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Strengthening Teaching Competences
in Higher Education
in Natural and Mathematical Sciences

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Constructivism – theory behind practice

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Constructivism – theory behind practice

- The goal of this session is to
  - support the constructivist based contemporary university teaching,
  - Introduce some constructivist methods and tools that could make university teaching more focused, organized and consistent, and
  - **inspire our participants to raise** some **questions** concerning their teaching practice

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Constructivism – theory behind practice

A good theory is a thread connecting all our actions. It gives consistency to the learning process.

- Why theory?
  - There is nothing so practical as a good theory - Kurt Lew
  - The greatest wrong, the greatest treason, is to do the right thing for the wrong reason. - T.S. Eliot, Murder in the Cathedral
- Why constructivism?
  - It is considered the leading theoretical approach in education, and the foundation of many modern education systems.

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Constructivism – how people learn

- knowledge **can not be transferred** from the "knower" to the learner – **the learner actually has his own share of responsibility** in the process
- The learner is expected to be more active, aware, critical, independent, adaptable, cooperative, etc.
- learning is a guided, but subjective discovery of reality
- the one who learns is deeply **immersed in the context** of the situation and **motivated by his own needs**

Student centered theory!

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Constructivism – individual vs. society

- nurturing socio-emotional and intellectual skills
- developing professional and scientific skills
- deep reflection and dedicated individual work
- students have the freedom of independent research
- knowledge is created in socially engaging situations through cooperation
- focused on the practical application of knowledge
- knowledge must be placed in the context of the modern society, science and the profession for which the students are educated.
- learning from all the available sources
- relying on ICT (to engage, to connect, to personalize, to provide feedback)

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Constructivism – some of the teacher's responsibilities

- previous knowledge as the starting point for further learning
- designing an inspiring learning surroundings
- providing enough time for students to interact and exchange ideas;
- encouraging students to engage in dialogue, to contribute, to work in teams ;
- asking open-ended questions and insisting on explanations from students;
- promoting and supporting inventiveness and divergence in students' thinking,

- Personal competences
- Teaching competences
- Dedication (Time-consuming)

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Constructivism – the main methods used

- Peer collaboration
- Tutoring
- Inquiry based learning
- Cooperative learning
- Authentic learning method (example demonstration, simulation environment)
- Problem-based learning
- Project based learning

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Assessment in constructivist-oriented teaching

Types of assessment

- Self-assessment
- Peer assessment
- Collaborative evaluation

The most common means of evaluation

- Portfolio
- Lab notebook
- Oral examination
- Objective tests
- Poster
- Written Assignment
- Project report

Learning oriented, not grade oriented.

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Assessment in constructivist-oriented teaching

Feedback – students learn how to learn more successfully, while teachers learn how to teach more successfully

Tools:

- Checklist
- Semantic differential (Likert Scale)
- ***Rubrics***

- Rubrics are not a *form of assessment*, but are ***the criteria*** for making an assessment.
  - Provide student with copy of rubric
  - Review rubric with students **prior to** assignment being submitted
  - Use rubric to grade/assess work
  - Provide students with feedback

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The example of a rubric

Written Communication Skills: Learning Outcome				
	Level of Performance			
Criteria	Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
1. Idea and Content	Writes clearly and with focus; relevant details support the central theme.	Maintains clear focus throughout the paper with sufficient appropriate details indicating awareness, knowledge, and insight.	Partially focuses on topic with minimal or no support of position. Writing is basic, too general for the reader to develop a clear understanding.	Writes with unclear purpose or central theme. Does not clearly define or support position on topic. Uses limited or disconnected details that disrupt the unity of the paper.
2. Organization / Structure	Provides clear introduction and reinforcing conclusion. Orders writing logically with effective transitions, providing sufficient information in the appropriate places.	Supports thesis and purpose through organization and paragraphing; most transitions are appropriate, but sequence of ideas may need improvement. Reiterates introductory elements in conclusion.	Writes with some signs of logical organization; may include abrupt or illogical shifts and ineffective flow of ideas. Makes few transitions between ideas.	Writes with organization that is unclear or inappropriate to the thesis; lacks transitions between ideas.
3. Voice	Writes expressing own personality, with confidence and feeling. Individual, powerful commitment to the topic is obvious, as are strong connections to the audience and to the purpose; evokes strong emotion in the reader.	Writes so that own personality pokes through; confidence and feeling fade in and out. Commitment to the topic is apparent, and connection to the audience and to the topic are appropriate. The writing evokes some emotion in the reader.	Writes without revealing own personality; writing is cautious. Commitment to topic, and connection to the audience and to the purpose are limited. Writing evokes limited emotion in reader.	Writes without personality. Shows lack of commitment to topic, connection to the audience and to the purpose. Evokes no emotion in reader

First task

- Think about a teaching practice at your university
- To what extent it complies with the constructivist orientation?
- What can we do to make it more constructivist oriented?
- The main criteria:
  1. Institutional support – overall organisation of space and time, learning resources, programs and courses, availability of modern technology equipment
  2. Teacher responsibilities – competences, dedication, teaching process (methods, assesment, class climate)

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First task

Strengths – What we already do/have	**Weaknesses – what we don't do, but we could/ have, but not use**
Opportunities – what we partially do/ have, but needs improvement	**Threats – what we cannot do (and why)/ don't have**

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Contemporary university teaching and teachers' and students' competences

Students' competences

- Competences are complex combinations of knowledge, skills, understanding, values, attitudes, and desire, leading to effective action in particular situations
  - dispositions – cognitive and affective-motivational components
  - performance – observable behavior

- General and professional competences – learning outcomes
- learning outcomes have become the international language of education

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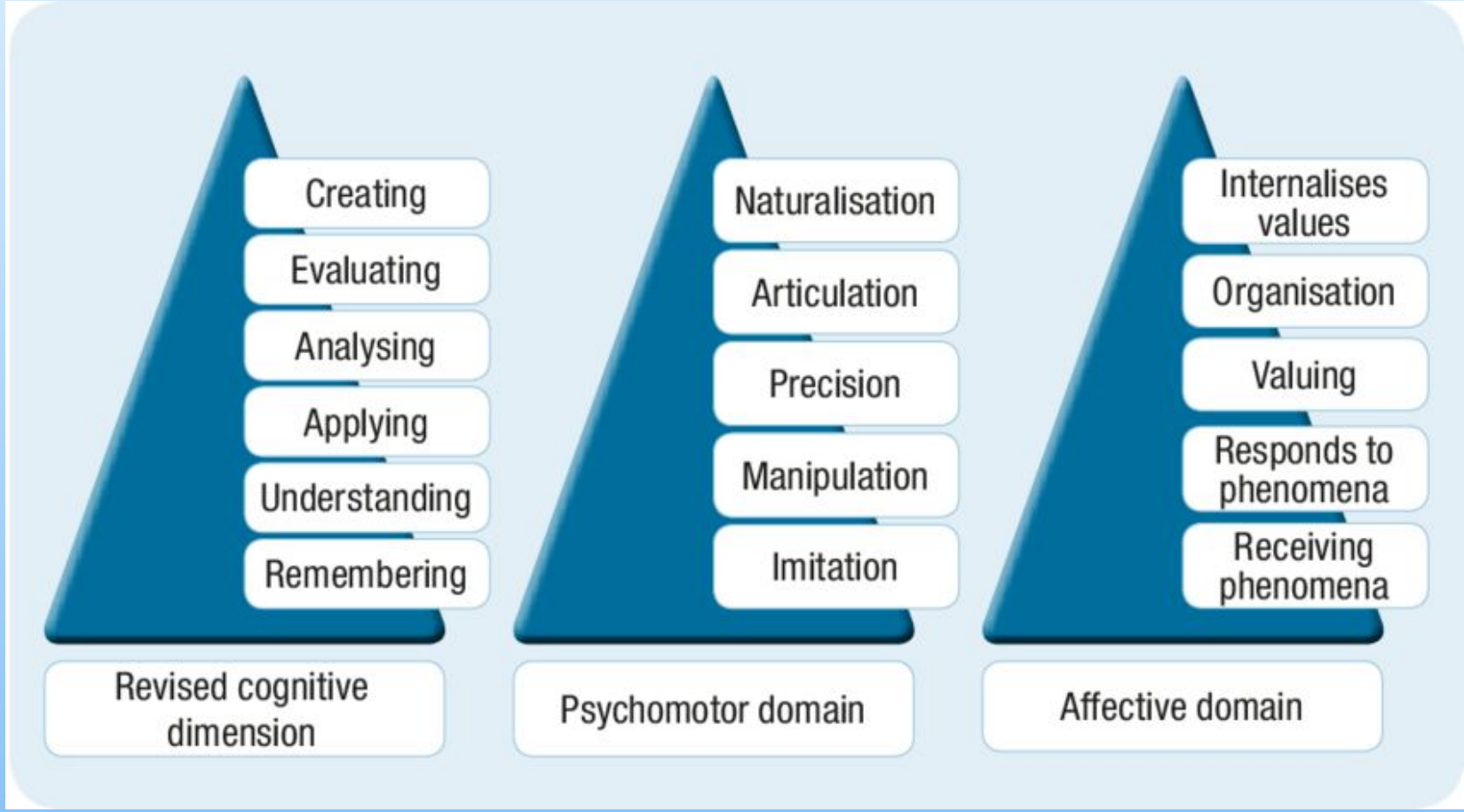
Goals and outcomes in constructivist teaching



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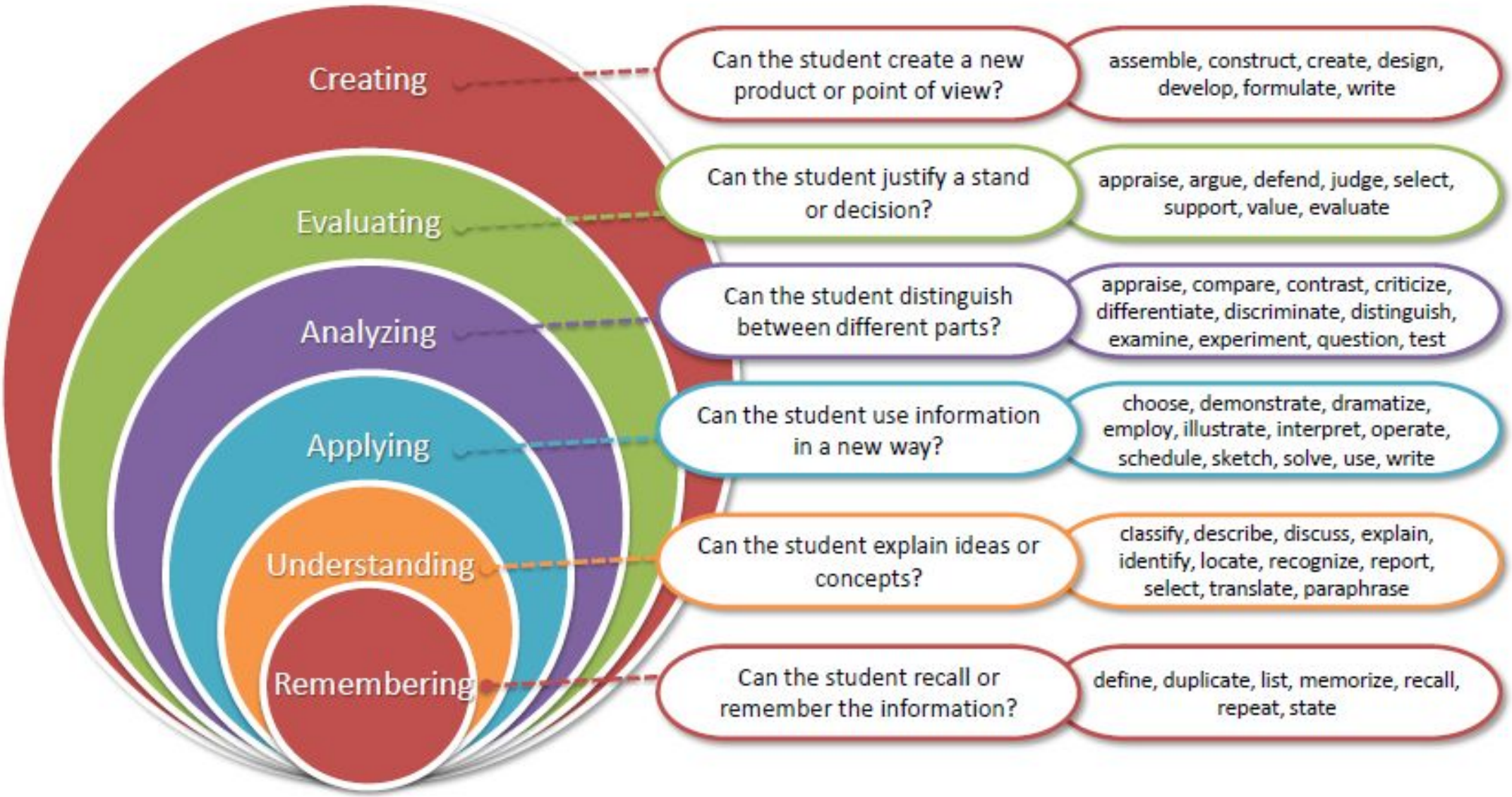
Bloom's Taxonomy (Revised)

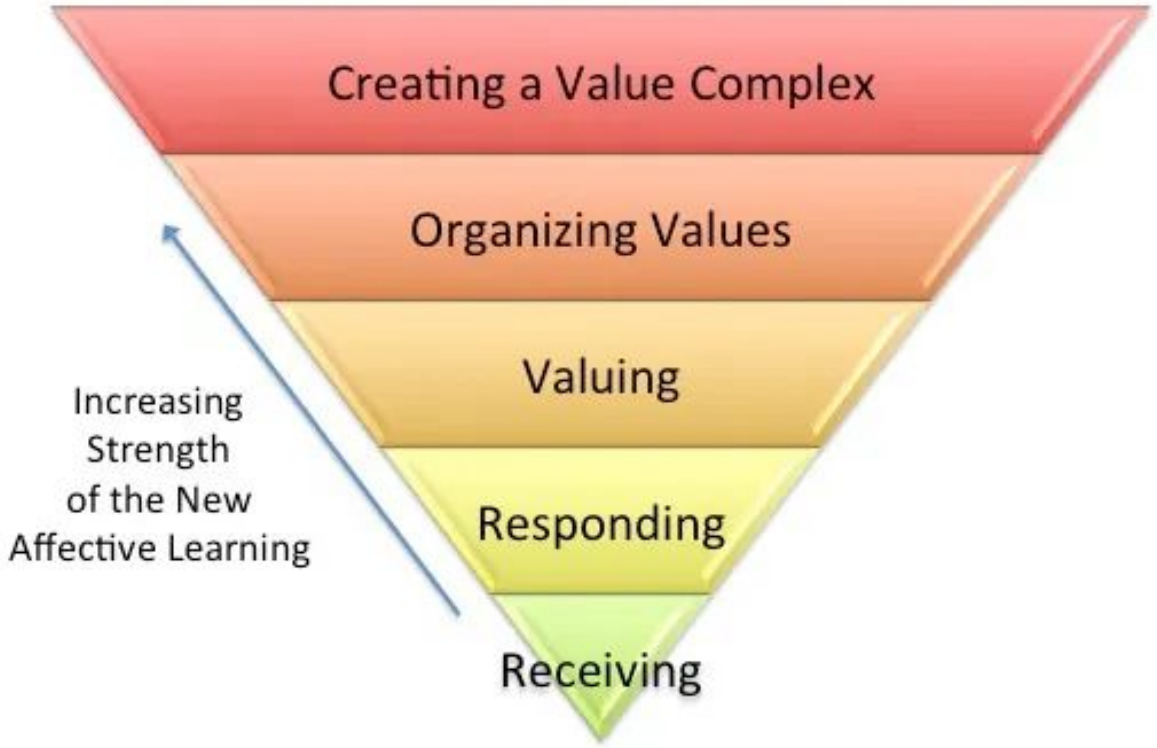


Creative Agni

Instructional Design Junction

Krathwohl's Taxonomy for the Affective Domain

(Krathwohl, Bloom, Masia, 1964)



Inverse Pyramid Presentation Suggestion by Shafali R. Anand

The outcomes example of this workshop

We will be able to

1. **identify** the main aspects of Constructivist theory in university teaching
2. **make a self-evaluation** of our teaching practice from the standpoint of constructivism
3. **define our own** teaching objectives and outcomes in terms of competences
4. **use** evaluation procedures, instruments and useful tools
5. **design** a modern constructivist-based teaching process

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Teachers' competences

- Teachers do work on improvement, but occasionally and not consistently and systematically
- As motivation factors are concerned, they range from
  - altruistic like helping students learn easily,
  - through personal like gaining respect and making class preparation easier , and
  - to financial and material gain.

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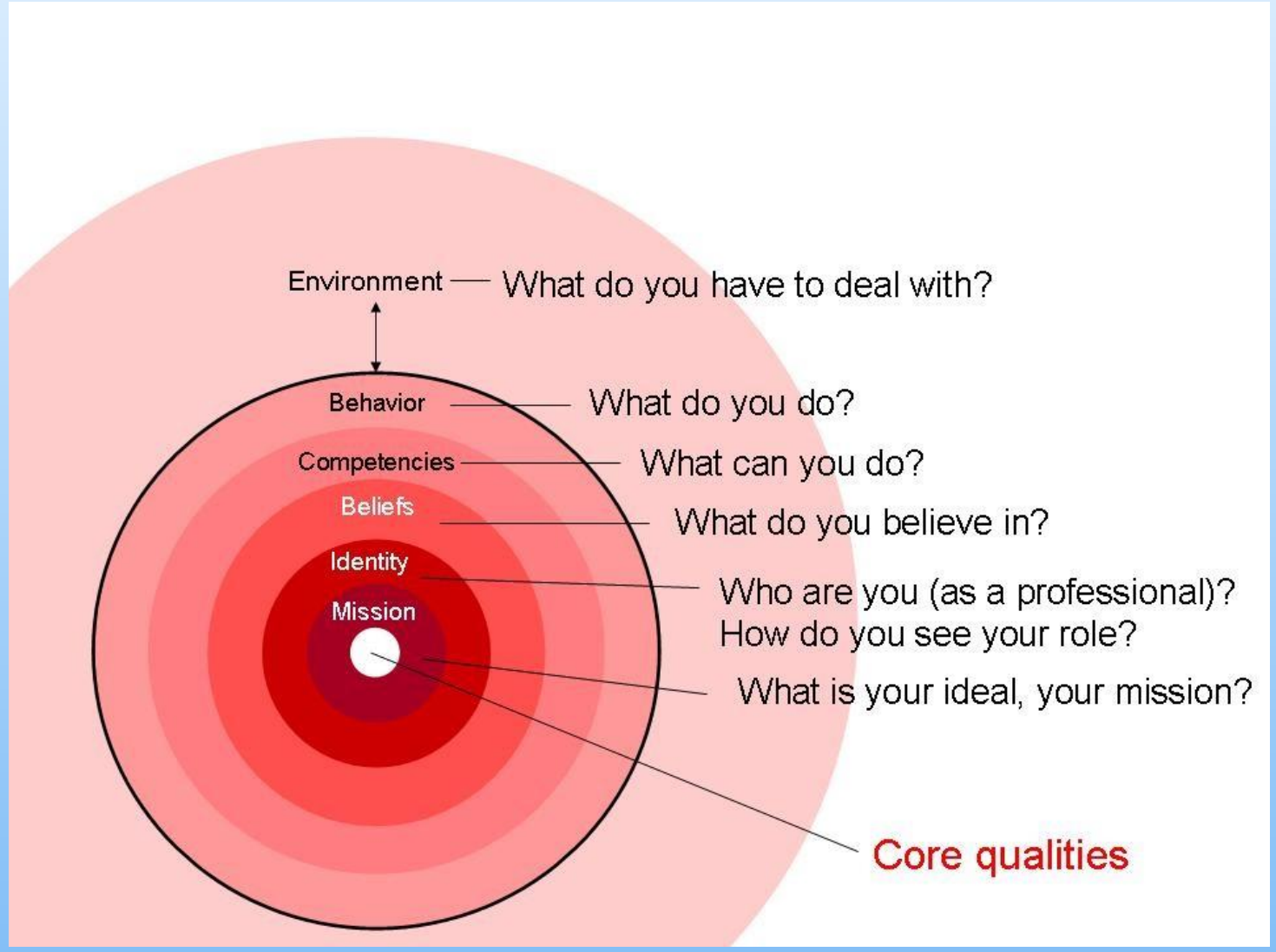
Teachers' competences

Competences	Description
Subject competence	Managing, structuring and restructuring subject knowledge, integrating subject knowledge and pedagogic skills, applying constructive strategies in subject knowledge processing
Pedagogic competencies	Employing a range of teaching and learning strategies, supporting students' autonomous learning, using diverse teaching methods, stimulating students' socio-emotional and moral development, encouraging multicultural respect and understanding, teaching heterogeneous classes, guiding and supporting learners
Integrating theory and practice	Integrating study and practicum, using research-based, learning, using guided teaching practice, learning the acquisition of information and development of knowledge, supporting research orientation, carrying out research
Co-operation and collaboration	…between students, colleagues, parents and schools, working effectively with the local community, with work based training providers and stakeholders, supporting communication skills, using collaborative learning methods, promoting safe, respectful school environment
Quality assurance	Understanding and applying the principles of assessment, contributing to systems of quality assurance, using the results of assessment to evaluate and improve teaching and to improve standards of attainment
Mobility	Supporting students' and teachers' European and international contacts, encouraging student exchange, learning and using European languages, learning and understanding different (European) cultures
Leadership	Supporting leadership competencies so as to develop the institution and the learning environment, collaboration between institutions and communities, regional collaboration, staff development, strategic, pedagogic and economic leadership, encouraging teachers to career development
Continuing and Lifelong Learning	Supporting and preparing students for lifelong learning, understanding the importance of self-development to continue their professional development throughout their careers

The onion model (Korthagen & Vasalos, 2005)



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Second task

- What is your ideal, you mission?
- Who are you as a professional? How do you see your role?
- What do you believe in? What is the best way to teach? What yo
  can use, what you can rely on?
- Which competences would you like to develop and strengthen in
  order to achieve your mission?
- Does asking these questions can help you achieve better quality
  in your teaching?

This brings us to the beginning – the importance of understanding theory behind practice

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Teachers' pedagogical beliefs and didactical strategies

- Strategies that Foster the Adoption of Learning Strategies by Learners
- Strategies to Match the Teaching and Learning Activities to Student Characteristics
- Strategies to Make Students Actively Engaged in the Classroom
- Strategies that Centre on Effective Teacher Instruction
- Strategies that Help to Organize the Teaching Activities
- Strategies to Develop the Positive Classroom Climate

(Shahzad et. al, 2017)

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Thank you for your time and cooperation!

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