below. <i>Patients have a unique patient number as well as a name. They are examined in medical assessments ...</i>
2.	Indent and/or use bullet points for additional structure, whenever possible.
	You have created the following relational model for an order process: – <i>Customer (CustomerID, Firstname, Lastname)</i> – <i>Order (OrderID, CustomerID, Date, Discount)</i> – <i>Position (PositionID, OrderID, Amount)</i> – <i>Article (ArticleID, PositionID, Name)</i> – <i>Price (PriceID, ArticleID, Date_from, Price)</i>
3.	Use numerical digits , not words, for all your figures (except in measurements and calculations).
	– <i>For each correct answer, you will receive 1 point.</i> – <i>Give 3 examples of measures to improve the situation.</i> – <i>Which 2 statements are correct?</i>
4.	Alphabetize multiple-choice answers and put them in ascending order. Inconsistencies may give students clues as to which answer is the “odd one out.”
	A. <i>Quantity and price decreased</i> <input type="checkbox"/> 9% B. <i>Quantity and price increased</i> <input type="checkbox"/> 50% C. <i>Quantity and price not affected</i> <input type="checkbox"/> 90% D. <i>Quantity decreased, price increased</i> <input type="checkbox"/> 45% E. <i>Quantity increased, price decreased</i> <input type="checkbox"/> 70%

5.	Use similar formats and word classes for multiple-choice answer alternatives
	<p>Example: all answer alternatives begin with verbs</p> <p><i>The government of Cambodia is making efforts to promote (instant) electronic payments. Its main objective is to ...</i></p> <p>A. <i>Liberalize Cambodia's banking sector.</i></p> <p>B. <i>Promote blockchain technology.</i></p> <p>C. <i>Protect Cambodian banks from foreign competitors.</i></p> <p>D. <i>Raise more tax and fight corruption.</i></p> <p>E. <i>Relieve Cambodian citizens of carrying around stacks of cash.</i></p>
6.	Additional required information
	<p>At the beginning of an exam or a particular section, it is often necessary to give students additional information or explanations. Here are some examples of what you might need to write at the top of your exam paper or a particular section.</p> <ul style="list-style-type: none"> – <i>Use the separate answer sheet provided for all your answers. Only the official answer sheet will be marked.</i> – <i>Evaluation: 4 correct answers = 8 points. 3 correct answers and one wrong or missing answer = 4 points. All other variations = 0 points.</i> – <i>Round your answers to 2 decimal places.</i> – <i>Each task has only 1 correct answer. Every correct answer is worth 2 points.</i> – <i>Indicate whether each statement is true or false by checking the appropriate box.</i> – <i>Several answers are possible. / There is only 1 correct statement.</i>

5.3 LANGUAGE AND STYLE

Instructions for materials to be produced in English can be found in the Sprachleitfaden SML, (which also includes some information on writing in English), and its English counterpart,

Sprachleitfaden SML English. In the context of creating exam questions, the following is recommended.

1.	Use American English to write words such as “organization,” “labor,” or “center.” Use “check” or “mark” rather than “tick.”
2.	<p>Use gender-neutral language (“he or she” or “they”) where possible. Avoid words such as “chairman” (unless referring to a specific person), “man-made,” or “manpower” in favor of “chair,” “synthetic,” or “labor.”</p> <p>In providing context for exam tasks, ensure that some but not necessarily all of your characters (especially those with leadership responsibilities such as CEOs, managers, analysts, legal advisors, etc.) are female.</p> <p><i>A good businessman knows he needs to sharpen his skills regularly.</i> <i>Good business professionals know they need to sharpen their skills regularly.</i> <i>The CEO has told you that she wants you to lead the production of a new range of game consoles.</i></p>
3.	Use (American) English notation
	<ul style="list-style-type: none"> – “...” (rather than „...” or «...») – 1,000 (rather than 1'000) – 15.5% (rather than 15,5 %) – million (rather than “mio”)

4.	<p>Capitalize major words in titles and headings. Do not capitalize keywords or names of topics, models, theories, or disciplines unless they are proper names. Remember that English, unlike German, does not capitalize common nouns (e.g., management, employee, bank etc.) in the middle of a sentence.</p> <ul style="list-style-type: none"> – <i>Which statement is the main message of R.L. Gregory's <i>The Eye and the Brain</i> (1966)?</i> – <i>Based on the new St. Gallen management model, describe the basic tasks of management.</i> – <i>List 3 branding-related benefits of corporate social responsibility (CSR).</i>
5.	<p>Use a neutral to formal register. This includes the following recommendations:</p> <ul style="list-style-type: none"> – Avoid contractions (“they’ll,” “isn’t,” “can’t” etc.). – Do not use “please” or other polite phrases in your instructions. – Avoid questions that are actually requests. (Use “Explain the principle of...” rather than “Can you explain the principle of...?”) – Do not use exclamation marks (!) to end instruction sentences. – Avoid run-on sentences (etc., and so forth) – Use the “Oxford comma” after the penultimate item in a list of 3 or more to avoid misunderstandings. (“The 4 Ps of marketing are price, product, promotion, and place.”)
6.	<p>Apply the KISS³ principle by writing simple questions and instructions that have a linear sentence structure. Give your players names to avoid misunderstandings.</p> <ul style="list-style-type: none"> – <i>Which statement is the best option?</i> – <i>Calculate the following double sums.</i> – <i>ABC Company has 360 employees.</i> – <i>The CEO, Maria Morgenstern, decides to restructure the company. She ...</i>
7.	<p>Which or What? Which asks students to choose among possible answer options. What seeks the answer from an undefined set (e.g., if a short answer is required).</p> <ul style="list-style-type: none"> – <i>Which of the courts listed below is competent to hear the claim?</i> – <i>What courts make up the judicial branch of the U.S. government?⁴</i>

³ KISS = Acronym originating in the U.S. Navy: “Keep it simple, stupid” (also known as “keep it short and simple”)

⁴ This is not an MCQ question.

6 References

- Anderson, L. W., Krathwohl, D. R.** (2001). *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*. New York: Longman.
- Azer, S. A.** (2003). Assessment in a problem-based learning course: Twelve tips for constructing multiple choice questions that test students' cognitive skills. *Biochemistry and Molecular Biology Education*, 31(6), S. 428–434.
- Biggs, J.** (1996). Enhancing teaching through constructive alignment. *Higher Education*, 32(3), S. 347–364.
- Bücker, S., Deimling, M., Durduman, J., Holzhäuser, J., Schnieders, S., Tietze, M., Sayeed, S., Schneider, M.** (2015). Prüfung. In M. Schneider & M. Mustafic (Hrsg.): *Gute Hochschullehre: Eine evidenzbasierte Orientierungshilfe. Wie man Vorlesungen, Seminare und Projekte effektiv gestaltet*. Berlin: Springer.
- Case, S. M., Swanson, D. B.** (2002). *Constructing written test questions for the basic and clinical sciences*, 3rd edition (revised). Philadelphia: National Board of Medical Examiners. Retrieved from http://www.nbme.org/PDF/ItemWriting_2003/2003IWGwhole.pdf
- Ehlers, J. P., Guetl, C., Höntzsch, S., Usener, C. A., Gruttmann, S.** (2013). Prüfen mit Computer und Internet – Didaktik, Methodik und Organisation von E-Assessment. In M. Ebner & S. Schön (Hrsg.): *Lehrbuch für Lernen und Lehren mit Technologien*. 2. Auflage. S. 53–64. Bad Reichenhall: L3T.
- Haladyna, T. M., Downing, S. M., Rodriguez, M. C.** (2002). A Review of Multiple-Choice Item-Writing Guidelines for Classroom Assessment. *Applied Measurement in Education*. 15(3), S. 309–333. https://doi.org/10.1207/S15324818AME1503_5
- Haladyna, T. M.** (2015). *Developing and Validating Multiple-Choice Test Items*. 3rd Edition. Mahwah NJ: Lawrence Erlbaum Associates (Routledge).
- Hattie, J.** (2015). The applicability of Visible Learning to higher education. *Scholarship of Teaching and Learning in Psychology*, 1(1), 79.
- Köster, J.** (2005). Unterschiedliche Prüfungsmuster im deutschen Schulwesen. In K. M. Kodalle (Hrsg.): *Der geprüfte Mensch – Über Sinn und Unsinn des Prüfungswesens*. S. 25–36. Würzburg: Verlag Königshausen & Neumann.
- Krebs, R.** (2004). *Anleitung zur Herstellung von MC-Fragen und MC-Prüfungen für die ärztliche Ausbildung*. Medizinische Fakultät, Institut für Medizinische Lehre, Abteilung für Assessment und Evaluation. Bern: Universität Bern.
- Lindner, M. A., Strobel, B., Köller, O.** (2015). Multiple-Choice-Prüfungen an Hochschulen? – Ein Literaturüberblick und Plädoyer für mehr praxisorientierte Forschung. *Zeitschrift für Pädagogische Psychologie*. 29(3–4), S. 133–149.
- Morrison, S., Walsh, K.** (2001). Writing Multiple-Choice Test Items that promote and measure Critical Thinking. *Journal of Nursing Education*. 40(1), S. 17–24.
- Scully, D.** (2017). Constructing Multiple-Choice Items to Measure Higher-Order Thinking. *Practical Assessment, Research & Evaluation*. 22(4), S. 1–13.
- Shrock, S. A., Coscarelli, W. C.** (2007). *Criterion-Referenced Test Development - Technical and Legal Guidelines for corporate Training*. 3rd Edition. San Francisco: Pfeiffer.

7 Further Reading

American Psychological Association

[APA] (2010). *Publication Manual of the American Psychological Association*. 6th edition. Washington, D.C.: APA.

Anderson, L.W., Krathwohl, D.R., Airasian, P.W., Cruikshank, K.A., Mayer, R.E., Pintrich, P.R., Raths, J., Wittrock, M.C. (2001). *A Taxonomy for Learning, Teaching, and Assessing: A revision of Bloom's Taxonomy of Educational Objectives*. New York: Pearson, Allyn & Bacon.

Bloom, B.S. (Ed.), Engelhart, M.D., Furst, E.J., Hill, W.H., Krathwohl, D.R. (1956). *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. New York: David McKay Co Inc.

National Board of Medical Examiners:

Constructing Written Test Questions for the Basic and Clinical Sciences, third edition (revised). Retrieved October 6, 2015 from <http://www.nbme.org/publications/item-writing-manual.html>.

Appendix 1: Form for Creating MCQs

Form for creating MCQ	
Module name	
Module responsibility	
E-Mail	

Multiple-Choice-Question (compare to MC-Manual SML)	
Topic of the question	
Question shortcuts	
Stem (Scenario, topic or case description incl. any illustrations)	
Question (Question or instruction)	
Answer options	a b c d
	e f g h
	achievable Points processing time (in minutes)
Taxonomy level	1 knowledge <input type="checkbox"/> 3 application <input type="checkbox"/>
	2 understanding <input type="checkbox"/> 4 analysis <input type="checkbox"/>
Task type	Type A+ <input type="checkbox"/> Type A- <input type="checkbox"/> Kprim <input type="checkbox"/>

Revision	
Auditor	
Date	
Decision	<input type="checkbox"/> Question accepted <input type="checkbox"/> Revise question <input type="checkbox"/> Question rejected
Remark Revision	

Note: This form can be found online as a PDF [template](#).

Appendix 2: Checklist for Creating MCQs

With the help of the checklist below, MC tasks can be qualitatively checked and, if necessary, adapted (see Haladyna, 2015, p. 99 et seqq.). If every item is answered in the affirmative, the MC task can be accepted.

1	Content and Stem		
1.1	Is the MC task relevant for this exam?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1.2	Is the case description adequate (application-oriented information)?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1.3	Does the stem contain all necessary but no irrelevant information?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1.4	Is the stem free from any indication of the correct answer?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1.5	Is the language simple, clear, and without ambiguities?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1.6	Are only well-known abbreviations and technical terms used?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
1.7	Does the MC task have an appropriate level of difficulty?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

2	Question and Answers		
2.1	Can the MC question be answered without answer options (“cover the options” rule)?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.2	Are the MC question and answers free from double negations?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.3	Have word repetitions from the stem (in question and answers) been avoided?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.4	Does the MC task have an unambiguously correct (technically undisputed) answer?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.5	Are all answers homogeneous (same text length, grammar)?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.6	Do all answers come from the same answer category?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.7	Have vague quantifications and absolute concepts been omitted from the answers?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.8	Does the MC task consist of at least four answers?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.9	Do the answers contain only one idea?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
2.10	Does the position (a–d or a–e) of the correct answer vary in the different MC tasks?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Appendix 3: Example of a Complex MCQ

Stem

OC OERLIKON: EXCERPT FROM THE ANNUAL REPORT 2009

2009 has probably been the most challenging year in OC Oerlikon's history. In all our markets, demand and sales have plummeted dramatically. Overall, the group's orders fell by almost 30 percent to CHF 3 billion and sales by almost 40 percent to CHF 2.9 billion. In the Textile Machinery Division – our largest segment – this decline followed a similarly sizable drop in sales in 2008.

The company is responding to the downturn with further restructuring measures and the uncompromising implementation of agreed measures to reduce costs and safeguard liquidity. In 2009, recurring cost savings of around CHF 240 million were already achieved. To this end, restructuring costs of CHF 107 million were booked in 2009. Restructuring costs of up to CHF 70 million are planned again for 2010. Annual savings of up to CHF 400 million are expected from 2012 onwards. Thanks to measures to improve liquidity, we were able to reduce net working capital by more than CHF 300 million in 2009. As part of the restructuring process, it was unavoidable to part with over 2,500 employees in 2009. More than 1,100 employees left the group in 2009 as a result of company asset disposals. Measures that are still in the planning stage envisage a further reduction of around 1,700 jobs.

The 2009 financial year was marked by the most severe global economic crisis in recent decades. The collapse of the financial market, which began in September 2008 with the insolvency of the investment bank Lehman Brothers, triggered a world recession that had a massive impact on the global economy, especially in the first half of 2009. The resulting weakened market demand, combined with more difficult financing in the industry, is leading to a one-time investment freeze in almost all industries in which the Oerlikon-based group operates. Like OC Oerlikon, customers also took advantage of the situation to reduce their inventories. This has additionally weakened incoming orders. While global sales in the automotive industry fell by around three percent in 2009, vehicle production dropped by more than 15 percent.

As a consequence, OC Oerlikon has also been affected by a sharp decline in business volumes: Orders fell by 28.8 percent from CHF 4.2 billion in 2008 to CHF 3.0 billion in 2009. Current orders amounted to CHF 1.0 billion as of 31 December 2009. (Previous year: CHF 1.1 billion). Sales fell by 37.9 percent from CHF 4.6 billion in 2008 to CHF 2.9 billion in 2009.

Essential Key Figures	2009	2008
Equity capital returns	-114 %	-38 %
Total capital returns	-12 %	-7 %
Asset coverage II	46 %	127 %
Equity financing ratio	12 %	20 %
Liquidity 2	71 %	152 %
Liquidity 3	52 %	157 %

Stem

**CONSOLIDATED INCOME STATEMENT, ASSETS, LIABILITIES, AND CASH FLOW
STATEMENT OF OC OERLIKON (2008–2009)**

in CHF million	Notes	January 1 to December 31 2009	January 1 to December 31 2008 restated
Sales of goods		2 246	4 014
Services rendered		631	618
Total sales		2 877	4 632
Cost of sales		-2 444	-3 548
Gross profit		433	1 084
Marketing and selling		-253	-309
Research and development		-202	-235
Administration		-253	-303
Impairment of goodwill	12	-202	-252
Restructuring costs	3	-107	-66
Other income	2	43	101
Other expenses	2	-48	-79
Result before interest and taxes (EBIT)		-589	-59
Financial income	4	8	13
Financial expenses	4	-165	-122
Result before taxes (EBT)		-746	-168
Income taxes	5	50	-56
Result from continuing operations		-696	-224
Result from discontinued operations	22	104	-198
Net result		-592	-422
Attributable to:			
Shareholders of the parent		-592	-425
Minority interests		-	3
Earnings per registered share in CHF	6	-46.16	-33.13
Fully diluted earnings per registered share in CHF	6	-46.16	-33.13
Earnings per registered share continuing operations in CHF	6	-54.27	-17.69
Fully diluted earnings per registered share continuing operations in CHF	6	-54.27	-17.69
Earnings per registered share discontinued operations in CHF	6	8.11	-15.44
Fully diluted earnings per registered share discontinued operations in CHF	6	8.11	-15.44

Stem

CONSOLIDATED BALANCE SHEET AT DECEMBER 31 2009 – ASSETS

in CHF million	Notes	2009	2008
Cash and cash equivalents	7	357	393
Current financial investments and derivatives	8	20	43
Trade receivables	9	433	534
Other receivables	9	221	340
Current tax receivables		17	16
Inventories	10	534	901
Prepaid expenses and accrued income		25	34
Assets classified as held for sale	22	10	60
Current assets		1 617	2 321
Loans and other non-current financial receivables	9	11	15
Non-current financial investments	8	33	33
Property, plant and equipment	11	1 137	1 278
Intangible assets	12	1 471	1 696
Post-employment benefit assets	13	1	–
Deferred tax assets	5	72	133
Non-current assets		2 725	3 155
Total assets		4 342	5 476

Stem

CONSOLIDATED BALANCE SHEET AT DECEMBER 31 2009 – LIABILITIES AND EQUITY

in CHF million		2009	2008
Trade payables	14	332	455
Current loans and borrowings ¹	14	2 043	56
Other current liabilities	14	74	91
Accrued liabilities	15	232	373
Current customer advances		136	143
Current income taxes payable		38	130
Current post-employment benefit provisions	13	18	18
Other current provisions	16	207	149
Liabilities classified as held for sale	22	11	67
Current liabilities		3 091	1 482
Non-current loans and borrowings	14	11	2 039
Non-current customer advances		–	40
Non-current post-employment benefit provisions	13	562	552
Deferred tax liabilities	5	125	198
Other non-current provisions	16	33	47
Non-current liabilities		731	2 876
Total liabilities		3 822	4 358
Share capital		283	283
Treasury shares		–292	–294
Reserves and retained earnings		502	1 104
Equity attributable to shareholders of the parent		493	1 093
Minority interests		27	25
Total equity		520	1 118
Total liabilities and equity		4 342	5 476

¹ The classification as short-term reflects the provisions of IAS 1 as of December 31, 2009. Upon completion of the refinancing arrangement discussed in note 1 such loans will be reclassified as long-term.

Stem

CONSOLIDATED CASH FLOW STATEMENT (2008 – 2009)

in CHF million	Notes	January 1 to December 31 2009	January 1 to December 31 2008
Net result		-592	-422
Tax expenses (+) / tax income (-)		-48	61
Interest expense (+) / interest income (-) from financial liabilities and assets		102	64
Depreciation of property, plant and equipment	11	173	205
Amortization of intangible assets	12	36	48
Impairment losses on property, plant and equipment	11	11	1
Impairment losses on intangible assets	12	206	410
Addition to (+) / release of (-) other provisions	16	146	101
Increase (+) / decrease (-) in post-employment benefit provisions		20	4
Losses (+) / gains (-) from sale of non-current assets		-9	-
Gain on sale of discontinued operations, net of income tax		-97	-4
Income taxes paid		-51	-51
Other non-cash expenses (+) / income (-)		11	-4
Cash flow from operating activities before changes in net current assets		-92	411
Decrease (+) / increase (-) in receivables / accrued assets		196	178
Decrease (+) / increase (-) in inventories		349	-87
Increase (+) / decrease (-) in payables / accrued liabilities and use of other provisions		-368	-291
Increase (+) / decrease (-) in customer advances		17	-106
Non-cash impact on net current assets due to hedge accounting		-12	18
Cash flow from changes in net current assets		182	-288
Cash flow from operating activities		90	123
Capital expenditure for property, plant and equipment	11	-97	-278
Capital expenditure for intangible assets	12	-33	-74
Disposal of discontinued operations, net of cash disposed of		78	11
Purchase of financial investments		-	-1
Sale of financial investments		-	2
Proceeds from sale of intangible assets		3	1
Decrease (+) / increase (-) in loans receivable	9	4	-
Decrease (+) / increase (-) in marketable securities		-2	5
Acquisition of Group companies		-	-2
Proceeds from sale of property, plant and equipment		26	27
Interest received		3	9
Cash flow from investing activities		-18	-300
Dividends paid		-	-2
Purchase of treasury shares		-	-111
Sale of treasury shares		-	1
Increase of financial debt		2	318
Repayment of financial debt		-20	-28
Interest paid		-88	-62
Cash flow from financing activities		-106	116
Conversion adjustments to cash and cash equivalents		-2	-30
Increase (+) / decrease (-) in cash and cash equivalents		-36	-91
Cash and cash equivalents at the beginning of the year	7	393	484
Cash and cash equivalents at the end of the year	7	357	393
Increase (+) / decrease (-) in cash and cash equivalents		-36	-91

Question 1	Which of the following statements regarding OC Oerlikon's financial position is incorrect? (1 point) The weak financial situation at OC Oerlikon is reflected among other things in ...
Answers	<input type="checkbox"/> the negative returns. <input type="checkbox"/> the reduction in equity. <input checked="" type="checkbox"/> the drop in inventories. <input type="checkbox"/> the negativity of EBIT. <input type="checkbox"/> the reduction in the balance sheet total.
Question 2	Decide whether the following statements are true or false. (Total 2 points, evaluation: 4 correct = 2 points; 3 correct = 1 point; 2 or less correct = 0 points)
Answers	T F <input type="checkbox"/> <input checked="" type="checkbox"/> The equity financing ratio became smaller in 2009 because, among other things, total capital became smaller. <input type="checkbox"/> <input checked="" type="checkbox"/> The equity financing ratio changed in 2009 compared to 2008 because own capital was substituted by borrowed capital. <input checked="" type="checkbox"/> <input type="checkbox"/> The equity financing ratio fell because the 2009 financial year ended with losses. <input type="checkbox"/> <input checked="" type="checkbox"/> The equity financing ratio in 2008 would, in any case, be sufficient for an unquoted company.
Question 3	Decide whether the following statements are true or false. (Total 2 points, evaluation: 4 correct = 2 points; 3 correct = 1 point; 2 or less correct = 0 points)
Answers	T F <input checked="" type="checkbox"/> <input type="checkbox"/> The cash flow statement explains the deterioration in the equity financing ratio. <input type="checkbox"/> <input checked="" type="checkbox"/> The raising of current financial liabilities led to a negative financing cash flow in 2009. <input checked="" type="checkbox"/> <input type="checkbox"/> In 2008, loans had to be taken out to finance investments. <input type="checkbox"/> <input checked="" type="checkbox"/> Operating cash flow in 2009 was sufficient to repay interest and financial liabilities.

Appendix 4: Useful Verbs¹⁴

ACTION WORDS FOR BLOOM’S TAXONOMY

Knowledge	Understand	Apply	Analyze	Evaluate	Create
Copy	Ask	Act	Advertise	Appraise	Adapt
Define	Associate	Administer	Analyze	Assess	Anticipate
Describe	Cite	Apply	Appraise	Argue	Arrange
Discover	Classify	Articulate	Break down	Choose	Assemble
Duplicate	Compare	Calculate	Calculate	Compare	Collaborate
Enumerate	Contrast	Chart	Categorize	Conclude	Collect
Examine	Convert	Choose	Classify	Consider	Combine
Identify	Demonstrate	Collect	Compare	Convince	Compile
Label	Describe	Complete	Conclude	Criticize	Compose
List	Differentiate	Compute	Connect	Critique	Construct
Locate	Discover	Construct	Contrast	Debate	Create
Match	Discuss	Demonstrate	Correlate	Decide	Design
Memorize	Distinguish	Determine	Criticize	Defend	Develop
Name	Estimate	Develop	Deduce	Discriminate	Express
Quote	Explain	Discover	Devise	Distinguish	Facilitate
Recall	Express	Dramatize	Diagram	Editorialize	Formulate
Recognize	Extend	Employ	Differentiate	Estimate	Hypothesize
Reproduce	Generalize	Establish	Discriminate	Evaluate	Imagine
Select	Give Examples	Examine	Dissect	Find Errors	Infer
State	Group	Experiment	Distinguish	Grade	Integrate
Tabulate	Identify	Explain	Divide	Judge	Intervene
Tell	Illustrate	Interpret	Estimate	Justify	Invent
	Indicate	Interview	Evaluate	Measure	Justify
	Infer	Illustrate	Experiment	Order	Manage
	Interpret	Judge	Explain	Persuade	Modify
	Judge	List	Focus	Predict	Negotiate
	Observe	Manipulate	Illustrate	Rank	Organize
	Order	Modify	Infer	Rate	Originate
	Paraphrase	Operate	Order	Recommend	Plan
	Predict	Paint	Organize	Reframe	Prepare
	Relate	Practice	Outline	Score	Produce
	Report	Predict	Plan	Select	Propose
	Represent	Prepare	Point out	Summarize	Rearrange
	Research	Produce	Prioritize	Support	Reorganize
	Restate	Record	Question	Test	Report
	Review	Relate	Select	Weigh	Revise
	Rewrite	Report	Separate		Rewrite
	Select	Schedule	Subdivide		Schematize
	Show	Show	Survey		Simulate
	Summarize	Simulate	Test		Solve
	Trace	Sketch			Speculate
	Transform	Solve			Structure
	Translate	Teach			Substitute
		Transfer			Support
		Use			Validate
		Write			Write

¹⁴ Source: Teachthought.com, <http://www.teachthought.com/learning/249-blooms-taxonomy-verbs-for-critical-thinking/>



PUBLISHED BY

ZHAW School of Management and Law

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