Tool for assessing quality of learners' questions Advanced version

How can I benefit?

This tool can be useful for you if

- you have already used the "Tool for assessing quality of learners' questions. Simple version";
- you are familiar with the model of stages of competence development;
- you intend to organise the learning process based on the stages of competence development model.

When can it be used?

The tool should be used at different stages of mastering a particular competence. It is assumed that learners' questions should change as they progress towards becoming more competent.

This tool can be used any time you ask your learners to formulate questions. It will be easier for you to assess questions if they are written down. You can use the tool either for assessing an individual student or the whole group.

In both cases, the tool will help you capture learners' progress in asking questions and see where support is needed.

How can I use it?

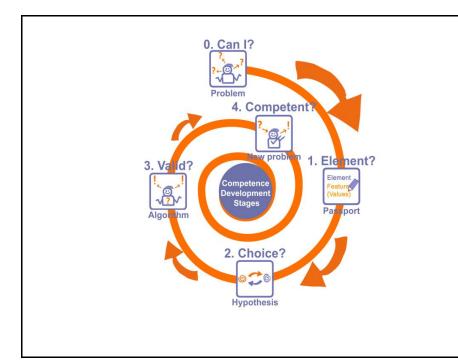
The use of the tool is similar to the application of a simple version of assessing quality of learners' questions. It is based on the same three evaluation parameters: problem-centredness, disposition and independence. As the indicators for the parameters differ at various phases of competence development, make sure you have selected the assessment sheet for the corresponding competence development stage.

Prior to assessing individual learners, you might want to get acquainted with all the proposed questions and decide on the best and poorest ones.

Taking notes of how learners are working will help you assess their disposition and independence.

Stages of competence development

Learners' questions depend on the stage of competence development the learner is working on. Formative assessment should help the learner move towards the next stage. This is the general path to follow for the teacher and the learner.



0. Can I? Accepting a learning problem.

Learner's questions aim at defining the problem to be resolved, and setting the objective to help the learner achieve this.

1. What am I dealing with? Creating the passport of an element

Learner's questions aim at identifying the elements involved in the defined problem and specifying their properties via parameters and values.

2. How to make a choice? Formulating a hypothesis

Learner's questions aim at formulating a hypothesis based on connections between parameters and values of the specified elements.

3. Does my hypothesis work? Developing an algorithm

Learner's questions aim at (dis)proving the hypothesis and transforming it into a rule or an algorithm for dealing with the defined problem.

4. Do I still need the algorithm? Becoming competent and facing a new problem.

Learner's questions aim at optimizing the algorithm and identifying new problems.



1. Element?



2. Choice?



3. Valid?



4. Competent?





Learner's Questions at Competence Development Stage 0. Towards definition of a problem

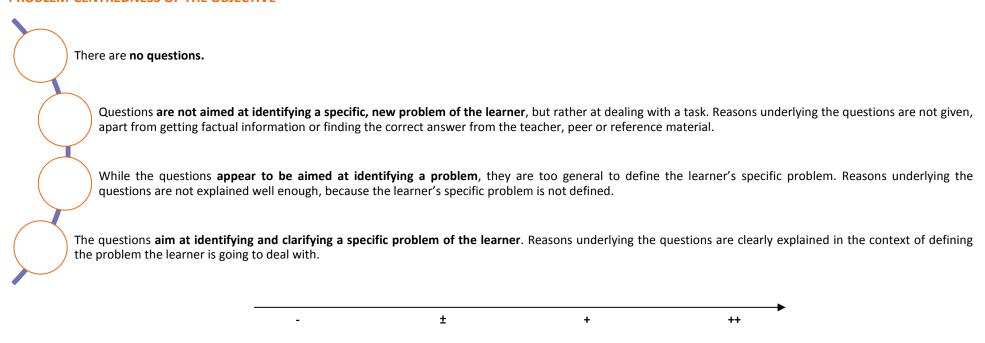
Important remark

The questions are formulated at Stage 0 as a response to a problem situation. They may have a very general character and may not be explicitly connected with the learner's difficulty because the problem at this stage might be too vague for the learner. The competent learner is, however, able to move from asking general questions to asking personal and specific ones.

A well-formulated specific question allows the learner to move towards:

- showing what (s)he would like to achieve (desired result);
- focusing on specific difficulties by giving examples of own mistakes (obstacles);
- explaining how the mistakes prevent from achieving the result;
- defining the objective for further work at Stage 1.

PROBLEM-CENTREDNESS OF THE OBJECTIVE



Please note that the learner's independence and disposition <u>cannot be</u> assessed unless problem-centredness has reached point (+).

DISPOSITION OF THE LEARNER TOWARDS DEFINING QUALITY QUESTIONS

The learner does not try to formulate questions that would allow him to identify and clarify his/her specific problem. S/he doesn't formulate questions or comes up with formal general questions.

The learner **tries to formulate questions**, links them to potential difficulties in the problem area but doesn't demonstrate the willingness to connect them to a specific problem s/he faces.

The learner **formulates and reformulates questions** until they are specific enough for allowing him to identify and clarify his/her specific problem.

INDEPENDENCE OF THE LEARNER IN THE PROCESS OF DEFINING QUALITY QUESTIONS

The learner can't formulate questions aimed at identifying and clarifying his/her specific problem.

The learner can formulate questions aimed at identifying and clarifying his/her specific problem but only with the teacher's or peers' support.

The learner can independently formulate questions aimed at identifying and clarifying his/her specific problem. (S)he can also help peers improve their questions.

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Learner's questions at Stage 1. Towards identification of the research element and its properties

Important remark

The questions are formulated at Stage 1 as a response to the need to identify the element (what I deal with) and specify its properties via parameters and values (how I describe it). They may first be focused on general, randomly formulated characteristics of the element. The competent learner is, however, able to move from general and random characteristics to those specifically related to the problem the learner deals with (why I describe the element). This process results in a systemic description of the element through parameters and values.

A well-formulated specific question allows the learner to move towards:

- finding and recognising the elements s/he is dealing with when resolving the chosen problem;
- describing the elements via parameters and their values;
- distinguishing between the elements or their forms;
- defining the objective for further work at Stage 2.

PROBLEM-CENTREDNESS OF THE QUESTION

There are no questions.

The questions are not aimed at identifying the research element and specifying its properties but rather at getting factual information. Reasons underlying the questions are not given, apart from finding the correct answer from the teacher, peers or reference material.

The questions are aimed at identifying the research element and specifying its properties however they are not always connected with the specific problem of the learner or may not lead to a systemic description of the element. Reasons for the questions are formulated in a very general way.

The questions are aimed at identifying the research element and specifying its properties in the context of the chosen problem. They focus on a specific problem the learner deals with and lead to a systemic description of the element. Reasons for the questions are clear.

Please note that the learner's independence and disposition <u>cannot be</u> assessed unless problem-centredness has reached point (+).

DISPOSITION OF THE LEARNER TOWARDS DEFINING QUALITY QUESTIONS

The learner does not try to formulate questions aimed at identifying the research element and specifying its properties. S/he does not formulate questions or comes up with formal general questions.

The learner **tries to formulate questions**, links them to potential difficulties in the problem area but does not demonstrate the willingness to specify questions that would allow to identify the research element and specify its properties .

The learner **formulates and reformulates questions** until they are specific enough for identifying the research element and specifying its properties.

INDEPENDENCE OF THE LEARNER IN THE PROCESS OF DEFINING QUALITY QUESTIONS

The learner can't formulate questions aimed at identifying the research element and specifying its properties.

The learner can formulate questions aimed at identifying the research element and specifying its properties but only with the teacher's or peers' support.

The learner can independently formulate questions aimed at identifying the research element and specifying its properties. (S)he can also help peers improve their questions.



Learner's questions at Stage 2. Towards formulation of a hypothesis for solving the problem

Important remark

The questions are formulated at the beginning of Stage 2 as a response to the need to choose properties of the research element essential for formulating a hypothesis that would help to solve a specific problem the learner faces. They may first be rather random and not focused on essential parameters for the defined problem and links between their various values. The competent learner is, however, able to move from random guesses to well formulated questions that help to solve the learner's specific problem.

A well-formulated specific question allows the learner to move towards:

- defining the essential parameters in the context of the learner's specific problem;
- establishing a connection between various values of the defined parameters in the "passport" of the element;
- formulating a hypothesis on resolving the initial problem based on the established connection;
- defining the objective for further work at Stage 3.

PROBLEM-CENTREDNESS OF THE QUESTION

The questions are not aimed at choosing essential properties of the research element and establishing a connection between them for formulating a hypothesis, but rather at getting factual information. Reasons underlying the questions are not given, apart from finding the correct answer from the teacher, peers or reference material.

The questions are aimed at choosing essential properties of the research element but fail to establish a connection between them for formulating a hypothesis and solving a specific problem the learner faces. Reasons for the questions are given but are formulated in a very general way.

The questions are aimed at choosing essential properties of the research element and establishing a connection between them for formulating the hypothesis and solving a specific problem the learner faces. Reasons for the questions are clear as they focus on specific difficulties the learner has when formulating a hypothesis.

Please note that the learner's independence and disposition <u>cannot be</u> assessed unless problem-centredness has reached point (+).

DISPOSITION OF THE LEARNER TOWARDS DEFINING QUALITY QUESTIONS

The learner does not try to formulate questions aimed at choosing essential properties of the research element and establishing a connection between them for formulating a hypothesis. S/he doesn't formulate questions or comes up with formal general questions.

The learner tries to formulate questions aimed at choosing essential properties of the research element, links them to potential difficulties in the problem area but doesn't demonstrate the willingness to establish a connection between them for formulating a hypothesis.

The learner **formulates and reformulates questions** until they are specific enough and allow to choose essential properties of the research element and establish a connection between them for formulating a hypothesis.

INDEPENDENCE OF THE LEARNER IN THE PROCESS OF DEFINING QUALITY QUESTIONS

The learner can't formulate questions aimed at choosing essential properties of the research element and establishing a connection between them for formulating a hypothesis.

The learner can formulate questions aimed at choosing essential properties of the research element and establishing a connection between them for formulating a hypothesis but only with the teacher's or peers' support.

The learner can independently formulate questions aimed at choosing essential properties of the research element and establishing a connection between them for formulating a hypothesis. (S)he can also help peers improve their questions.

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Learner's questions at Stage 3. Towards defining an algorithm

Important remark

The questions are formulated at Stage 3 as a response to the need to (dis)prove the formulated hypothesis and transform it to a rule or an algorithm for dealing with the specific problem the learner faces. They may first be directed at finding the proofs that support the initial hypothesis without going beyond the obvious. The competent learner, however, treats his/her own hypotheses as models that have drawbacks and applicability limits, so is able to focus on collecting more data for finding and eliminating flaws of the hypothesis and building the algorithm as a result.

A well-formulated specific question allows the learner to move towards:

- collecting the data as a result of following the hypothesis;
- selecting the data where the hypothesis "failed" and choosing those examples that will help to further improve the hypothesis;
- on the basis of the analysed data, build the algorithm;
- demonstrating how the proposed algorithm helps to resolve the problem;

and they focus on finding and resolving specific flaws of the hypothesis that prevent the learner from building an algorithm.

defining the objective for further work at Stage 4.

PROBLEM-CENTREDNESS OF THE QUESTION

The questions are not aimed at (dis)proving the hypothesis for building an algorithm for solving a specific problem the learner faces, but rather at getting factual information. Reasons underlying the questions are not given, apart from finding the correct answer from the teacher, peers or reference material.

The questions are aimed at (dis)proving the hypothesis, however they are too general for building an algorithm for solving a specific problem the learner faces. Reasons for the questions are given but focus on supporting the hypothesis rather than finding specific flaws.

The questions are aimed at (dis)proving the hypothesis for building an algorithm for solving a specific problem the learner faces. Reasons for the questions are clear

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Please note that the learner's independence and disposition <u>cannot be</u> assessed unless problem-centredness has reached point (+).

DISPOSITION OF THE LEARNER TOWARDS DEFINING QUALITY QUESTIONS

The learner does not try to formulate questions aimed at (dis)proving the hypotheses for building an algorithm for solving a specific problem. S/he doesn't formulate questions or comes up with formal general questions.

The learner **tries to formulate questions**, links them to potential difficulties in the problem area but doesn't demonstrate the willingness to connect them to (dis)proving the hypotheses aimed at solving a specific problem s/he experiences.

The learner formulates and reformulates questions, making them more specific for (dis)proving the hypotheses for building an algorithm aimed at solving a specific problem s/he experiences.

INDEPENDENCE OF THE LEARNER IN THE PROCESS OF DEFINING QUALITY QUESTIONS

The learner can't formulate questions aimed at (dis)proving the hypotheses for building an algorithm for solving a specific problem.

The learner can formulate questions aimed at (dis)proving the hypotheses for building an algorithm for solving a specific problem but only with the teacher's or peers' support.

The learner can independently formulate questions aimed at (dis)proving the hypotheses for building an algorithm for solving a specific problem. (S)he can also help peers improve their questions.

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4. Competent?



Evaluation parameters

Learner's questions at Stage 4. Towards optimising the algorithm and identifying new problems

Important remark

The questions are formulated at Stage 4 as a response to the need to optimise the algorithm and apply it in a larger context. The competent learner understands that the algorithm s/he has developed should be aligned with their other algorithms and poses questions that guide them in this process. Additionally, the learner understands that each algorithm has its applicability limits and therefore takes a note of its flaws that may point to potential new problems to focus on in the future. Here the questions help to establish priorities for further learning.

A well-formulated specific question allows the learner to move towards:

- making a choice in any problematic situation that falls under the definition of the problem s/he has been working upon;
- comparing own algorithm for dealing with the problem with those developed by peers and optimising the algorithm if necessary;
- collecting the data when the algorithm does not seem to work and defining a possible new problem;
- formulating the objective for further work with a new problem (Stage 0).

PROBLEM-CENTREDNESS OF THE QUESTIONS

There are **no questions**.

The questions **are not aimed at optimising the algorithm or identifying a new problem**, but rather at getting factual information. Reasons underlying the questions are not given, apart from finding the correct answer from the teacher, peers or reference material.

The questions **are aimed at optimising the algorithm or identifying a new problem, however they remain too general** to guide the learner in this process. Reasons for the questions are given but focus on supporting the existing algorithm rather than finding specific flaws.

The questions **are aimed at optimising the algorithm or identifying a new problem** the learner might face in a larger context. Reasons for the questions are clear and they focus on specific flaws of the algorithm or on moving to a possible new problem.

Please note that the learner's independence and disposition <u>cannot be</u> assessed unless problem-centredness has reached point (+).

DISPOSITION OF THE LEARNER TOWARDS DEFINING QUALITY QUESTIONS

The learner **does not try to formulate questions** for optimising his/her algorithm or finding a new problem s/he might face in a larger context. S/he doesn't formulate questions or comes up with formal general questions.

The learner **tries to formulate questions,** links them to potential difficulties in the problem area but doesn't demonstrate the willingness to connect them to optimising the algorithm and identifying new problems s/he might face.

The learner **formulates and reformulates questions** for optimising his/her algorithm or finding a new problem.

INDEPENDENCE OF THE LEARNER IN THE PROCESS OF DEFINING QUALITY QUESTIONS

The learner **can't formulate questions** for optimising his/her algorithm or finding a new problem s/he might face in a larger context.

The learner can formulate questions for optimising his/her algorithm or finding a new problem s/he might face in a larger context but only with the teacher's or peers' support.

The learner can independently formulate questions for optimising his/her algorithm or finding a new problem s/he might face in a larger context. (S)he can also help peers improve their questions.

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Student assessment sheets

In this part you can find assessment sheets you can use at any stage of competence development. Before filling in the assessment sheet, write down the stage for which you are using it.



1. Element?



3. Valid?

4. Competent?



There are two types of sheets, one for assessing individual students and another one to be used for assessing the progress of the class a whole.



Individual student assessment sheet



Class assessment sheet

Each type of the assessment sheet offers three evaluation parameters:

- problem-centredness of questions;
- disposition of students;
- independence of students.



Individual student assessment sheet Quality of questions: problem-centredness of questions

		Problem-centredness of questions						
Student name	Student's question(s)	No questions	Not problem focused	Partially problem focused	Problem focused			
S1								
					•			
S2								
					—			
S3								
S4								
S5								
					•			



Individual student assessment sheet

Quality of questions: disposition & independence of students

Student name	Student's question(s)	Problem- centredness of questions	Disposition of students			Inc	dependence	Progress bar					
		Problem focused +	Doesn't do -	Does but +/-	Does +	Can't do -	Can do with support +/-	Can do independently +					
S1									novice				competent
										+	++	+++	
S2					_				novice				competent
								,		+	++	+++	
S3									novice				competent
										+	++	+++	
S4									novice				competent
								_		+	++	+++	,
S5		 							novice				competent
										+	++	+++	•



Class assessment sheet

Quality of questions: problem-centredness of questions

Class	

		Problem-centred	ness of questions		•		
Date of assessment	No questions	No questions Not problem Partia focused fo		Problem focused	Notes		
T1							
	All	All	None	None			
	Most	Most	Few	Few			
	Half	Half	Half	Half			
	Few	Few	Most	Most			
	None	None	All	All			
T2							
	All	All	None	None			
	Most	Most	Few	Few			
	Half	Half	Half	Half			
	Few	Few	Most	Most			
	None	None	All	All			
T3							
	All	All	None	None			
	Most	Most	Few	Few			
	Half	Half	Half	Half			
	Few	Few	Most	Most			
	None	None	All	All			
T4							
	All	All	None	None			
	Most	Most	Few	Few			
	Half	Half	Half	Half			
	Few	Few	Most	Most			
	None	None	All	All			



Class assessment sheet

Quality of questions: disposition & independence of students

Class	

Date of assessment	Problem- centredness of questions		ition of st	udents	Independence of students			Notes
	Problem focused	Doesn't do	Does but	Does	Can't do	Can do with support	Can do independently	
T1								
		All	None	None	All	None	None	
	Few	Most	Few	Few	Most	Few	Few	
	Half	Half	Half	Half	Half	Half	Half	
	Most	Few	Most	Most	Few	Most	Most	
	All	None	All	All	None	All	All	
T2								
		All	None	None	All	None	None	
	Few	Most	Few	Few	Most	Few	Few	
	Half	Half	Half	Half	Half	Half	Half	
	Most	Few	Most	Most	Few	Most	Most	
	All	None	All	All	None	All	All	
T3								
		All	None	None	All	None	None	
	Few	Most	Few	Few	Most	Few	Few	
	Half	Half	Half	Half	Half	Half	Half	
	Most	Few	Most	Most	Few	Most	Most	
	All	None	All	All	None	All	All	
T4								
		All	None	None	All	None	None	
	Few	Most	Few	Few	Most	Few	Few	
	Half	Half	Half	Half	Half	Half	Half	
	Most	Few	Most	Most	Few	Most	Most	
	All	None	All	All	None	All	All	