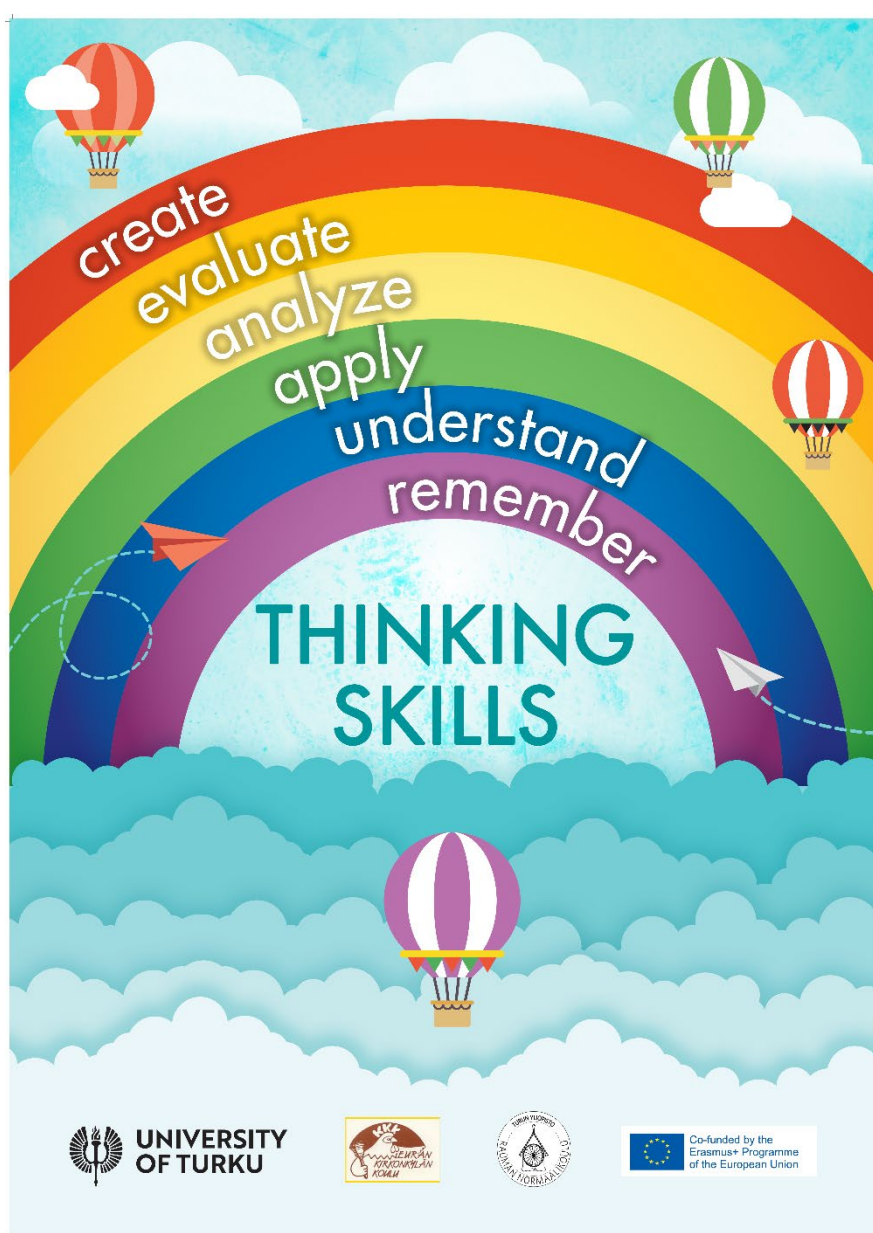# Assessment Companion for Thinking Skills

HOW ARE THE CHILDREN ABLE TO ASSESS THEIR THINKING?

HOW IS THE STUDENTS' CAPABILITY TO ASSESS THEIR THINKING DEVELOPED?

COMBINATION OF TWO TOOLS: THE RAINBOW POSTER AND THE SOLO TAXONOMY FIGURE

create
evaluate
analyze
apply
understand
remember

THINKING SKILLS

UNIVERSITY OF TURKU

Co-funded by the Erasmus+ Programme of the European Union

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KKK NEURÄN KIRKONKYLÄN KOULU

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1. Description of the tool with background references

The Finnish National Curriculum for Basic Education (2016) aims at learning skills and learning to learn. This aim includes many perspectives on children's thinking and thinking. Regardless of this emphasis on thinking skills, they often remain invisible and the educators have no means to assess these skills.

In the Finnish National Curriculum, Bloom's taxonomy is considered as the basis for all the contents in relation to thinking skills (updated version of Krathwohl et al. 2001). The **Rainbow Poster** assessment tool assists the educators to apply and understand Bloom's taxonomy. This means, that this assessment tool is very close to the foundations of Finnish curriculum and therefore easy and natural to use.

Bloom's taxonomy gives the educators possibilities to think about their teaching and the learning of their students. In Bloom's taxonomy, thinking is organized in six levels: 1. **Remembering r**efers to thinking in which the student recalls the things, facts, concepts, and answers he or she has learned before. Consciously remembering can mean knowledge of terminology (basic knowledge) or knowledge of one's own knowledge (metacognitive knowledge). 2. **Understanding** means that the students usually compares or arranges facts in order to illustrate the main point. 3. By **applying**, the student solves the problems with knowledge, skills and facts he or she has already learned. 4. **Analytical** thinking means that the student explores and analyzes information in an effort to find motives and causes. Conclusions and generalizations are usually made when analyzing. 5. **Evaluative** thinking is about expressing one's own opinions and judicious evaluation of one's own work. 6. At the highest level of Bloom's taxonomy, thinking is **creative**, in which the student compiles what he or she has learned in a new way or suggests alternative ways of doing things.

Based on Bloom's taxonomy, it is essential to understand that thinking always progresses from the lower level to the higher. This means, for example, that no one can create something new without remembering, understanding, applying, analyzing and evaluating his or her work. It is important, therefore, that teaching starts with remembering and progresses towards more challenging thinking. Without a good foundation, higher thinking cannot be achieved.

The interaction between the educator and the student is vital while using the Rainbow Poster assessment tool. This is in line with Vygotsky's theory, which also considers interaction as a key feature for individual's spiritual and intellectual growth. According to Vygotsky, language is used both internally (which decreases as the child grows) and externally (which increases as the child grows). By increasing interaction, the student learns better and the educator gets more insight into what the students think. The Rainbow Poster produces a visible intrapsychological event that would otherwise be impossible to see. This also allows the educator to better assess his or her own teaching and whether the student has achieved the goals.

With the Rainbow Poster assessment tool, students practice assessing and describing their own thinking according to Bloom's taxonomy. The educator, in turn, can observe students' ability to verbalize and argument their thinking. The Rainbow Poster is supported with a figure describing SOLO's taxonomy. SOLO's taxonomy helps the educator helps to see the student's development and ability to assess their own thinking. SOLO (Structure of the Observed Learning Outcome) taxonomy is generally considered a good support for structuring thought levels (Biggs & Collins, 1982).

REFERENCES FOR FURTHER READING

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: Addison Wesley Longman, Inc.

Biggs, J. B., & Collins, K. F. (1982). Evaluating the Quality of Learning. The SOLO Taxonomy. London: Academic Press.

Bloom, B. S.; Engelhart, M. D.; Furst, E. J.; Hill, W. H.; Krathwohl, D. R. (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I: Cognitive domain*. New York: David McKay Company.

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2. Guidelines for implementing the Rainbow Poster assessment tool

The aim of the Rainbow Poster (see below) assessment tool is to assess how a student can self-evaluate his or her thinking based on Bloom's taxonomy and how the student's assessment ability develops when using the poster. In addition, the aim is to help the student to reflect on and assess his or her own thinking, with the support of SOLO's taxonomy. The central activity while using the Rainbow Poster is the discussion between the teacher and the students.

The Rainbow Poster assessment tool should be placed prominently in the learning environment. In addition, the class should have the clouds (see below) and smileys (see below) illustrating Bloom's taxonomy for students. If the students want to take notes of their own thinking, there may be a special booklet (see below) for this purpose. In addition, to the material attached to this document the educator and the students need some kind of a mark attachable to the poster (e.g. magnets with a name).

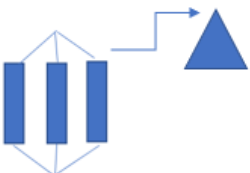When using the Rainbow Poster assessment tool, one option is to follow these steps:

1. The educator plans a study project (in any subject or content) that supports thinking and considers what kind of thinking (based on Bloom's taxonomy) is required of the students.

2. In the beginning of each lesson, the educator illustrates to the students the level of thinking he or she is aiming at. For example, she might place his/her own mark on the rainbow poster at the desired level.

3. At the end of the lesson, the students will assess their own thinking by placing a mark on the Rainbow Poster at the level of thinking he or she has achieved during the lesson (to his/her own mind). To support students' assessment the educator can use the smileys or the clouds illustrating Bloom's taxonomy.

4. After deciding the thinking level, the students justify their level of thinking using the attached self-assessment scale based on SOLO taxonomy.

5. All the students place their thinking marks (magnets) on the Rainbow Poster and argument the place (thinking level) of their mark. Based on the arguments the educator makes a note on students' ability to evaluate their own thinking. The educator can use the assessment scale based on SOLO taxonomy (1-5) as a support. (The educator can also copy the assessment of the student (based on SOLO) and compare it to the assessment he/she makes.)

6. In addition to the self-assessment form, it is a good idea to discuss about the arguments the students give and ponder together the perspectives of making the assessment in correct direction.

7. Based on his or her notes, the educator sees how students assess and argument their thinking, how the thinking of different students varies and how the ability to assess thinking skills develops.

3. A note page for the educator's notes

This note page helps the educator to make notes on the student's ability to justify their own thinking. If the educator adds the date to the table, it is easy to connect student's assessment to a certain learning project.

The note page is quick to use: The teacher will assess (1-5) the student's reasoning using SOLO's taxonomy. The assessment is based on how well the student describes her or his thinking and how well the student is able to verbalize his or her own thinking. If desired, the teacher can draw a line between the assessments of various lessons, thus illustrating the development of the students' assessment ability. The table of SOLO's taxonomy might help the educator to place the assessment (1 = pre-built, 2 = single-built, etc.)

SOLO Taxonomy

SOLO-scale The student is able to explain what the thinking level he/she used during the project was. The student can argument the thinking level he or she has chosen.	
1. I need help to assess my thinking	I am not completely sure what the thinking level I used was. I cannot justify my thinking yet.
2. I have some arguments on my thinking level	I'm able to say something about the tinkling level I used. I can give one reason to justify.
3. I have a clear idea of my thinking but cannot justify it completely yet.	I know what thinking level I used during the lesson. I can give several reasons to justify or explain how they fit together. My justification is not fully complete.
4. I have a complete idea of my thinking and I can justify it.	I can explain what thinking level I used in class. I can give several reasons and give a full explanation about thinking level I used. I can explain how reasons fit together/developed.
5. I'm able to create something new based on my own thinking. I can be creative and I have a good idea of different thinking levels and how and when to use them.	I'm able to assess during the project what thinking level I should use to proceed with the tasks. I can explain why this strategy might be productive in another context. (beyond this lesson) I am flexible in my thinking and I can control it.

Educator´s note page (empty)

Date											Average
Student	5										
	4										
	3										
	2										
	1										
Student 2	5										
	4										
	3										
	2										
	1										
Student 3	5										
	4										
	3										
	2										
	1										

Educaator´s note page (filled)

Date		1.10.	8.10.	15.10.	23.10.	30.10.	7.11.	15.11.	22.11.	29.11.	Average
Meeri	5							X	X	X	
	4						X				
	3					X					3.11
	2			X	X						
	1	X	X								
Pauliina	5						X	X	X	X	
	4				X	X					
	3	X	X	X							4.11
	2										
	1										
Elmeri	5										
	4										
	3							X	X	X	
	2			X	X	X	X				2.11
	1	X	X								

4. A notebook for the student

Notebook

In the notebook, the student makes notes on his or her own thinking. The teacher can give students ready-made titles in the notebook, which makes it easier for the students.

An example of possible things to write in a notebook (headings):

1. Date
2. Topic and subject
3. Teacher's aim for the thinking level
4. Student own assessment of his or her thinking level based Bloom's taxonomy
5. Student assessment for his or her capability to justify the thinking level according to SOLO's taxonomy
6. Assessment of the correctness of one's own level of thinking after the discussion with the educator and other students

5. An example of the student's notebook in practise

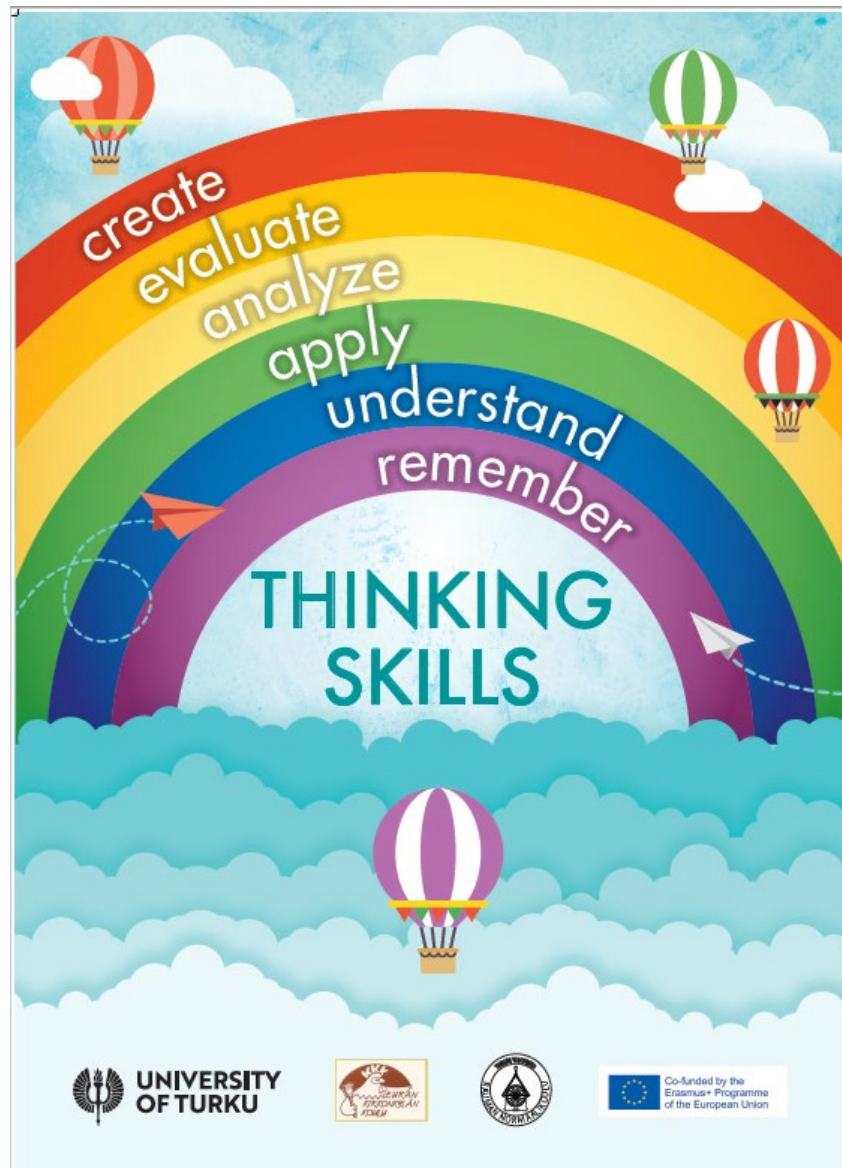*Example 1*

Date 27.10.2019

Student: Wilma
Subject: Biology
Tkinking goal: Remember and understand
My own thinking: I used my memory, because I remember the word gravity. I can not justify my thinking. I can not explain the word.
SOLO-scale (1-5): 2

6. Rainbow Poster Assessment Tool

7. Supporting material for the Rainbow Poster

Smileys for students

I understand this.
I can explain this to my friend.

I solved tasks given during the lesson using the information I had already learned.

During the lesson I experssed and defended my views.
I also carefully considered my work during the lesson.

I combined the knowledge I learned in a new way by combining the things I learned.
Even the teacher did not know the result.

During the lesson I used my memory because I remembered what I had already learned.
I remember something from this lesson.

During the lesson I tried to find out why. Why do something like this? Why is it like this?