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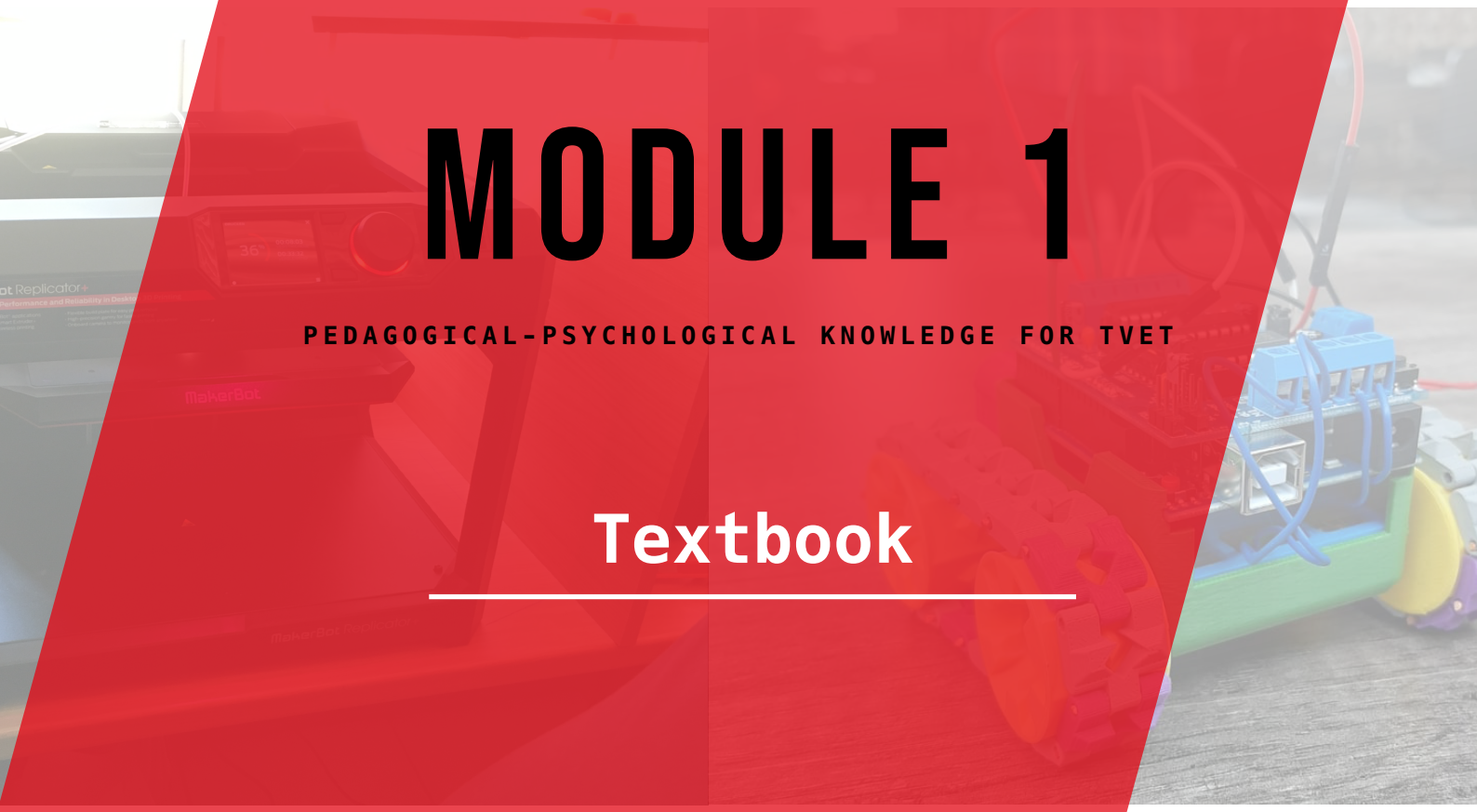

MODULE 1

PEDAGOGICAL-PSYCHOLOGICAL KNOWLEDGE FOR TVET

Textbook

Education is future

MODULAR TRAINING & EDUCATION

IN MECHANICAL & ELECTRICAL ENGINEERING

TRAINME

EDITING

1st Edition

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This study book has been developed within the bilateral programme TRAINME in order to promote in-service lecturers in the fields of mechanical and electrical engineering at South African TVET colleges. The programmee has been designed by the Inter-Company Training Center in Easter Bavaria (ÜBZO) and University of Stuttgart on behalf of the German Federal Ministry of Education and Research and DLR in cooperation with the South African Department of Higher Education (DHET).

Stuttgart, September 2021

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Supported by:

Federal Ministry of Education and Research

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ABOUT THIS BOOK

The Module 1 + 2 of the TRAINME programme pursues an approach to 21st century learning and how you can design lessons that enable your sudents' learning and competence development. This textbook is part of the TRAINME programme Module 1 for TVET Lecturers in Mechanical and Electrical Engineering. Here, you will critically reflect on the main findings of learning theories, theory of interest & motivation, and knowledge. It supports your understanding of the relationship between learning and teaching by questioning:

- Why are teachers (or lecturers) central to students learning and school performance?
- What is quality or teaching?
- How human learning occurs?
- What factors determine learning processes?
- How can I diagnose and assess learning?
- How can I deal with diversity and inclusion?

The accompanying activities support you to apply theory from this textbook to practice.

The terms "educator", "teacher" and "lecturer" are used synonymously in this textbook.

EXPLANATION OF ICONS

Further Reading

Watch a Video

Cross Reference

When you click on the icons or when you scan the QR-Code you will be led to particular files, websites or videos.

Content

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Unit 2: Pedagogical-Psychological Basics

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Kereluik et al. (2013): What Knowledge Is of Most Worth: Teacher Knowledge for 21st Century Learning

21st Century learning & Life Skills: Frame-work

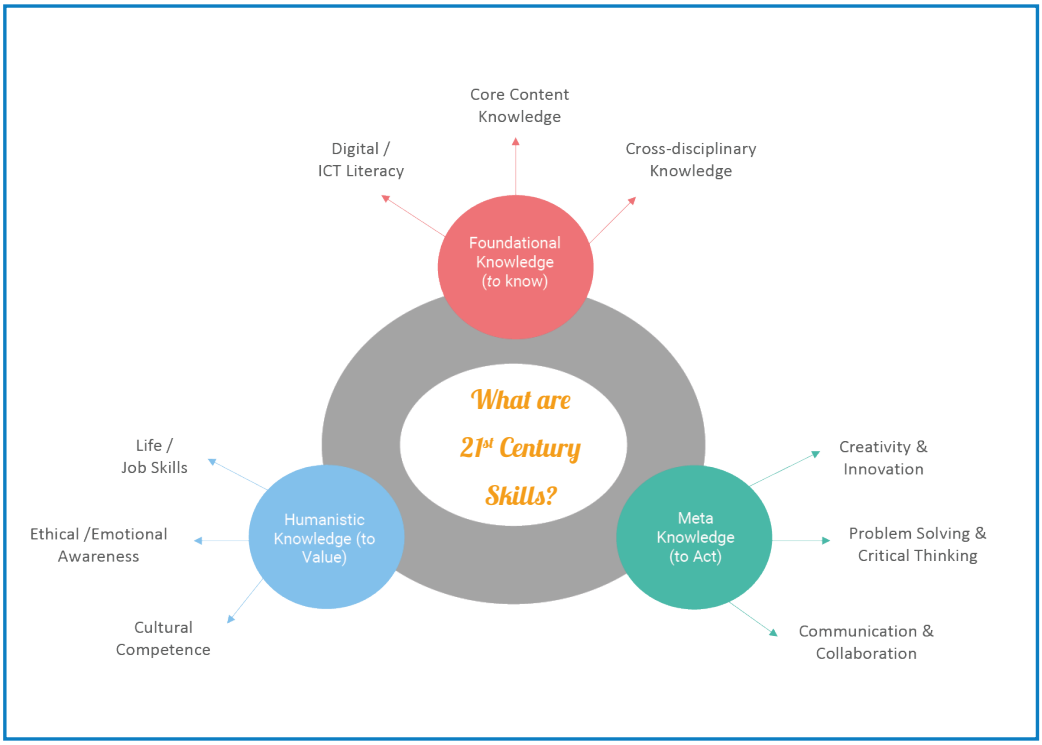


Figure 1| „21st Century Skills“ (Source: Own consruction based on Kereluik et al., 2013)

Chapter 1

Teaching & Learning in TVET Colleges

1.1 4IR & ITS IMPACT ON SKILLS

The fourth industrial revolution will bring extensive changes in the nature of work. While automation is likely to displace workers, new occupations will be created. Emerging occupations are likely to be disproportionately concentrated in the nonroutine and cognitive category, and require skills that cannot be easily automated. Skill demands of the fourth industrial revolution require strengthening learnability – the willingness and ability to learn, unlearn, and relearn – among the current and future workforce. Emerging trends in education systems and trends among firms demand greater learnability. A learning society is needed that promotes learnability - as part of personal competence - at all stages of workforce development (Sungsup Raa et al., 2019). 21st Century skills are essential for any employee in any industry. TVET students need these skills because many of today's employers expect candidates to have them prior to being hired. By mastering 21st Century skills, your students will be better equipped to start and grow in whatever career path they choose. Kereluik et al. (2013) analysed 15 key documents related to 21st-century learning indicating a convergence onto nine key domains - which in turn could be seen as falling under three broad categories (see Figure 1).

> The biggest reason it's important to teach 21st Century skills in TVET is the impact it can have on your students now.
>
> 21st Century skills can help your students be better learners

Dewa et al. (2018): Industry 4.0: A myth or a reality in South Africa?

1.2 TOWARDS ACTION-BASED PRACTICES

Action-based (or work-based) learning may be one concept to develop demanded competencies and skills needed in the 21st century workplace and beyond. The promotion of action-based learning & teaching as a key element in any TVET strategy is high on the political agenda these days (Bahl et al, 2019). Action-based education refers to the integration of knowledge, skills and attitudes as the intended outcomes of learning. Action-based vocational education covers various ideas and practices; i. e. authentic and functional learning - which is supported by active processes of participation based on interest and motivation, knowledge and training in specific skills. Educators use instructional strategies to support students in complex thinking or problem-solving. Assessment supports professional development and focuses on the quality of performances in authentic contexts (De Brujin, 2012.).

Bahl, Dietzen (2019): Work-based Learning as a Pathway to Competence-based Education

Definition of Competence Dimensions

Professional competence is the ability and willingness to properly master tasks and problems based on professional knowledge and skills. This includes the classification of knowledge, and the recognition of system and process correlations.

Methodological competence is understood to mean the ability and willingness to act purposefully, according to plan and independently when dealing with tasks and problems, thereby structuring the work process and selecting, applying and assessing solution strategies independently, appropriately and according to the situation.

Social competence refers to the ability and willingness to live and shape social relationships, to grasp and understand different interests and tensions, and to deal and communicate with others in a rational and responsible manner. Social competence is particularly evident in customer contact and in cooperation with colleagues and superiors.

Personal competence refers to the ability and willingness to act in a self-organized and reflexive manner, to grasp, think through and assess development opportunities, requirements and limitations in diverse contexts and to develop and refine performance. In the professional field, personal competence is reflected in the ability to learn, to reflect and to assume responsibility.

1.2.1 COMPETENCE MODEL FOR TVET

The understanding of competences is based on the concept of formulating competence-based training regulations, concretized in a model (Heyse und Erpenbeck). The model systematically maps all competence requirements for trainees in a particular occupation as well as making them ascertainable. It is presented in a matrix form through which a systematic relationship between professional requirements and competence can be established. The advantage is that with this two-sided approach, the competence model becomes compatible with the definition of the profession. On the "objective" side, it describes the situational requirements in typical work and business processes hence establishing the contextual reference of the occupation. On the "subjective" side, it describes the individual abilities in regards to the competence dimensions of technical, methodological, social and personal competence.

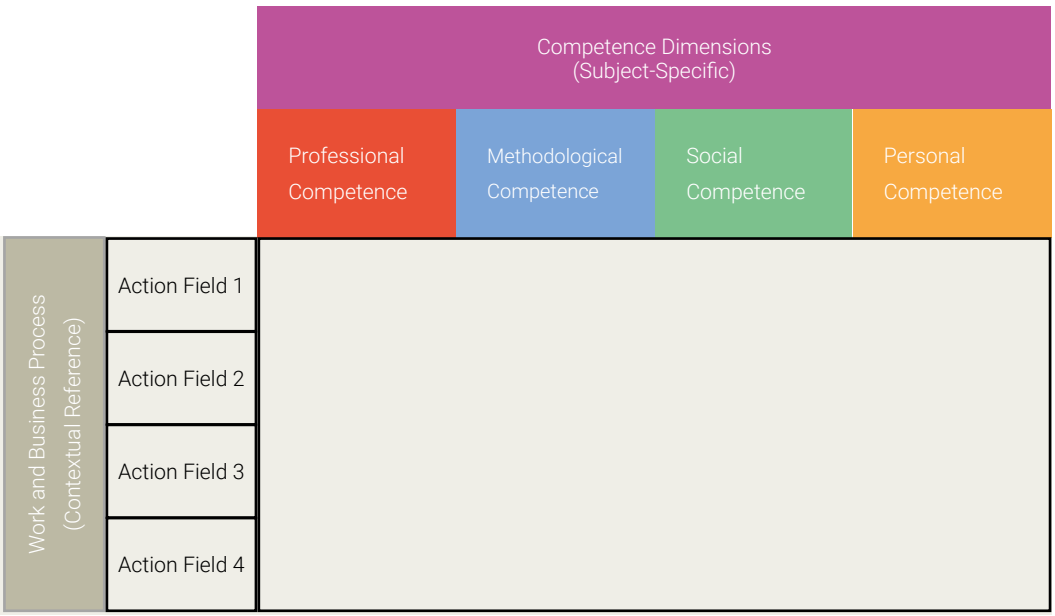


Figure 2| Vocational Action Competence (Source: Own construction based on Heyse und Erpenbeck, 2004)

1.3 THE QUALITY OF TEACHING

Your position as a lecturer is to train students, providing them with the skills, knowledge and attitudes necessary for employment in the labour market and for being a independent human being in society. Quality teaching requires not only knowledge of subject matter, but many educational and didactical skills of how students learn and how to transform them into successful learners. Teaching itself is a process, which deliberately supports learning processes and influences a positive output or manifestation. According to Elmore (1991), teaching "is fundamentally about creating, pedagogical, social and ethical conditions under which students agree to take charge of their learning." Thus, good teaching requires professional knowledge of concepts of learning in the field of educational set-ups. Following Berliner (2005), quality teaching represents the synergy of good and effective teaching. In German-speaking countries, for instance, the basic dimensions approach is particularly prominent to describe teaching quality. Here, teaching quality is considered as consisting of three basic dimensions: **cognitive activation**, **classroom management** and **student support**.

Berliner (2005): The Near Impossibility of Testing for Teacher Quality

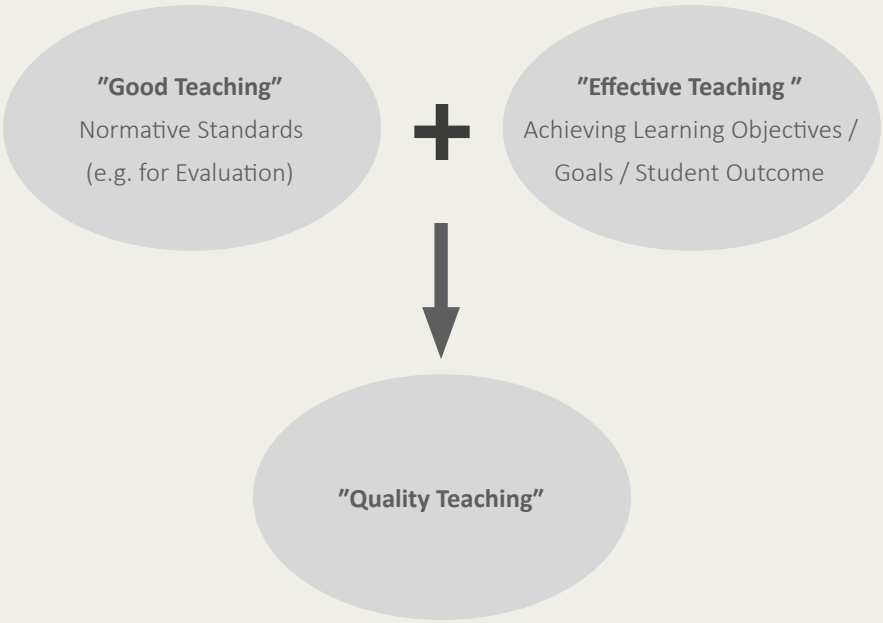


Figure 4| Quality of Teaching (Source: Own construction based on Berliner, 2005)

1.3.1 EFFECTIVE TEACHING

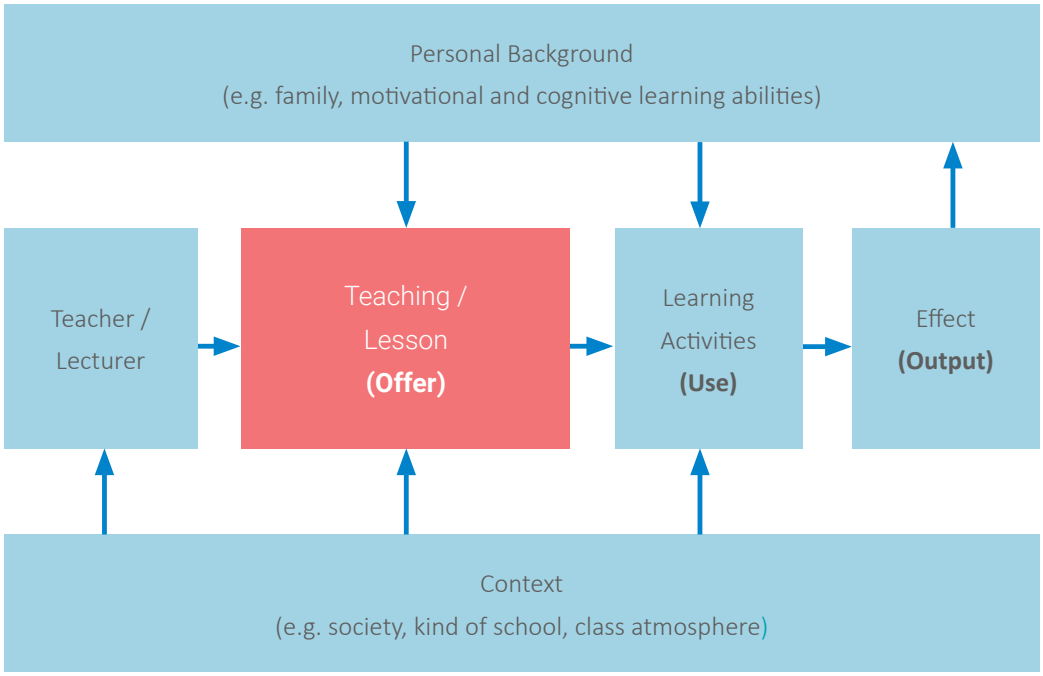


Figure 5| Offer- and Use-Model for Teaching Effectiveness (Source: Own construction based on Helmke, 2012)

International studies prove that requirements for teachers increase constantly. Students alone bring many different prerequisites to the classrooms and teachers have to cope with each one. Your instruction within lessons does only represent an offer, which has to be individually used by students and does not necessarily lead to successful teaching-learning processes or learning outcomes (Helmke, 2009). Instead, the quality of what is offered, as well as what is used are conditioned by various internal and external factors.

Learning activities and learning success depend on numerous factors:

- Most strongly based on the individual learning potential
- The quality and quantity of teaching
- The professionalism and personality of the teacher
- The family learning environment
- Entire impact pattern is embedded in a variety of contexts
- from class context and school context to historical and cultural framework conditions

-> Quality of teaching is not a control variable, but depends on the framework conditions that can be established

1.3.2 EFFECTS OF QUALITY TEACHING

Classroom teaching is the most important area of professional activity for all teachers or lecturers (Kunter, Voss 2013). The quality of classroom teaching is widely accepted as playing a key role for students' learning and competence development (Kuijpers, Houtveen, & Wubbels, 2010; Wadouh, Liu, Sandmann, & Neuhaus, 2014). Therefore, many studies on teaching and teaching effectiveness have been conducted (Wadouh et al., 2014) in order to systematically discover relations of teaching quality features and student outcome variables, e.g. students' achievement (von Kotzebue et al., 2015). Research shows positive effects of the three dimensions cognitive activation, classroom management and student support (including differentiation) on motivational and academic student outcomes via characteristics of student learning activities such depth of processing, time on tasks and intrinsic motivation (see Figure 3).

Blömeke et al. (2016): Relation of Student Achievement to the Quality of Their Teachers and Instructional Quality

Effects of Classroom Teaching?

Classroom teaching should have multiple goals, e.g.:

- competencies in the subject
- interdisciplinary skills (e.g. problem solving, design thinking ...)
- motivation & interest
- emotions
- beliefs and concepts
- extended concept of education (e.g personal responsibility, ability to democracy...)

Parts of the chapter **Effects of Teaching** are translated literally or rephrased from the following source: Grundlagen für einen wirksamen Unterricht, Landesinstitut für Schulentwicklung.

1.3.3 CRITERIA OF GOOD TEACHING

Empirical educational research has made considerable progress in the last decades. Therefore researchers can say today more precisely which characteristics of everyday teaching contribute to permanently high levels of cognitive, methodical, and social learning successes (Meyer, 2006, p. 5). Criteria of good teaching (or instruction) are empirically based characteristics of instruction, which have a high impact on the development of students competencies. Based on empirical results of educational research both in Germany and abroad, Hilbert Meyer (2006) defined ten criteria of good lecturing.

A central question is, what is good teaching which enables these effects?

10 Criteria of Good Teaching

1. Clear structure of a lesson
2. High proportion of time on task
3. Conducive learning environment
4. Content-related clarity
5. Meaningful communication
6. Variety of methods
7. Differentiation
8. Smart practicing
9. Transparency of performance expectations
10. Prepared environment

Parts of the chapter **Criteria of Good Teaching** are translated literally or rephrased from the following source: Meyer, Hilbert (2004): Was ist guter Unterricht? Berlin: Cornelsen Scriptor.

1. CLEAR STRUCTURE OF A LESSON

The learning success depends on process clarity; clearly-defined roles; agreement on rules, rituals, and what is permissible - this means, a high quality of cooperative classroom management – that's what you can see from outside, if you come into the classroom. Second, precise planning of the teaching-learning-process, that's what you can "see", if you interpret the didactical planning of the teacher and the behaviour of the students.

Indicators:

- Clear and precice teacher's language
- Definition of roles
- Consistent adherence to announcements the lecturer made (The lecturer is true to his word)
- Content sequencing
- Tasks are designed clearly and transparently
- Clear marking of the individual lesson steps
- Clear body language and coherent room
- Preparation and in-time provision of teaching / learning material

2. HIGH AMOUNT OF TIME-ON-TASK

The learning success depends significantly on intelligent time management; punctuality; reduction of organizational work in the classroom. Instead, the time is actively used by students. However, it precludes the management of organizational tasks, disciplinary measures, the writing of performance records or the lack of preparation of the lecturer or the students.
Good teaching starts in time and ends, if the teacher says so. In the United States there has been much empirical research about this topic in the last decades by John Caroll and Robert Slavin (Meyer, 2006).

Indicators:

- The majority of students is actively involved and an inner involvement is given
- Minor disturbances such as the door opens, have little or no effect on the focus and concentration of the learners on the current topic
- Tasks are answered autonomously, creatively and content-relatedly detailed
- The students are interested in the topic and do not use their cell phones
- The single and weekly planning follows their own, didactically based rhythm
- Learners are addressed by designing active learning phases with adequate break times
- The lecturer can avoid most or all disciplinary sanctions
- Freedoms granted are only used to successfully complete the given tasks
- The lecturer can phrase questions in a focused and clear manner, leaving students with a reasonable amount of time to answer and keep an eye on the total time
- Preparation and in-time provision of teaching / learning material

3. CLIMATE CONDUCIVE TO LEARNING

The learning success depends on mutual respect; rules that are adhered to; balancing of responsibility; equality and care for one another:

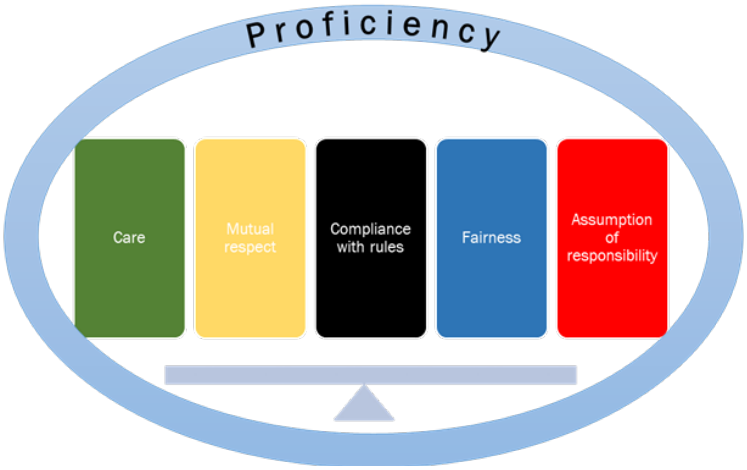


Figure 6| Proficiency Model for Climate Conducive to Learning (Source: Own construction)

These five dimensions evoke contradictions in everyday life. They are unavoidable and irresistible. But they can be brought into a justifiable balance. Creating this justifiable balance reveals the level of proficiency of a lecturer.

Indicators:

- Respectful interaction with each other. This means, e.g. that lecturers do not abuse their power to humiliate learners.
- Learners with better or worse performances are respected as well as everyone else.
- Teaching is characterized by mutual support of learners.
- The language of the students is free from discrimination, insult or other verbal attacks.
- All students are treated equally, but individually by the lecturer.
- All classes are based on democracy and are clearly defined.
- „Every now and then you laugh“

4. CONTENT CLARITY

The learning success depends on well-defined tasks; plausibility of thematic processes; clarity and continuity of retaining that which was taught.

Indicators:

- Monitoring is described as the ability to observe, analyse and reflect one's earning behaviour. In doing so, the lecturer makes interim questions based on observations in order to eliminate learning barriers. Likewise, learners can ask questions if they do not understand something
- Picking up, contrasting and further developing the previous experiences and everyday ideas of the students (preconceptions): Everyday ideas or "intuitive concepts" of the students can be used as a starting point for the clarification of e.g. scientific phenomena, because certain views have stubbornly settled in the thinking of the students and by picking them up the interest can be increased and the learning effect can be strengthened
- Concentrating on the topic - no digression and messing up
- Clean transcripts of the work results

5. MEANINGFUL COMMUNICATION

The learning success depends on participatory planning; thorough discussions on the meaning of tasks and frequent mutual feedback in which students, in exchange with their lecturers, give a personal meaning to the teaching-learning process and its outcomes. This is mainly about the students‘ trust in the professional competence of the lecturer. Learners will be more open to engage in new topics if they trust the lecturer‘s statement and find it useful.
The student‘s confidence in the lecturer‘s judgment is not given automatically. However, it can be positively influenced and promoted by the following aspects.

Indicators:

- The students are concentrated while listening
- They experience learning as pleasurable
- They succeed in bringing in and developing their professional and interdisciplinary interests
- They create links to past lesson topics and transfer it to a new topic
- They share their learning progress and challenges with the lecturer
- They have confidence in the content of the lecturer and engage in new topics
- Personal experiences of the students are included
- There is a (self-)reflection of the learning process
- The own evaluation of the work results takes place with the best of one‘s knowledge and belief
- Critical and complementary questions are asked

6. VARIETY OF INSTRUCTIONAL METHODS

The learning success depends on a multitude of teaching and learning patterns; and balancing of individualized and collective learning, of self-regulated and guided learning. Meyer compiles the following aspects:

(1) When the wealth of available staging techniques is used
(2) When a variety of action patterns are used
(3) If the course forms of the lesson are made variable
(4) And if there is a balance of the basic forms of teaching

Overall, a distinction is made between a „three-level model“:

The three-level system:

- At the highest level, the macro-methodical level, are the basic methodological forms of teaching. These are subdivided into individualized teaching, course-based teaching, cooperative teaching and joint teaching.
- The meso-methodical level contains 3 dimensions of methodical action
  (1) Social forms
  (2) Behavioural patterns
  (3) Progressive forms
- At the most differentiated level, micro-methodology introduces staging techniques of lecturers and students.
- The methodological forms differ with regard to the duration of the implementation.

7. INDIVIDUAL SUPPORT

The learning success depends on being patient with your students and a taking time for each student; through differentiation; through individual learning analyses and plans; particular attention to at-risk students. It is normal to be different. Individual support of students requires unconventional forms, a lot of time, patience and certainly also a lot of experience.
Statistics show that in a class with 25 students, there are most likely students with various disorders who need additional and separate support to master their everyday school life. Without support, college can become traumatic.

Indicators:

- Students have more time to deal with individual topics so they can work at their own pace
- Students work on tasks that correspond to their level
- High-performing students have access to tasks of their own level of difficulty and with the appropriate level of abstraction that enables self-contained, interest-based learning
- Students with learning difficulties receive additional help
- In a cooperative learning environment, students support each other
- The performance differences are transparent as well as the performance expectations by the lecturer
- Students are heavily involved in decisions that affect school work
- Participation has a motivating effect, as a part of the responsibility is given to the students and they can influence their development
- Students with learning disabilities are encouraged to reflect on their learning
- There are co-operations with various extracurricular institutions like companies

8. INTELLIGENT EXERCISES

The learning success depends on making students aware of learning strategies; precise assignments for exercises; and concerted support.

The state of the classrooms reflects the social wealth and poverty, the model of the college and of course the imagination and competence of the lecturers and students.
The last criterion is all about the condition of a classroom, its preparation and use. This results in creating a free and attractive classroom which balances between freedom and tidiness because the classroom is the materialized curriculum. Specifically, this means: Classrooms are prepared learning environments, if they...

- are in good order,
- have a functional facility
- give lecturers and students the feeling that this is their own space and property. Meyer sees in a successful interior design positive effects on the competence development of students and on the satisfaction of lecturers in the profession.

9. CLEAR DESCRIPTION OF GOALS TO BE ACHIEVED

The learning success depends on constructing learning situations fitted to the curricula and the capabilities of the students; punctual feedback on learning progress.

Indicators:

- The lecturer discusses his performance expectations with his students
- The feedback of performance checks are given close to the date of evaluation
- The feedback is phrased in understandable and traceable sentences for the students
- Students are permanently aware of their current tasks during the lesson. If there is a lack of clarity students can ask questions
- Students are informed about the level of difficulty of the assigned tasks or they work with learning material that is designed to self-estimate the level of difficulty and choose a suitable task by option
- A variety of methods for assessment purposes are used and it is also explained which method is good for which purpose
- Performance checks and assessments will be announced in advance
- Students propose their suggestions for performance assessment

10. WELL-PREPARED LEARNING ENVIRONMENT

The learning success depends on well-organized, functional facilities; useable learning tools.

Practicing generally has three goals:
(1) Exercising routines or sequences („automation“)
(2) To deepen learning content („quality improvement“)
(3) To get to know the use of the learned in other areas („transfer“)

Indicators:

- Short repeated practice is sufficient in addition to the lesson phases
- Attention is focused on the exercise, unwanted disturbances are limited. When they occur, they are resolved consistently and discreetly
- The students have understood the exercise and know-how to deal with missing information
- Differentiated exercises are offered
- Freely accessible learning material is self-explanatory
- The exercises are based on the level of achievement of the students
- Materials allow success control
- Lecturers supervise students while practicing and give differentiated feedback
- Students‘ achievements are appreciated and positively encouraged
- The students have “good experiences and a sense of achievement“
- Learning strategies are developed and used as needed

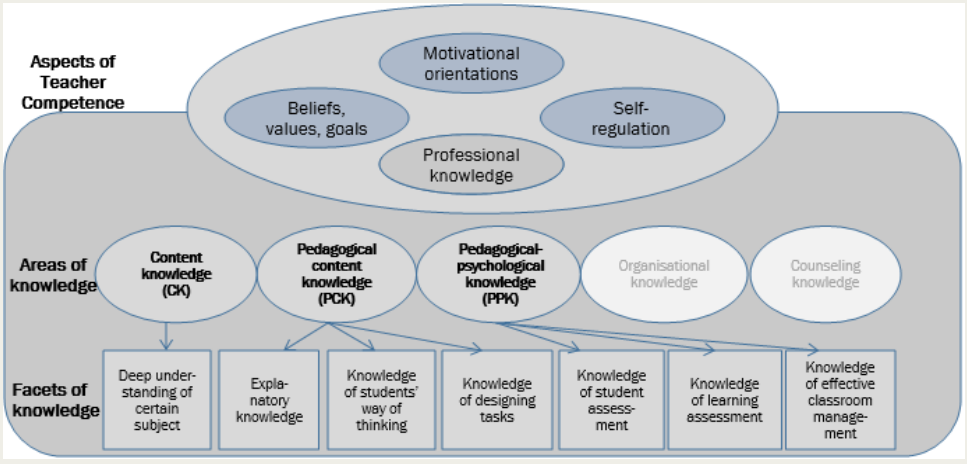
1.4 TEACHER PROFESSIONALISM

You, as a teacher, are central to students learning and school performance. But a central question is, what is good teaching and how can you design lessons that enable these effects?

Teacher professionalism is a broad concept comprising several dimensions. A teacher requires not only knowledge of subject matter, but many educational and didactical skills of how students learn and how to transform them into successful learners. In other words, teacher professionalism is defined as "the knowledge, skills, and practices that teachers must have in order to be effective educators" (Talis, 2013). When we speak about teachers' professional knowledge it is valuable to consider Shulman's (1986) domains of teacher knowledge. According to Shulman, there are four main domains of teacher knowledge that are necessary to understand in order to teach:

- pedagogical knowledge (knowledge about classroom management)
- pedagogical content knowledge (knowledge about the transfer of content knowledge)
- content knowledge (knowledge concerning subject matter contents)
- curricular knowledge (knowledge about curriculum, school and classroom organisation)

Shulman (1986): Those Who Understand: Knowledge Growth in Teaching



Baumert, Kunter (2013): The COACTIV Model of teacher's professional competence

Figure 7| COACTIV Model (Source: Own Construction based on Baumert, Kunter 2013)

The theoretical model of teacher's competence COACTIV (Baumert, Kunter, 2013), which is particularly based on the ideas of Shulman, comprises the three areas of knowledge (content knowledge, pedagogical content knowledge, pedagogical psychological knowledge) but integrates further aspects like beliefs, motivation and self-regulation of teachers' in order to create effective teaching and learning situations. The content of Modules 1 + 2 of the TRAINME programme is based on the structure of the COACTIV-Model.

NOTES

Chapter 1

Theories of Learning

1.1 INTRODUCTION

Within the last 100 years in psychology various theories of learning which differ in their understanding of learning have tried to explain and summarize the way we learn. Theories serve as bridges between research and educational practices, and as tools to organize and translate research findings into recommendations for educational practices. There is not the one only learning theory, but according to the behaviour and motivation, cognitive skills one theory corresponds more than another and has important implication for a teaching-learning

History of Learning Theories

The scientific study of learning had its beginning in writings such as Plato and Aristotle. Within the last 100 years three main theories of learning have been developed:

- behaviourism
- cognitivism
- constructivsm

NEUROSCIENCE SCIENCE OF LEARNING

Learning occurs via changes in the strength of neuronal connections at synapses.
As synapses change when they transmit signals, learning occurs whenever the brain processes information (Spitzer, 2006, p. 47). For detailed information consult Byrnes, 2001; Jensen, 2005; Rose, 1998; Wolfe, 2001.

PSYCHOLOGICAL STUDY OF LEARNING

In educational psychology, we define observational learning as learning not by our own experiences, but by watching someone else behave and noting the consequences of that behaviour. Common ways to assess learning include direct observations, written and oral responses, ratings by others, and self-reports.

Figure 8| Research fields of learning

1.2 THE NATURE OF LEARNING

With an overview of main arguments of the learning theories, we can understand learning as the way how we change or modify our behaviour. In a broader sense, learning comprises the modification of existing knowledge, skills, strategies, beliefs, attitudes, and behaviours. Learning situations are most natural and common in life and every one of us is learning although they may not necessarily be aware of it. An individual starts learning immediately after their birth and at various stages in humans cognitive development, the ability of learning and reasoning is different. At a simple level, children learn to solve 2+2 =4, to recognize 'y' in the word daddy, to tie their shoes, ride a bicycle and to play with other children. At a more complex level, students learn to solve long-division problems, write term papers and work cooperatively on a group project (Schunk et al. p. 2).

You as a lecturer need to consider how instructions affect your students' behaviour and thinking

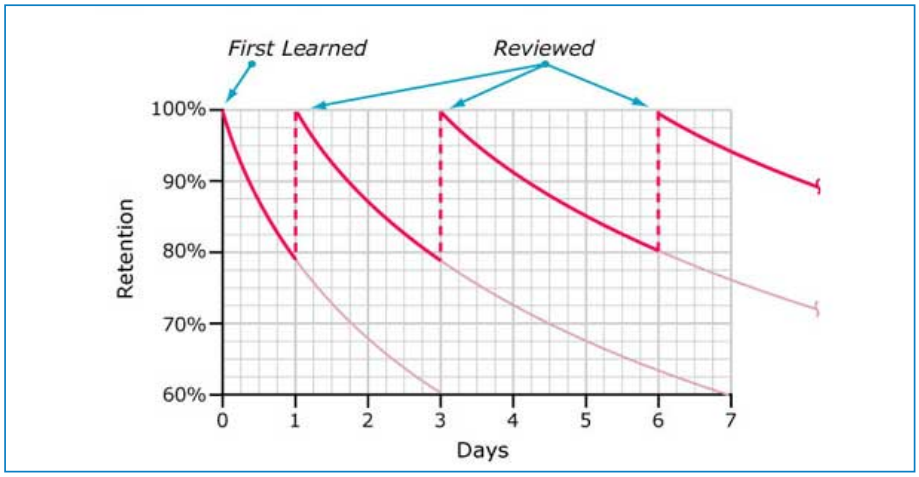


Figure 9| Forgetting Curve (Source: Own construction based on Ebbinghaus, 1885)

The Forgetting Curve

Instead learning may involve mastering abstract principles, understanding proofs, remembering factual information, acquiring methods, techniques and approaches, recognition, reasoning, debating ideas, or developing behaviour appropriate to specific situations; it is about change (Fry et al. 2009, p. 8). Furthermore, learning consistency depends on the learning content. Motor skills like the example of riding a bike can stay unlimited, whereas cognitive skills like content knowledge, passwords are less persistent. How we learn cognitive, linguistic, motor, and social skills, can take many forms. Some theorists argue that behaviour is acquired through associations between stimuli and responses, whereas for others learning occurs through internal processing of information. Many also say that learners construct their knowledge and beliefs; they don't automatically adopt what somebody tells them. Not everyone learns in the same way. Individuals learn faster or slower, easier or harder or more or less sustainable. Why humans learn differently depends on many factors which influence learning processes and results.

Learning is not a single thing ...

According to Wilson and Peterson (2006), a teacher "may valiantly try to teach mathematics to a student, but whether the student learns something depends on many factors within and outside the teacher's control" (Wilson, Peterson, 2006, p. 9) - since students bring different backgrounds and expectations to learning (see Helmke's Offer-Use-Model, 2007).

In the teaching-learning research, there is a consensus that the performance of students is motivated by multiple determinants. In addition to general intelligence, personal motivation, interest and self-concept regarding ability, it is also assumed that the subjective theories of learners (e. g. epistemological beliefs, opinions about learning, and subjective theories concerning the subject) play a crucial role in learning processes. All theories about learning, knowledge, motivation, interest, environment and so on are relevant in their own way for the work of teachers in order to achieve the optimal learning goal. However, you as a teacher have to question appropriate methodology. Are the classroom and school conditions conducive to learning? Are the student's parents supportive? Is there enough time to digest the ideas and practice new skills? Is there any peer pressure? (Wilson, Peterson, 2006, p. 9). The list goes on - but this textbook will support your understanding of the relationship between learning and teaching and how you can support sustainable learning processes.

Overview of Learning Theories

Features of Learning Processes

analytic	intuitive/imaginative
conscious	unconscious
intentional	incidental
instructional	experienced
individual	social
hard	effortless
meaningful	unrational
receptive	active
extrinsic	intrinsic
desirable	undesirable
contextual	simulated

Figure 10| Features of Learning Processes

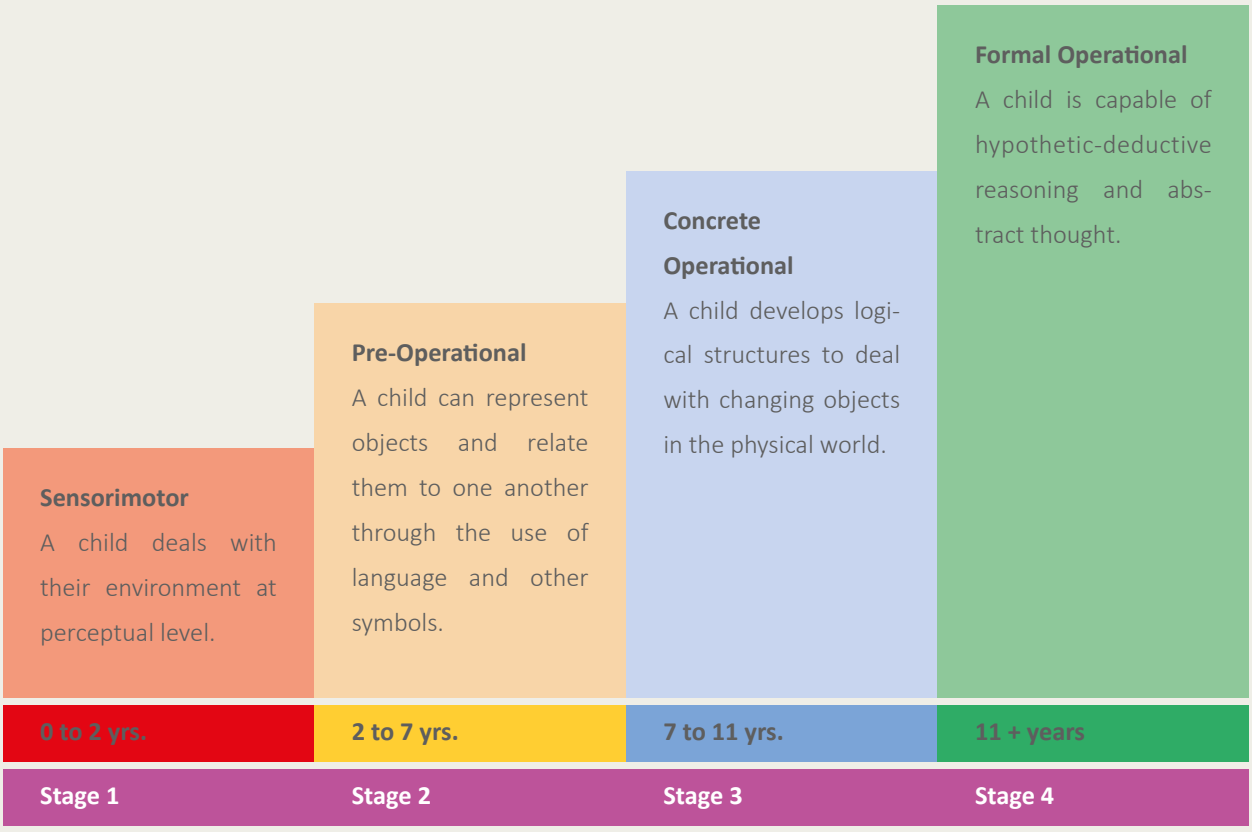


Figure 11| Stages of Cognitive Development (Source: Own construction)

1.1 BEHAVIOURISM

Behaviourism dominated the study of psychology of learning in the first half of the 20th century (Schunk, 2012, p. 21). Behavioural theories explain learning as the change in a subject's observable behaviour or behaviour potential to a given situation. The ehaviour change cannot be explained on the basis of the subject's native response, tendencies, maturation, or temporary states such as fatigue, drunkenness, drives, and so on (Bower & Hilgard, 1981, p. 17). The inner activities of humans and especially those of the brain become a *black box*.
Humans are completely controllable by the environment. A person learns by reacting to certain stimuli. As a result of certain stimuli, positive and negative reactions can occur. While the wanted positive reactions can be strengthened by rewards, unwanted or negative reactions are reduced by being unrewarded or punished. Reward and punishment or avoidance are therefore central to learning success. This explanation is extended by 'operant conditioning' or 'instrumental learning'. Behaviour depends very much on the consequences that follow. These consequences are the starting point for the future behaviour.

Figure 12| Stimulus-Response Chain (Source: Own construction)

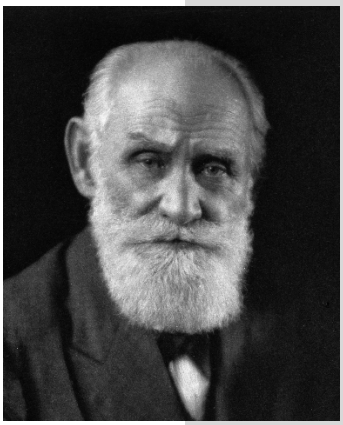
The figure shows a stimulus-response chain that serves as the basis of learning. A person learns by reacting to certain stimuli. As a result of certain stimuli, positive and negative reactions can occur. While the wanted positive reactions can be strengthened by rewards, unwanted or negative reactions are reduced by being unrewarded or punished. Reward and punishment, or avoidance are therefore central to learning success. This explanation is extended by 'operant conditioning' or 'instrumental learning'. Behaviour depends very much on the consequences that follow. These consequences are the starting point for the coming behaviour.

1.1.1 LEARNING CONCEPTS IN BEHAVIOURISM

Behaviourism differentiates between two core learning concepts

1) Learning as a result of classical conditioning and
2) Learning as a result of instrumental or operant conditioning (Skinner)

CLASSICAL CONDITIONING



The concept of classical conditioning was developed by Russian physiologist, Ivan Petrovic Pavlov (1849- 1936).

The key element in classical conditioning is association. It means that if two stimuli are repeated and experienced together, they will become associated.

Figure 13| Ivan Petrovic Pavlov (Source: by Unknown author is licensed under CC BY 4.0; URL: https://wordpress.org/openverse/photos/a53d1521-4eaa-47ab-a848-c243e0a61385)

EXAMPLE FROM EVERYDAY SCHOOL LIFE

If a student frequently encounters unpleasant stimuli in Mathematics class such as unfriendly teacher, difficult questions, and a lot of homework, he may learn to dislike Mathematics.

PAVLOV'S EXPERIMENTS

Pavlov discovered classical conditioning almost by accident. Originally, he wanted to study the role of salivation in digestion. He measured how much saliva dogs produce when given meat. After a few days in the experiment, Pavlov noticed that the dogs in his laboratory started salivating when the lab attendant entered the room with the meat dish, before the meat was placed in their mouth. This aroused Pavlov's curiosity and he pursued the issue with more experiments. For example, he rang a bell just before presenting his dogs with food. The dogs began to salivate as soon as they heard the bell at any time right before being fed (Study Notes For Child Pedagogy CTET).

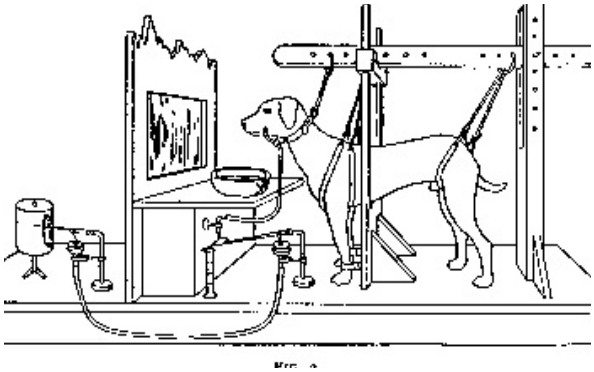


Figure 15| Pavlovs Experiment (Source: Yerkes, R. M., & Morgulis, S. is licensed under CC0 1.0; URL: https://wordpress.org/openverse/photos/669f4cd1-9898-42e7-ab18-2e998ef558d7)

Conclusion

A native stimulus (salivating at the sight of a piece of meat) is associated with a neutral stimulus (bell). That´s possible because the bell is always being rung whenever the dog gets to see a piece of meat. The salivation soon takes place on the neutral stimulus (bell).

US	unconditioned stimulus
UR	unconditioned reaction: reaction triggered by a US
NS	neutral stimulus: originally neutral stimulus to which no specific reaction follows
OR	Orientation Reaction: Reaction following NS
CS	conditioned stimulus: an initially neutral stimulus, which has become a learned stimulus through repeated coupling with a US.
CR	conditioned response: a reaction learned by the conditioning process that is triggered by the CS

Figure 14| Important Abbreviations and their Meanings in Behaviourism (Source: Own construction)

OPERANT CONDITIONING

Operant or instrumental conditioning is a form of learning in which a stimulus and a reinforcer are used by an experiment to generate a specific response. The goal of, for instance Skinner's (1904 - 1990) operant conditioning is to achieve behaviour shaping. The learner is rewarded for following a particular action. Consequences of behaviour lead to changes in the probability that the behaviour will occur. Behaviour that brings about a satisfying effect (reinforcement) is apt to be performed again, whereas behaviour that brings about negative effect (punishment) is apt to be suppressed.

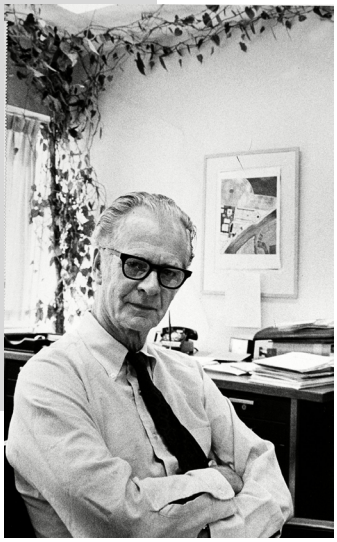


Figure 16| Burrhus Frederic Skinner(Source: Source: Encyclopædia Britannica, URL: https://www.britannica.com/biography/B-F-Skinner#/media/1/547663/109857)

EXAMPLE FROM EVERYDAY SCHOOL LIFE

A student interrupts the teacher during a lesson with funny comments. The other students laugh at them reaffirming. The teacher ignores the comments and continues with the lesson. Since the class laughed and the teacher did nothing against the offense, the student experiences the behaviour as positive. On the one hand, the behaviour is positively reinforced by the class and, on the other hand, there is no consequence or punishment by the teacher. As a result, this behaviour will presumably continue in the future. The student will probably interrupt the teacher in order to come back into the 'enjoyment' (satisfier) of the 'reinforcement' (recognition of the class). However, if the other students did not laugh and ignore or not positively reinforce each student's behaviour, it would most likely lead to a cessation of the behaviour, as the teacher did not react.

SKINNERS EXPERIMENT

Rat 1 always gets food when it presses the lever. Rat 2 can turn off the electricity flowing through the bottom grid (see graph) by pressing the lever, and rat 3 gets an electric shock when it presses the lever.

After several attempts, rat 1 and rat 2 pressed the lever again and again, while rat 3 did not press the lever.

The rats had learned to repeat behaviour with positive consequences (getting food, switching off electricity) and to avoid negative consequences (electric shock). Skinner called this learning effect: ‚learning through reinforcement' or ‚learning by success': the behaviour (switching off electricity from the cage floor, for example) satisfies the need and reinforces the behaviour.

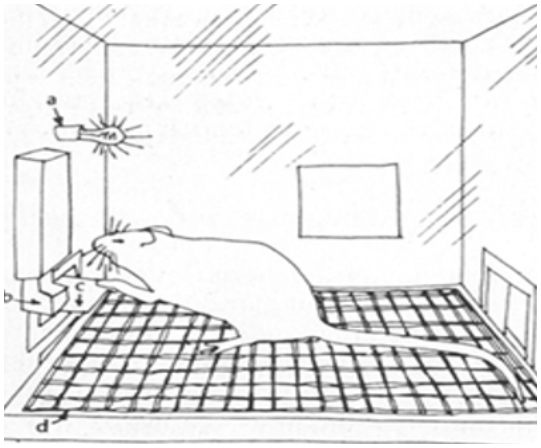


Figure 17| Skinners Experiment (Source: Lefrancois, Guy R., 1994, p. 36)

Conclusion

In the experiment with rats, it can be postulated that learning happens by trial and error. For example, they only get food when they learn how to use a lever. Learning is positively enhanced. The first time the rat pressed the lever, it will keep pressing it because it is rewarded for it. Another rat can improve their situation with a negative reinforcer. Negative reinforcers generally turn off unpleasant events. In this case, the electricity at the bottom plate can be switched off. A deletion occurs when positive reinforcement is left out or, in the case of the third rat, a penalty for operating the lever.

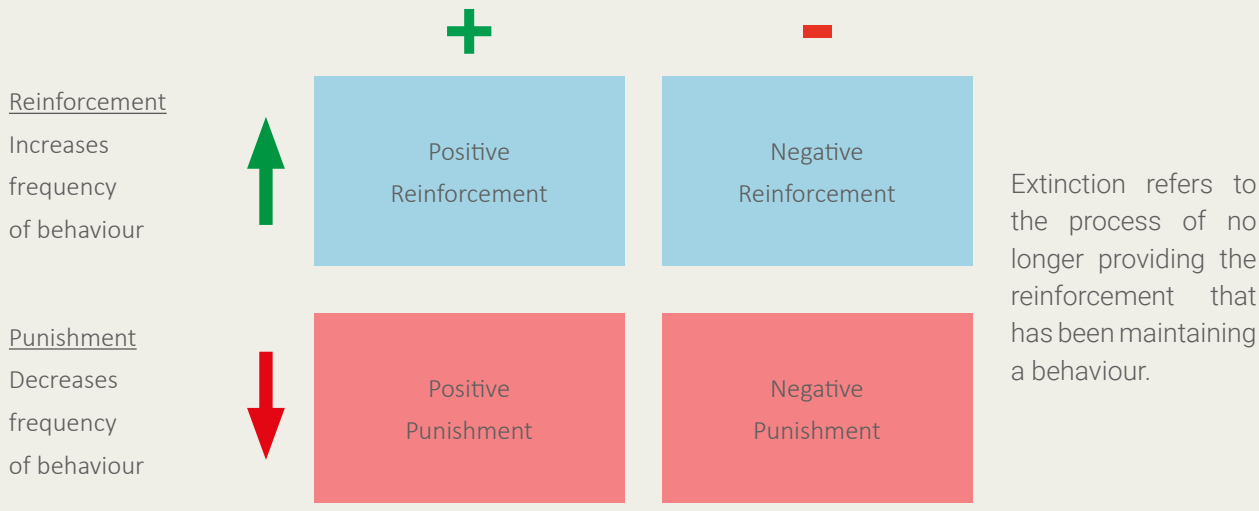


Figure 18| Operant Conditioning Procedures (Source: Own construction)

1.1.2 BEHAVIOURISM IN THE CLASSROOM

The teacher´s measurement is the key to the learning success of the students. They set appropriate incentives (stimulus) and give feedback on the reactions of the students (conditioning). The teacher determines which behaviour is **welcome** (correct) and which is considered **unwanted** (false). The teacher has the power of reward and punishment (for example, notes, or detention). On the basis of the above-mentioned conditioning stimuli, the teacher completely influences the learning of the students. In this way, with their positive or negative evaluation or feedback, the teacher intervenes decisively in the students learning process. What happens inside the learner does not need to be analyzed by the teacher, because these areas belong, so to speak, to the **black box.** Only the result (learning success) should be paid attention to. If this is not the case, this may be due to missing or wrong incentives. In everyday school, life aspects of operant conditioning are predominantly used.
The **learner** takes a **passive part**. He reacts to external stimuli. The learning success is externally controllable and depends, if at all, only to a very limited extent on the internal activity of the person.

1.2 COGNITIVISM

In psychology, cognitivism is a theoretical framework for understanding the mind as a human information processor. The movement had gained credence in the 1950s and was a response to behaviourism, which cognitivists said neglected to explain cognition. According to cognitivism, the acquisition of knowledge is recognized as a personal achievement (learning) of the observer, and does not degenerate into the inner black box. The key element of this theory is perception, which represents an active achievement in the processing of information. Mainly, cognitivism appears in the definition of competence in the curricula of the countries. Here, various levels of mental processing are defined as learning objectives. Viewed more generally, humans store information from all areas of life as cognitions or insights (Schmitt & Plassmann, 2005).

1.2.1 UNDERSTANDING OF LEARNING

According to the theory of cognitivism, learning refers to the acquisition, processing and storage of information. The focus is on information processing, tied to the right methods and problems that support this process. In this way, a key role is assigned to the learning offer itself, the preparation of information, the problem definition and the methodology. These aspects influence the learning process to a great extent. The focus is therefore on problems, in the solution of which the learner gains knowledge and thus increases their knowledge.
Following cognitions broach the issue of inner processes:

- The processed information or findings can be stored in memory and, if necessary, retrieved again from it.
- They can be linked together to create new cognitions.
- They can be compared with each other.
- Matches or discrepancies can be found.

1.2.2 LEARNING MODELS

Cognitivism covers a wide range of ideas. The widely accepted theories of cognitivism in education are the Bandura's Social Learning Theory and Piaget's theory of Cognitive Development.

SOCIAL LEARNING THEORY

Albert Bandura's Social Learning Theory, also known as Observational Learning or Modeling, describes learning processes based on the behavioural observation of role models (models), or interacting with them. Bandura caries out his theory in four different processes based on two phases:

1) Phase of Acquisition (competence, acquisition)

Attention

The learner focuses their attention on the important components of the model's behaviour. On the one hand, the attention processes depend on the characteristics of the model (is it sympathetic, is the action clear, is the action successful?), and on the other hand on the traits of the observer (his skills, expectations and level of excitement).

Retention

The information is coded by the observer both sensorially and symbolically. To retain this information, it is repeated either cognitively or in action. The symbolic as well as the motor imitation of the learned is conducive to remembering it.

2) Execution Phase (performance)

Motor Reproduction

The learner remembers the observed behaviour and imitates the seemingly beneficial behaviours. How well the imitation succeeds depends on one's abilities. The practice of the model behaviour is also carried out by self-observation; there are also corrections that depend on feedback from the environment.

Reinforcement

Whether a behaviour is imitated or even considered depends on the motivation. This plays a role in both the acquisition and execution phase. Only if a person assumes that behaviour benefits, will they mimic their behaviour. Thus, motivation is closely related to the reinforcement of behaviour. There are four different types of reinforcement according to Bandura:
External Reinforcement: The behaviour is rewarded or a punishment is avoided.
Substitute reinforcement: The model was rewarded for its behaviour (had success).
Direct self-reinforcement: The observing person rewards themselves.
Deputy self-reinforcement: The model rewards itself for its behaviour.
(Bandura, 1971; Schmitt & Plassmann, 2005).

COGNITIVE DEVELOPMENT

Figure 19| Jean Piaget (Source: Wikimedia Common; URL: https://commons.wikimedia.org/wiki/Category:-Jean_Piaget#/media/File:Jean_Piaget_in_Ann_Arbor.png

The basis of Piaget's (1896-1980) theory of cognitive development is the assumption of two innate tendencies. Piaget assumes that humans adapt to their environment (adaptation). To achieve this adaptation, either the environment can be adapted to one's own needs (assimilation) or one's own behaviour to the environment (accommodation). The second tendency is to organize, that is, to classify one's own behaviour into coherent systems, so humans can integrate two behavioural patterns. A baby can first look at an object or reach for it, later it can integrate these two processes into one and do both at the same time. According to Piaget, people seek balance through adaptation and assimilation. By the basic tendencies, according to Piaget's theory, child development advances in stages (Piaget, 1964, p. 176-186; Piaget, 2001).

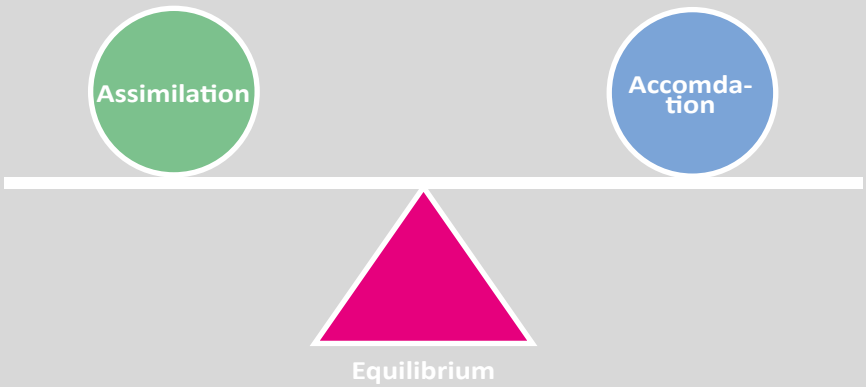


Figure 20| Cognitive Equilibrium (Source: Own construction)

1.2.3 COGNITIVISM IN THE CLASSROOM

The **teacher** plays a **key role** in the didactical preparation of problems. They select or provide information, present problems, and help learners to edit the information. They have the primacy of knowledge transfer.

The **learner** gets an **active role** that goes beyond the pure response to stimuli. He learns independently by taking in information, processing it and developing solutions based on given problems. Being able to solve problems makes the individual´s position in the learning process more important.

1.3 CONSTRUCTIVISM

Contrary to theories of behaviourism and cognitivism, constructivism does not focus on the processing of information, but on the individual perception and interpretation of the 'experienced'. Every human being constructs their own reality through their filtered perception of the environment in the brain itself. Knowledge is neither injected into the human being nor controlled from the outside but constructed by the human being himself. The process extends from perception, over processing, to interpretatio, which means the construction of reality. The constructed reality results from personal experiences, living circumstances and immanent systems in which a person lives. The existence of an objective external world is recognized, but one has no direct access to it. Consequently, Constructivism does not have a universally valid reality but contains an infinite number of multiple perspectives, which can or may not be shared inter-subjectively and don´t imply to become an objective *reality manifest*.

Excursus

AUTOPOIESIS

The term „autopoiesis" goes back to Maturana and Varela, and initially refers to biological cells. Cells, according to biologists, constantly produce the components they need to maintain their internal organization at a molecular level. Like cells, humans act in analogy to cells as living systems that also function autopoietically. Living systems function autopoietically, i.e. they are: Self-referential, Self-organizing and Self-preserving. According to S. J. Schmidt, this means: Living systems are deformed by the environment and by themselves; however, they can only be modeled and not controlled by external events (Schmidt, 1987, p.23). Foerster distinguishes a living system fundamentally from a 'trivial machine' (v. Foerster 1996, p.247), which is incapable of disobedience. Schmidt formulates the basic consensus, that is the basis in Constructivism as follows: By saying farewell to absolute concepts of truth and reality, transforming objectivity into inter-subjectivity and binding all knowledge to a human and their actions, he also points to our full responsibility for the natural and social environment in which we live.

Experiment: The Blind Spot

Hold the image below it with outstretched arms in front of your face.
Focus with your right eye on the star.
Close your left eye.
Approach the image slowly to your face.
While moving the paper closer to your face pay attention to the circle.
Important: The star must be fixed and focused the whole time. The opened eye cannot be moved. Write down your observations.

Conclusion

A phenomenon is visible under certain conditions and not under others. Are the objects dependent on how someone sees them?
We do not see that we see nothing. How can we be sure that we have ever seen everything? The derivation and explanation of the theory can be found in brain research: Specific sensory stimuli are nonspecifically registered in the brain.

1.3.1 UNDERSTANDING OF LEARNING

Learning is understood as a self-directed, active process. Learning can´t be imprinted on us from the outside. In the practice of teaching, we often hear painfully that in many cases the participants do not learn what has been taught, that something has been learned, which hasn´t been taught or something has been learned, even if not taught at all (Schäffter 1994, p.6).
Wrong ideas of learners, alternative conceptions or constructions of teachers also have to be put to the test as well as the content of the lessons.
Learning, on the basis of a constructivist epistemology, means that constructs of learners change.

1.3.2 CONSTRUCTIVISM IN THE CLASSROOM

The **role of teachers** goes beyond the tasks of presenting information and imparting knowledge. They not only impart knowledge or prepare problems, but also assume the role of **a coach** or **a facilitator**, who supports self-reliant and social learning processes. It is up to the teacher to create an atmosphere in which learning is possible. In this sense, building authentic contexts and appreciative relationships with learners is of central importance.
The learner observes what is learned and how it can be learned. It provides detailed feedback on the learning status within the subject areas and shows the learner opportunities for compensation.

The **learners** are at the **centre of this theory**. They are offered information with the aim of defining and solving problems themselves. They receive few specifications and have to find a self-organized solution. They already bring with them skills and knowledge. The focus is therefore on the recognition and appreciation of the learners, as well as the concentration on the individual knowledge that each student has. In terms of self-preservation, the learner is most productive when their present system is questioned or doubted.

NOTES

Chapter 2

Interest & Motivation

2.1 DEFINING MOTIVATION

Motivation is the momentary readiness of an individual to direct and coordinate his or her sensory, cognitive, and motor functions to the achievement of a future target status (cf. Heckhausen, 1974, 149).

It has been proven that motivation is intimately linked with learning, whereas intrinsically and extrinsically motivated students are different in terms of qualitative aspects of learning. The differences are visible in their learning behaviour; e.g. intrinsically motivated students use a higher degree of deep processing strategies (Schunk, 2012, p. 356; Schiefele & Schreyer, 1994; Wild, 2000). The motivation topic is extremely multifaceted and is often and repeatedly emphasized in connection with learning. Countless motivational theories have been adopted in various didactic approaches and translated into general principles or methodological derivations for all phases of lesson planning and implementation. This makes it clear, that the importance of motivation for learning has long been recognized and didactically worked out (Tenberg 2011, p. 32).

Ryan, Deci (2000): Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being

To be motivated means to have pleasure, joy or interest in something. One cannot motivate anyone, but can only offer motives; to arouse them and to develop their strengthening and differentiation or their weakening and dispiriting. Before the implementation and the benefits of teaching are dealt with, the concepts „motive“ and „motivation“ are to be clarified.

MOTIVE	MOTIVATION
Is a general term for all meanings for which a person acts. What can be answered in the context of human motivation to the question 'Why?' is 'motive' (Schiefele 1974, p. 31). A motive can be provisionally characterized as an inner reference system that can be presumed as the cause of purposeful behaviour (Meister 1994, p.30). The hypothetical term motive refers to relatively permanent dispositions. Motives are developed through social interaction in a person's frame of reference, forming cognitive, effective and value-oriented subsystems. In the process of motivation, motives are activated. They are the causes of an action and determine what they mean for the person (Schiefele 1974, 455). -> Individual reasons of action are referred to as motives.	Motivation is understood as a „psychic force" or behavioural readiness, which influences the direction of the target (E.g. preparing for the exam vs. making friends) in particular, endurance (e.g. extending the time required for preparing for the exam) and the intensity of the behaviour (e.g. degree of concentration during learning) (cf. in: (Quoted from.): Wild & Möller 2009, p. 152; cf. in e.g. Rheinberg, 2006; Schunk, Pintrich & Meece, 2008). Motivation depends on the situation and a short-term event. This refers to all the current factors and processes that lead to actions under given situational stimulated condition and keep them going until they are completed (Heckhausen 1974, p. 143) Addition(ally): personal characteristics (e.g. performance motives) can be assumed in part as an enduring condition (cf. Wild & Möller 2009, p.152). Motivation is intended to characterize the processes of a temporary and situational activation of individual motives, which one can perceive in oneself and in others (Meister 1994, p.30). Motivation is the term for a psychological construct, a collective term for motive-based human action, incorporated as a buzzword in the everyday language, and is correspondingly used imprecise (Glöckel 2003, p.290).

Figure 21| Comparison between Motive and Motivation

2.1.2 LEARNING AND ACHIEVEMENT MOTIVATION

Learning motivation describes the conscious intentions to actively, permanently and effectively deal with certain content, subjects etc. in order to achieve new knowledge and skills.

Achievement motivation focuses on a sub-aspect of learning, particularly the achievable or achieved performance through learning (cf. Krapp, 1993; Schiefele, 2009b). Achievement motivation is a theoretical model intended "to explain how the motive to achieve and the motive to avoid failure influence behaviour in a situation where performance is evaluated against some standard of excellence" (J. W. Atkinson, 1957, p. 371). Achievement motivation is usually characterized by the following indicators:

"The achievement motive is defined as the recurrent concern for competing with standards of excellence and to increase one's competence. Achievement-oriented individuals strive to do well, improve their personal accomplishments, and outperform others on achievement-related tasks, activities, and skills and school environment, as well as additive genetic influences on achievement motivation." — Brundstein & Heckhausen,

- "setting up certain standards for unique attainment within the current study period or in the long term,
- pursuing satisfactory outcomes or excellence in the acquisition of specific knowledge and skills,
- evaluating performance based on self-monitoring and feedback, and
- expressing a certain degree of affective attachment to the processes of goal attainment" (Low R., Jin P., 2012).

Brunstein, Heckhausen (2018): Achievement Motivation

Furthermore, the development of achievement motivation is determined, among other things, by the need for achievement, power and affiliation (McClleland, 1961), expectation and value (Atkinson, 1957), attributions (Heider, 1958; Weiner, 1972) and self-determination (social needs; Decy & Ryan, 1990). Especially in the field of educational psychology, many studies have also analyzed the influence by motivational and cognitive factors, which are connected with individual and/or situational interests. Studies also emphasize the role of environmental factors, such as parental home and school environment, as well as additive genetic influences on achievement motivation (Holodynski & Oerter, 2008). Children learn to evaluate their performance as a failure or success through parents' expectations, but especially through experiences at school (e.g. teacher's reference norm).

Amotivated	A person is neither intrinsically nor extrinsically motivated. The degree of self-determination and motivation to learn are close to zero. The student is indifferent to the learning content, does not agree with it, and is mentally absent. Denotes a state 'without' learning motivation (Prenzel 1996 in: Zinn „Technikdidaktik – Einführung", Folie 132).
Extrinsic	Learning takes place here under an external influence. A student pursues a goal to earn a reward or to avoid punishment. The degree of self-determination is restricted to a small measure in the execution of a particular task and the motivation to learn is also relatively low, but in certain cases, the reward can be classified as very high. This is especially the case when the extrinsic interest changes into an intrinsic interest. The students only learn because of an endorsement, for instance, a grade is anticipated or threatening sanctions or parental pressure. Learning here occurs only through external pressure, it is determined by others (Prenzel 1996 in: Zinn „Technikdidaktik – Einführung",slide 132).
Internalised	Learning continues to be externally determined and guided by the internalisation of external guidelines as well as by a sense of duty. It is more a fulfilment of the obligation to take up the school content rather than a critical analysis of the topics. The degree of self-determination and the motivation to learn therefore remain low. The expected result and the productivity of a person correspond to a large extent to the minimum requirements. „Learning takes place without immediate external pressure. The student forces themselves to study, for instance, because otherwise, they will have a guilty conscience. Because of 'self-imposed' pressure, learning is not yet self-determined." (Prenzel 1996 in: Zinn „Technikdidaktik – Einführung", slide 132).
Identified	Learning is based on one's own initiative which they consider as important content or activity. From the outside, the content or activity may appear to be unattractive. The student learns by themselves because they associate learning with the possibility of achieving self-imposed goals. Some contents that are to be learned may not seem attractive to the student at all, but they become subjectively important because they serve the purpose of achieving individual goals. The student thus learns in a self-determined way.
Intrinsic	The student learns because of the incentives they perceive on the subject or in the content-related activities. For instance, the curious questions or explorations, the fascination of dealing with problems, or the merging into one is characteristic of this form of motivated learning. Learning is highly self-determined (Prenzel 1996 in: Zinn „Technikdidaktik – Einführung",slide 132). Intrinsically motivated behaviors can be defined as interest-driven actions (Krapp, 1993, p. 225).
Interested	Is a more advanced variant of intrinsically motivated learning. The student wants to learn more about the subject area beyond its current situation. The student is so fascinated or 'spellbound' by the subject area that they want to revisit it out of their own will and explore it further (Prenzel 1996 in: Zinn „Technikdidaktik – Einführung",slide 132).

Figure 23| Forms of Learning Motivation

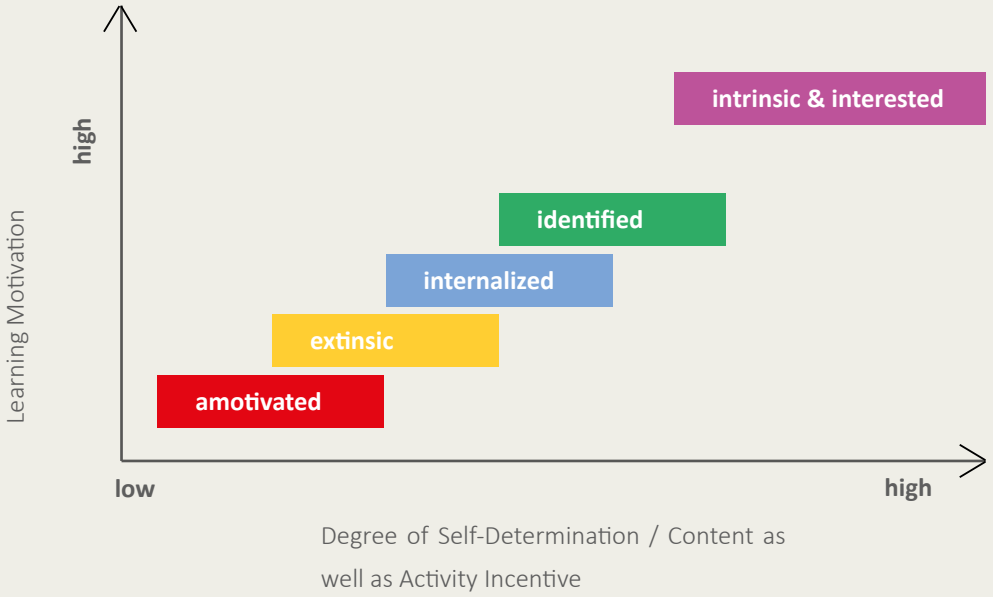


Figure 24| Development of Learning Motivation (Source: Own construction based on Prenzel & Drechsel, 1996, 218)

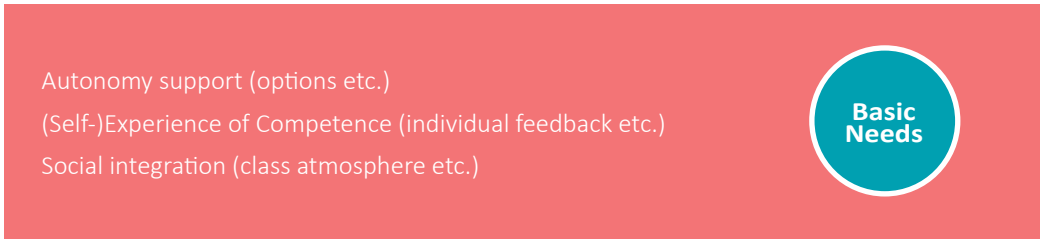
2.1.3 EFFECTS OF LEARNING MOTIVATION

Empirical findings show that the quality of learning motivation influences the quality of learning processes and outcomes. Identification, intrinsic motivation or interest supports cognitive processes (e.g. elaborations) and outcomes (e.g. understanding) of learning (Benware & Deci 1984; Grolnick & Ryan 1987; Schiefele 1995). Furthermore, motivated learning

- relates to positive emotions during learning which increases motivation to learn, (Csikszentmihalyi & Le Fevre 1989; Deci et al. 1991);
- supports the development of one's identity (Haußer 1983; Ryan 1993),
- is relevant for professional satisfaction (Holland, 1985), the identification with vocational training (Bergmann, 1992) and the readiness for further training (Ekkert, Klose, Kutscha & Stender, 1992; Röhr-Sendlmeier & Eschmann, 1995). This raises the question of the conditions of teaching-learning environments that favour or promote identified, intrinsically motivated or interested learning.

2.1.4 INTRINSIC MOTIVATION AND SELF-DETERMINATION

Self-determination Theory (SDT) is ”a motivational theory of personality, development, and social processes that examine how social contexts and individual differences facilitate different types of motivation, especially autonomous motivation and controlled motivation, and in turn predict learning, performance, experience, and psychological health (Deci & Ryan, 2015).”
Deci and Ryan (1985, 2015) consider various conditions as necessary for a person to self-regulate their learning in a self-determined way through identification.
On top of that, there is the aspect that a person has to experience a supportive environment on their quest for autonomy, competence, and social Integration. This includes mainly a structured way of teaching and strict classroom management.
According to Deci and Ryan, autonomy and competence support are also necessary conditions for intrinsically motivated or interested learning.



Students´ needs
Referring to the theory of ‚basic needs‘, students’ needs can be subdivided into further aspects such as: The need for acknowledgement, validity, acceptance, to identify with the teacher or adult and the need to avoid punishment.

2.1.5 EXPECTATION-VALUE MODELS

Expectation-Value-Models of motivation (Heckhausen, 1989; Weiner, 1986) attribute the development of a concrete motivation (e.g. the intention to work on a certain task) to two components:

- The expectation (including probability) that the action in question can be carried out successfully, and
- The value (or subjective significance) attributed to the action and its consequences

Expectation and value-based beliefs are, in turn, dependent on the goals of a person, their self-concept and the emotional content of performance-related experiences. In addition, influences of the social and school environment are taken into account in the model (see Anderman & Kaplan, 2008).

Furthermore, Eccles differentiates between four value components:

- The importance of good performance or the relevance of the task to important individual aspects (e.g. the perceived gender role),
- The interest in the task including the pleasure in completing it,
- The usefulness of accomplishing tasks for achieving future goals (e.g. professional career),
- The costs of the task processing (e.g. expenditure or renunciation of attractive alternative actions; in addition Fries & Dietz, 2007).

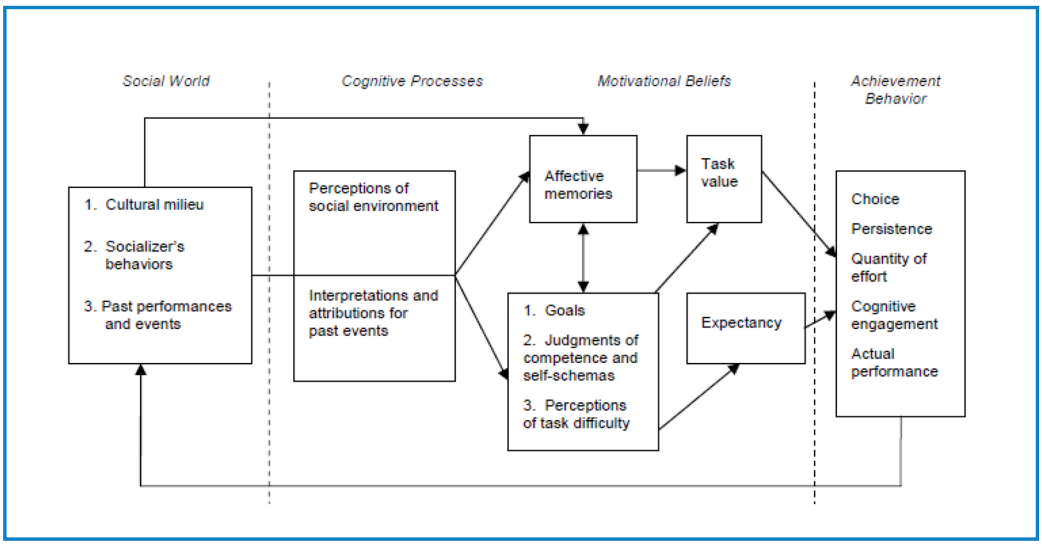


Figure 25| Simplified version of the social expectancy-value model by Eccles and Wigfield and their colleagues (Source: Pintrich & Schunk, 2002, p. 61)

2.2 DEFINING INTEREST

In everyday language the term interest is used in terms of hobbies, preferences, inclinations and so on. As one condition of learning - among many other variables - research understands interest as a cognitive and affective motivational variable that both develops and can be supported for further developmen. Interest emerges from an individual's meaningful interaction with an object (or environment) and this confrontation takes place for the sake of the cause itself (cf. Zinn, 2005). This idea is variously referred to as the person-object relation (Krapp, 1992); whereas an object cannot only be a material object, but content, events, ideas etc. within a society (Müller, 2006; Krapp 1992).

Relevant theories consider interest to be important for intrinsic motivation

In the current discussion, the term interest can describe two distinct (though often co-occurring) experiences:

- an individual's momentary experience of being captivated by an object
- as well as more lasting feelings that the object is enjoyable and worth further exploration (Harackiewicz et al. 2018)

Interest is, therefore, both a psychological state characterized by increased attention, effort, and affect, experienced in a particular moment (situational interest), as well as an enduring predisposition to reengage with a particular object or topic over time (individual interest; Hidi & Renninger, 2006). Modern Interest Theory defines interest as a construct that characterizes a meaningfully elevated relationship of a person to an object, and this confrontation takes place for the sake of the cause itself. (cf. Zinn, 2005). The basis of the theoretical construct of interest is thus the constructivism. Individual interests of the learner are an important condition of the intrinsic occurrence in educational settings. It can be assumed that the interest-dependent or object-centered intrinsic learning motivation is more important for learning at colleges than the activity-centered motivation to learn, since technical content is in the foreground here. Whereas in leisure time, students prefer more activities (e.g. sport) due to their incentive qualities (no object in the sense of a field of knowledge would play a special role; see Schiefele, 2009, p. 158).

INDIVIDUAL INTEREST

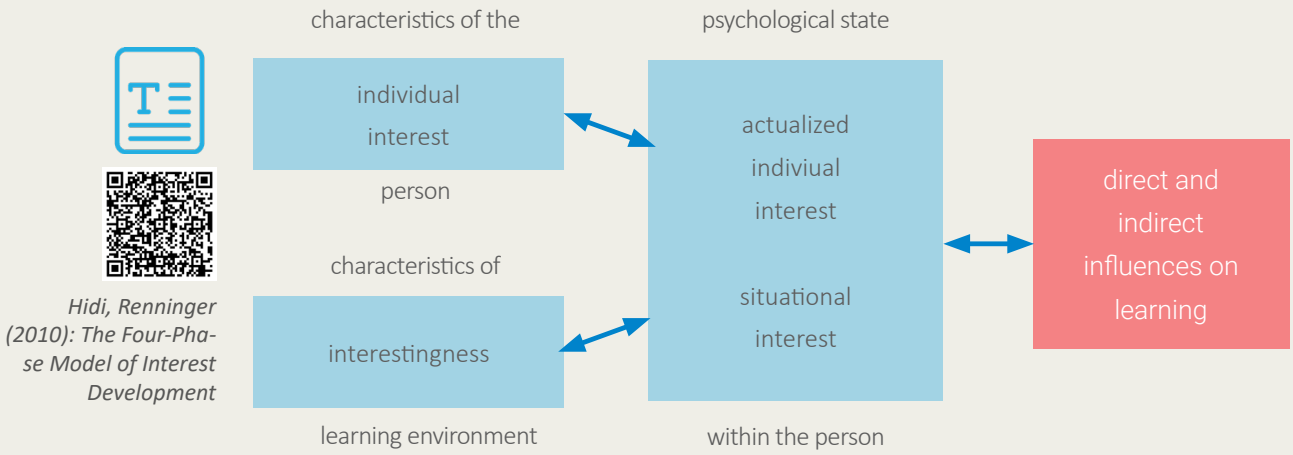
Individual interest is the trait-state of a person. On this level interests are relatively enduring characteristics (time persistent) or general orientations action (Krapp, 1992). Example: A person has a strong preference for specific tasks or fields of knowledge or subjects (e. g. physics or language).

If a learner is interested in a topic depends on his or her learning and educational biography, on the ability to self-motivate and on the future perspectives of the individual.

SITUATIONAL INTEREST

On this level, interest is a motivational, temporary state and is aroused primarily by certain conditions, situations, tasks, and/or concrete objects (e. g. vividness of a film, texts, learning material, media) in the environment (Interestingness). Situational interest is not dependent on the presence of dispositional (individual) preferences.

Like individual interest, situational interest can be described from the perspective of either the cause, the conditions that induce interest, or the perspective of the person who is interested. individual.



Hidi, Renninger (2010): The Four-Phase Model of Interest Development

If individual interest is supported with situational interst through the teacher, there will be a better learning achievement

INTERESTINGNESS

Interestingness of an object can generate situational interest in the short term. It can be assumed that didactically skillful preparation of the subject matter (e. g. „interestingness“ of learning materials) trigger new, current attention (interest) and thus lead to an improvement in cognitive processing.

Figure 26| Framework Model of the Interest Genesis (Source: Own construction)

2.2.1 INTEREST AND LEARNING

Whether a learner is interested in a particular subject depends on one side on the content itself, on the learning and educational biography, the ability to self-motivate and the future perspectives of the individual. A teacher thus can be supportive to help students develop further or even new thematic interests. Not every student who participates in an educational measure will bring or develop a thematic interest. Some topics are just not interesting for them. their personal relevance cannot be recognized even with the best will. Although, how the motivational orientation develops within or beyond the teaching and learning situation depends, among other things, decisively on the design of this learning environment.
According to Krapp (1992), learning should serve to promote and satisfy the diverse interests. He distinguishes the term interest in short-and long-term interest:

Harackiewicz et al. (2016): Interest Matters: The Importance of Promoting Interest in Education

- Interest as a personality-specific feature of the learner
  - Personality Trait
  - Time persistent
  - Essential part of the self-concept
  - Influence on learning, e.g. interest in physics
- Interest as a situation-specific, motivational state
  - results from the learning situation or
  - because of the learning material causing the individual to have a state of more intensive affection

Excursus

OVERJUSTIFICATION EFFECT

Eternal displacement or destruction of the intrinsic motivation is called the „Overjustification effect", „corrupting effect" or „predatory effect".
Lepper et al. (1982) found that external rewards (extrinsic motivation) influenced the execution of a task that has already been found to be attractive (intrinsic motivation), i.e. extrinsic reinforcements can undermine or even destroy intrinsic motivation. Tests with children also demonstrated that children who were rewarded with money for completing a task they normally enjoyed, were much less motivated and performed worse than children who were not rewarded but enjoyed the task. In an experiment, pre-school children were given the opportunity to play with felt-tip pens. Their intrinsic motivation was defined by the duration of the spontaneous exercise. Two weeks later they were supposed to draw pictures with the pens in three groups with comparable initial motivation conditions and under three different reward conditions. Another week, pens and paper were placed in the lounge and the exercise behavior was observed through a one-way mirror: 1st Group- Expected Reward: The children were promised a reward when using the pens. 2nd Group- Unexpected Reward: The children received a reward when they used the pens but not previously told. 3rd group- no reward promised.

Results of the experiment:

The group that was influenced by the expectation of a reward demonstrated a relative decrease in their willingness to perform. The resulting equated effect, called "motivational crowding effect" or "crowding-out", occurs when intrinsic and extrinsic motivations overlap, which especially happens in monotonous working situations, which a person does not perceive as sensible or is done reluctantly. In these cases, one tries to support the activity with extrinsic motivational factors, i.e. rewards. However, with self-motivated tasks, which one thinks of as sensible and likes to do, motivation no longer increases with rewards beyond a certain limit and can even suppress the inner motivation.

2.3 PROMOTING INTEREST & MOTIVATION: INSTRUCTIONAL DESIGN PRINCIPLES

Motivation in the Classroom - A time-persistent Problem

Institutional learning inevitably creates motivational problems:

- Learning is not voluntary, it is demanded
- Learning is not sporadic, but continuous
- Learning goals are not set by the students themselves, but are predetermined

The motivational support is an ongoing task for the teacher. During a lesson, i.e. in the process of teaching and learning, various factors determine whether an inner approaching to the subject of learning and whether the identification required for the development of a longer period of interest with the object takes place. Design principles that draw on Self-Determination Theory (satisfaction of competence, autonomous action control and social involvement), approaches of a constructivist philosophy of teaching and learning, and the behaviour of the teacher have proven to be viable (cf. Prenzel, Kramer & Drechsel, 2001; Stark & Mandl, 2000) to promote interest and motivation in a learning environment. Additionally, the flow experience (Cskiszentmihalyi, 1985) and certain emotions accompanying action (e.g. joy, situational interest) also come into question as signals for interested and motivated learning. If a teacher is able to serve all these requirements generally, possess incentives inherent in action, so that their implementation does not have to be controlled or motivated from outside.

Krapp (1999): Interest, motivation, and learning: An educational-psychological perspective

offer choices

give feedback

give a feeling of affiliation, partnership and cooperation

arouse curiosity

present learning objectives

create value-related relevance

What exactly can a teacher do to promote interest and motiva-

In order to support autonomy, concrete design principles such as the offering of choices, for example with regard to goals, learning organization and cooperation, belong here. For the promotion of experiences of competence the learning-promoting feedback on the individual learning progress which is experienced as not controlling, has proven to be helpful for the development of interest (see also Unit 3: Diagnosis and Assessment in this textbook). Social inclusion refers to the learning atmosphere, the feeling of affiliation, partnership or cooperation. In many cases there are no direct connections between the learning content and the current interests of the students, but bridges can be built in the sense of Dewey's concept of „indirect interests".

As a teacher, first of all, it is worth recalling Mitchell's (1993) distinction of Catch and Hold components of situational interest. This means, at the beginning of a lesson, the teacher triggers and maintains situational interest by arousing curiosity for a topic or object of a lesson and to „capture" students' attention in the short term. Because of the ultimate motivational problem, the creation of a willingness to learn, which lasts for the entire period of learning, the design of an introduction is primarily a question of „value-related relevance". Problem orientation and closeness to reality are important factors of the promotion of interest. An authentic and complex problem (e.g. a task from the professional context) should provide a meaningful incentive for action and place, action and knowledge in an application context.

More hints how you can promote your student's interest and motivation, see Appendix

Overview of Methods
that can Increase Students' Interest & Motivation

Action-based instructions have actually proved to be conducive to the development of interest, e.g.:

Anchored Instruction

Open Instruction

Project Method

Case Study Method

...

NOTES

Chapter 3

Knowledge & Epistemological Beliefs

3.1 KNOWLEDGE & ITS AQUISITION

Knowledge is an important source of teachers' actions in the classroom

If the term *learning* is used in the context of school, university and further education, it typically refers to the acquisition of knowledge (Renkl, 2009, p.4). Human knowledge acquisition is the process of absorbing and storing new information in memory. Many aspects and processes like prior knowledge & intelligence, self-regulation, motivation or classroom management (including teacher professionality & personality) support the acquisition of knowledge. In a broader sense, knowledge can be understood as the possession of information or the possession of the ability to locate desired information in memory. Geiger summarizes knowledge with reference to the philosophical approaches of *Habermas, Toulmin, Lyotard*, and *Foucault* as:

- originally linguistically authored (...). There can be no knowledge without language!
- socially constructed and never measures its quality by any reality which lies outside of knowledge.
- legitimized by a "societal recognized screening process".
- social, never purely individual. Since knowledge (...) must satisfy a societal recognized screening process ...." (Geiger, 2006 in: Broßmann & Mödinger, 2011, p.14)

3.1.1 MEMORY & KNOWLEDGE

The memory is the important basis for cognitive processes and the perspective on the role of memory has important implications for teaching. Memory has a fundamental role in our life: we recall information, reflect the past, relate past experiences with the present. Even if different learning theories vary in the role they assign to memory, they agree that the process of storing and retrieving information depends heavily on the representation and organisation of the information. Moreover, the utility of knowledge can also be influenced by how the information is structured. In order to understand how information is stored in memory, we have to differentiate this process between a time and content dimension (Wisniewski, 2016, p. 140):

The Neuroscience of Learning

- **ultra-short-term memory (USTM)**
- **short-term memory**
- **long-term memory (LTM)**

Both dimensions act as filters that protect our brain from the countless amount of information that overwhelms us everyday. However, the more information is repeated or used (learning vocabulary, riding a bike), the more likely it is to be retained in long-term memory. The scientific study of memory is usually traced back to Hermann Ebbinghaus (1885/1913). Ebbinghaus examined his own acquisition and forgetting of new information in the form of a series of nonsense syllables tested at various periods up to 31 days (Cowan, 2008, p. 323).

3.1.2 TYPES OF KNOWLEDGE

Knowing 'What' and 'How' to do is not enough: knowledge and skills must be transferred into competent acting.

The acquisition of knowledge (learning) and its sustainable storage in our memory depends not only how often we repeat information, but also on hhow the information is stored in the long-term memory. According to Kratwohl, knowledge can be categorized into four types (Renkl, 2009, pp. 4-6):

Declarative Knowledge

Facts/Concepts (e.g. Historical date or power circuit rules).

Procedural Knowledge

Means "Know How", is also known as imperative knowledge (e.g. How to built an electric engine and realise it) and is supposed the be acquired during apprenticeships

Conceptual Knowledge

Part of "Declarative Knowledge". It is often used in the context of a deeper understanding of declarative knowledge.

Metacognitive Knowledge

„Knowledge about Knowledge" or close phenomena like knowledge about knowledge acquisition, knowledge about the purpose of a certain learning strategy and planning one´s own proceeding.

de Jong, Furguson-Hesler (1996): Type and Qualities of Knowledge

3.1.3 KNOWLEDGE, TRANSFER & ACTION

Knowledge and action are viewed not as a unidirectional process, but as an interaction. The relationship between knowledge and action is highly important for the following reasons:

- without knowledge, there is often no action, and
- knowledge can highly influence the action taken.

Figure 28| Relationship between Knowledge and Action

When new knowledge and skills are needed later, retrieval from long-term memory during learning, into working memory is essential to the transfer of learning. The process of converting knowledge into action can be seen as a dynamic process. Knowledge alone is not sufficient for action to take place and knowledge is only the first step in the process of action. Instead, emotional, (meta-)cognitive, motivational, volitional, and action-regulating factors must be involved. Furthermore, research show, goal-oriented action always relates to an action's results (Frey et al., 2006).

Inert Knowledge Problem

One cause of transfer failure is inert knowledge (or inert ideas, see Whitehead (1929). Inert knowledge refers to theoretical knowledge that is stored in long-term memory, but because this information lacks the appropriate cues for retrieval, it fails to transfer. For example, a student makes an A in geometry but fails to use the principles of geometry, when appropriate, to learn goniometry. In these situations, the skills have been encoded into long-term memory, but the retrieval cues that support their transfer have not (Clark & Harrelson, 2002, Renkl et al., 1996).

Renkl, Mandl (1996): Inert knowledge: Analyses and remedies

3.1.4 PRIOR KNOWLEDGE

Research has revealed that the most predictive personality trait for performance is not intelligence but domain-specific prior knowledge (Aushubel, 1968; Dochy 1992; Schraw 2006; Schrader & Helmke, 2008)

Students do not come to school as blank slates. Rather, they come to school with considerable knowledge, some correct and some not. Either way, that knowledge is based on intuition, everyday experience, as well as what they have been taught in other settings. Research shows that prior knowledge is more important for learning success than motivation and intelligence (Fraser et al. 1987; Wahl, 2006; Hasselhorn & Gold, 2013, S. 87). Thus, students' prior knowledge should be taken into consideration in instructional design and curriculum planning. Furthermore, the results of prior-knowledge assessments may be used as a tool for student support in addressing areas of deficiency.

Tobias (1994): Interest, Prior Knowledge, and Learning

Correlation between ...
learning success and prior knowledge: r = 0.7
learning success and intelligence: r = 0.5
learning success and motivation: r = 0.2 to 0.3.

Index:
r = 0.0 no correlation; r = 1.0 full correlation

How previous knowledge can be activated and thus improve the learning success of the students, see Textbook- Module 2, Methods of Instruction

3.1.5 PRECONCEPTIONS

Preconceptions (or students‘ ideas, biases) are various everyday theories that manifest from one‘s own experience when an individual observes a given phenomenon of any kind and tries to decipher them. In this way, the individual creates personal contexts that correlate to what they have already learned and are often at odds with scientific explain. Thus, preconceptions can be considered also as prejudices or biases in forming scientific concepts (Méheut M., 2012). Existing ideas of e.g. physical effects among students have a significant influence on the process of information processing in new subject matter so that these are considered to be the most significant cause of topic-related learning difficulties.

Students' perceptions are the main source of internal learning difficulties: Learners process lesson content based on physically inadequate ways of thinking (Schecker & Duit 2018)

Example from Electricity Theory- Power Consumption

In class, the teacher presents an experiment on the electrical circuit. Before starting the experiment, he asks the class what the direction and strength of the current flow are. Linda gives the following answer: “The current flows in one line to the lamp, is partly consumed there and the lamp lights up. The residual current then returns to the battery.“

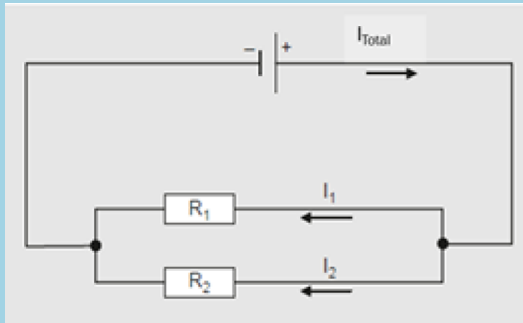


Figure 30| Electrical Circuit (Source: Own construction)

3.2 EPISTEMOLOGICAL BELIEFS

Epistemological Belief is „an identifiable set of dimensions of beliefs about knowledge and knowing, organised as theories, progressing in reasonably predictable directions, activated in context, operating both cognitively and metacognitively“ (Hofer 2005). Epistemological beliefs as a part of the subjective theories have functions in terms of directing and steering actions, and are therefore particularly relevant to research on teaching and learning (cf. Dann 1994). In the research literature, the connection between epistemological beliefs and the quality and effectiveness of teaching and learning processes is undisputed (e.g. Pieschl, Stahl, and Bromme 2006, 529). The philosophical perspective asks how can we know, how can we learn something new, what is the source of knowledge (Schunk, 2012, p. 5). Epistemological Beliefs are related to more complex learning strategies and better learning outcomes, e.g. college students epistemological beliefs are related to their academic performance in learning [and] their motivation (Zinn, 2013, p.4).

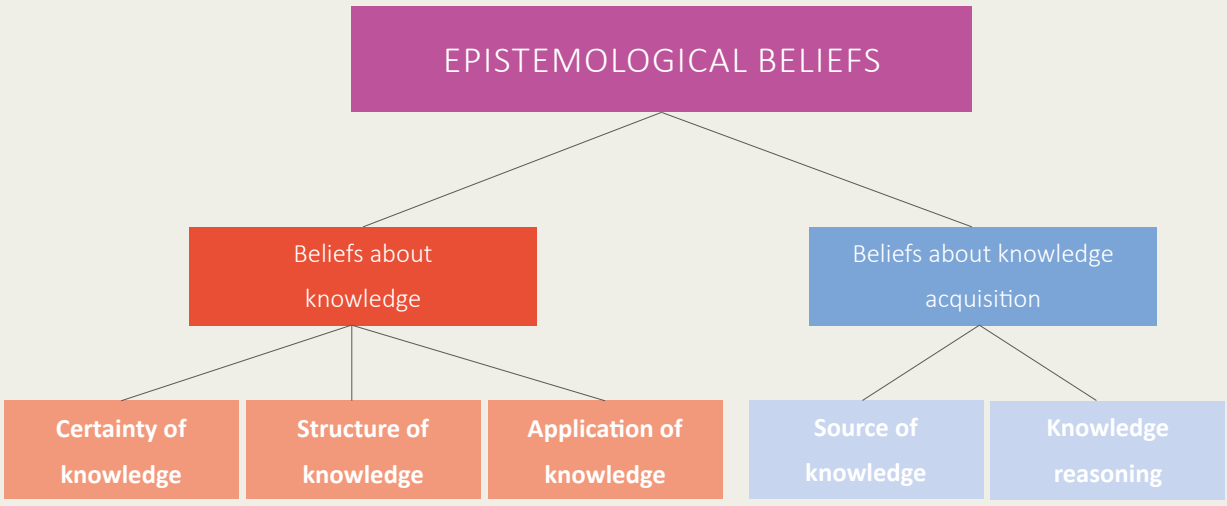


Figure 31| Epistemological Beliefs (Source: Own construction)

3.2.1 TEACHERS' EPISTEMOLOGICAL BELIEFS

Different research results point out that the beliefs of a teacher "impact their practice" (Bendixen & Feucht, 2010, p.567). The teacher has a lot of influence on students development of epistemological beliefs. Hence teachers have to understand their own and students' epistemologies in order to create a constructive and productive climate in class as well as learning environment. From an epistemological perspective the National Council of Teachers of Mathematics for example "has called for teachers to implement constructivist teaching techniques in mathematics to increase students' performance" (Bendixen & Feucht, 2010, p.570). Beliefs of teachers are very important in terms of the question:

- **"What does it mean to be a good teacher?"**
- **"How does it impact the learners' beliefs?"**

3.2.2 STUDENTS' EPISTEMOLOGICAL BELIEFS

The epistemological beliefs of learners play "a crucial role in the learning of individuals, such as its impact on argumentation, problem-solving and achievement" (Feucht & Bendixen, 2010, p. 4) and can be mainly influenced by teachers. To foster epistemological advancement there are four aspects to be considered:

Peer, Atputhasamy (2005): Student's Beliefs about Science and its Impact

How learners´ beliefs about the nature of knowledge are supposed to change...

DIMENSION	LESS DEVELOPED STAGE →	MORE DEVELOPED STAGE
Certainty of knowledge	• Knowledge is absolute and safe • Knowledge is a binding truth, no need to be questioned	• Knowledge develops gradually • It has a provisional character • It is open to new interpretations
Structure of knowledge	• Knowledge consists of isolated, unambiguous facts and truths	• Knowledge consists of narrow concepts or structures • It must be considered complex
Application of knowledge	• Low application relevance • Acquisition of knowledge to pass the exam	• Knowledge is important for operational activities and problem solving • Then again it has an individual benefit
Source of knowledge	• Knowledge is acquired by authorities; you can´t influence it. • You rather learn more and more facts	• Realizing that the individual is involved in the development of knowledge • Rather learn more methods / principles
Knowledge reasoning	• Memorize as given • One solution • Dualistic view	• Autonomous evaluation and structuring • Several solutions • Acceptance of multiple opinions

... because epistemological beliefs are related to more complex learning strategies and better learning outcomes, e.g. "college students epistemological beliefs were related to their academic performance, (...) engagement in learning [and] their motivation." (Zinn 2013, p. 4)

Figure 33| Development of Epistemological Beliefs (Source: Own construction)

3.2.2 EPISTEMOLOGICAL BELIEFS IN THE LEARNING PROCESS

How knowledge is acquired and how epistemological beliefs occur play a crucial role in the learning process of students and on the other side can be mainly influenced by teachers. It thus affects the reflection about one´s own epistemological beliefs, lesson planning as well as the actual teaching process.
A more detailed analysis of „how to influence and change epistemological beliefs of learners or rather the scientifically so-called "student conceptions" or "preconceptions" and their impact on teaching can be found in Textbook Module 2 – Preconceptions.

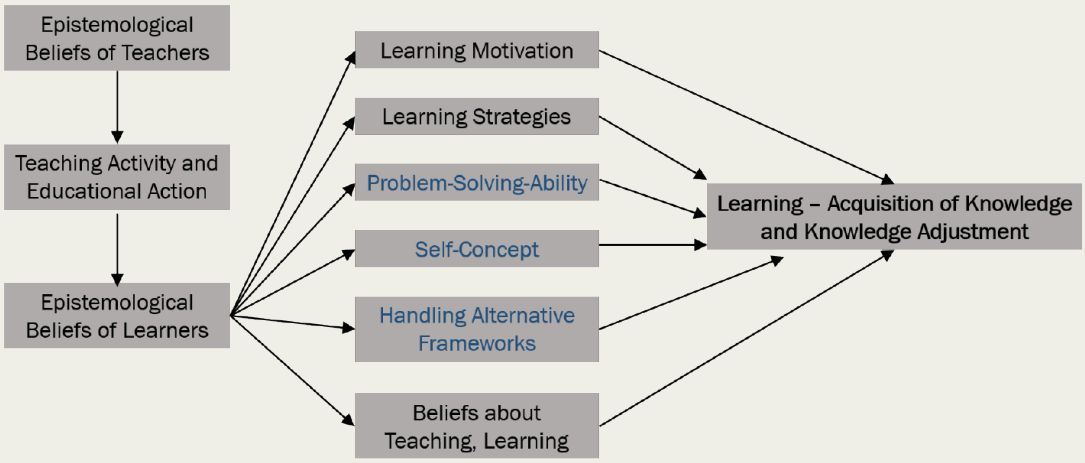


Figure 34| Overview of the Influence of Epistemological Beliefs on the Learning Process (Source: Own construction)

NOTES

Chapter 1

Educational Diagnostic

1.1 INTRODUCTION

"The better teachers can diagnose, the better they can advise and assist their students in learning." — Hascher

In scientific or medical contexts one speaks of diagnosis, if a clear assignment of phenomena can be made to a cause. This rigorously causal understanding of diagnosis often raises false expectations in the context of school. These expectations cannot be met in the face of complex interactions and learning processes that occur in a teaching environment, as well as the fact, that lessons are taught in groups and on a time-limited basis. However, education is also increasingly talking about „diagnosis", depending on the specific context with very different objectives. Often these are decisions about the suitability of a person for school types or study programs. For higher education and training, however, such questions of diagnosis are of particular importance, which aims at the differentiation of students.

In the context of the current discussion on college and teaching development, there is also the greatest need. This approach is often referred to as *Pedagogical Diagnostics* (Hechenleitner & Mayr, 2008, p. 5).

Pedagogic diagnosis includes all diagnostic activities that determine the requirements and conditions of scheduled teaching and learning processes among individual students and students working in a group, as well as analysing their learning processes and identifying their learning outcomes in order to optimize individual learning (e.g. students' biography, social context, prior knowledge and learning dynamic in order to establish cognitive or social factors (and so on) that might impact their school adjustment; Pitsch, 2015, p. 512).

Diagnostic activities which divide learning groups or appoint to advancement programmes, as well as societally anchored tasks such as controlling academic degrees or the assigning of qualification also belong to the field of diagnosis (Ingenkamp & Lissmann, 2008, p. 13).

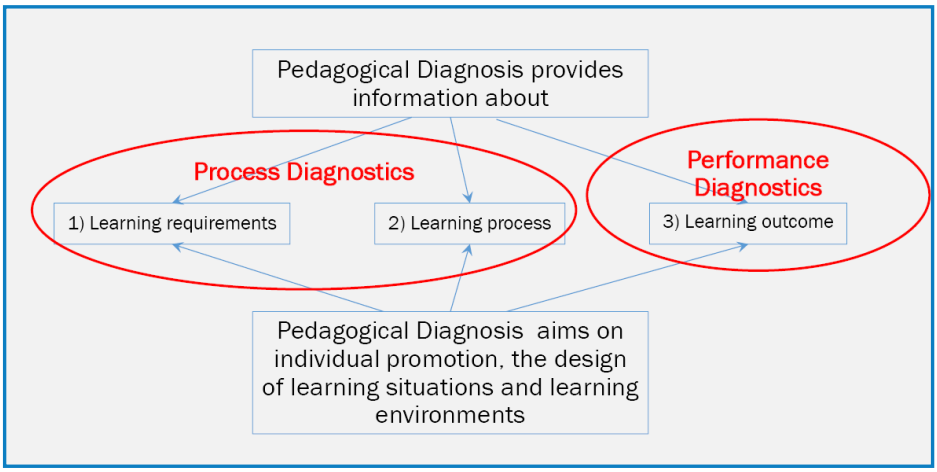


Figure 35| Framework Process Diagnosis and Performance Diagnosis (Source: Own construction based on Hechenleitner & Mayr, 2008)

Reasons for Educational Diagnostic

(1) Lesson Planning

(2) Identifying Learning Requirements of Students (e.g. How do students learn? What strategies do they use? What are they interested in? How do they motivate themselves?)

(3) Identifying Students Behaviour

(4) Performance Test (e.g. How do the students perform in comparison to International Student Assessments like PISA, TIMSS ...)

(5) Before Introducing New Topics to Students (e.g. What do the students already know (see Prior Knowledge, Preconcepts) and what do they need to know in order to understand the new topics?)

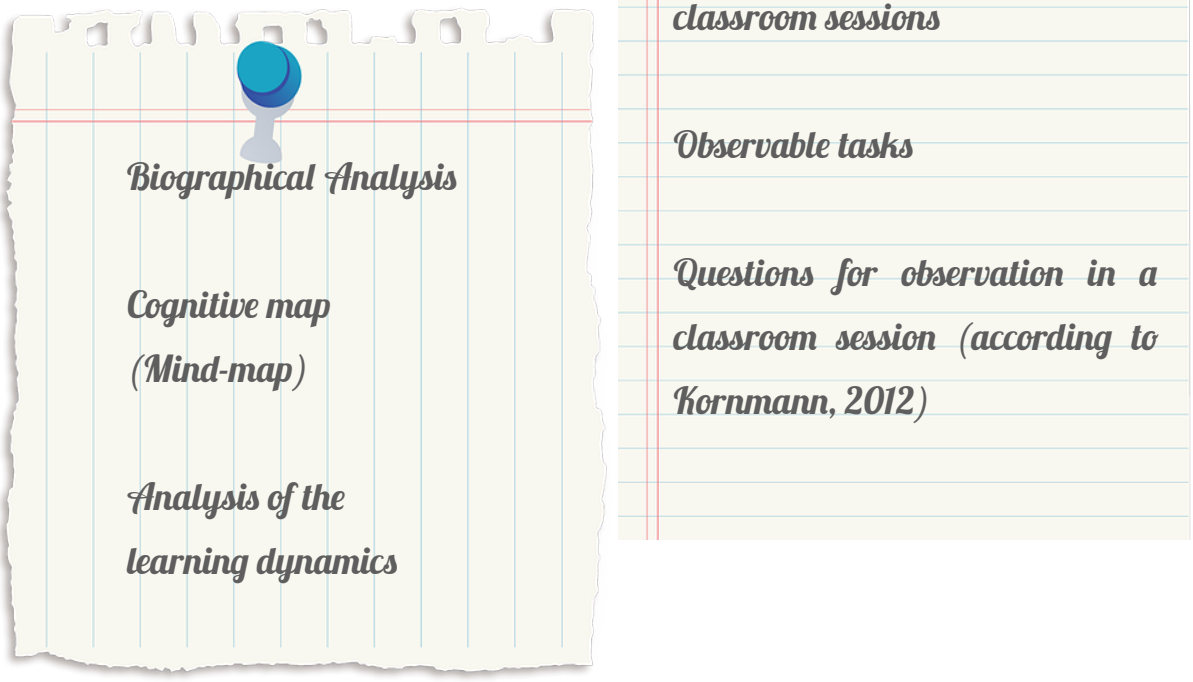
(6) Analysis of Own Teaching (e.g. Do the students understand my instructions (explanations ...)? How can I assess learning processes? Are the students supported enough? Is my lesson adaptive? Are my strategies appropriate (i.e. methods grab students' attention)?)

(7) Construction and Assessment of Tests (e.g. Do the tests present curricular requirements? Variation of difficulty of tasks (see Taxonomies)? What are assessment criteria? Error of Assessment?)

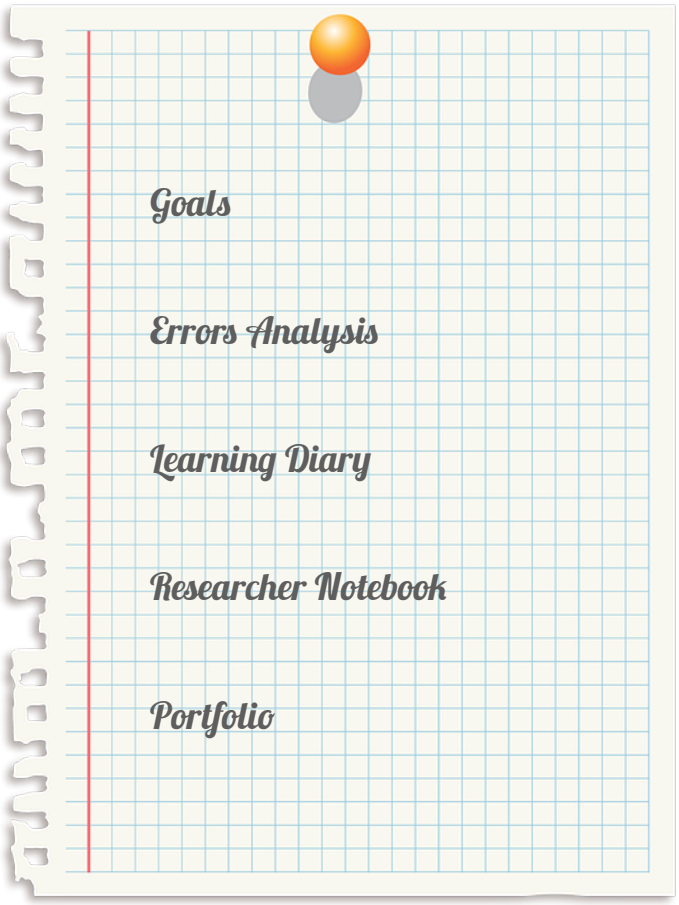
(8) Identifying Learning & Development Needs of Students (e.g. learning difficulties, dyslexia, reading disabilities...)

1.2 DIAGNOSTIC INSTRUMENTS

Diagnostic tools provide data to assist educators in designing individualized instruction and intensifying intervention for students who do not respond to validated intervention programs.
Diagnostic tools can be either informal, which are easy-to-use tools that can be administered with little training, or standardization.



Diagnostic Tools in detail, see Appendix


Goals
Errors Analysis
Learning Diary
Researcher Notebook
Portfolio


International school
performance comparison
studies

1.3 FRAMEWORK FOR A SYSTEMATIC DIAGNOSIS

A diagnosis has to be as differentiated as the derived pedagogical and didactical measures require. It also depends on the intended goals a teacher aims for and which lead to a diagnosis. Effective diagnosis requires careful selection of information, a systematic link between this information and a high level of teacher's diagnostic competence (Hascher, 2005, p. 4).
Effective diagnosis requires careful selection of information, a systematic link between this information and a high level of teacher's diagnostic competence (Hascher, 2005, p. 4).

Quality control guidelines:

- The number of considered information that leads to a diagnosis. (How much information was included?)
- The quality of the information. (How objective/ valid is each information?)
- The kind of using that information. (How are these information considered and evaluated? Method/ Procedure behind)
- The relation between information. (How are the information linked together?)

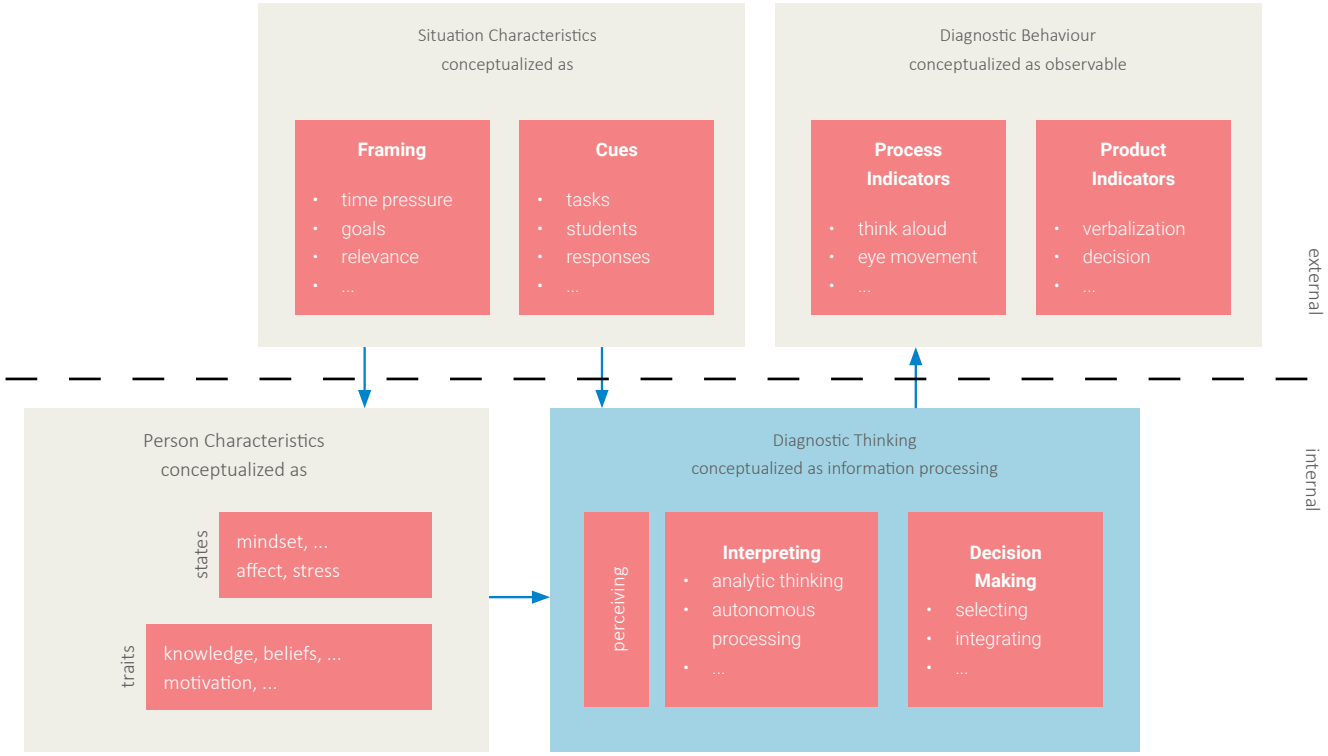


Figure 36| DiaCoM Framework of Diagnostic Judgements (Source: Own construction based on Laibl, 2020)

NOTES

Chapter 2

Assessment

2.1 INTRODUCTION

"Assessment defines what students regard as important, how they spend their time and how they come to see themselves as students and then as graduates . . . If you want to change student learning then change the methods of assessment."
— Brown, 1997, p. 7

If Diagnosis is first of all about recording and analysis of the subject-specific competencies and learning processes, then assessment is the evaluation of a product with reference to a reference standard (norms). Diagnosis is always connected to assessment and on basis of diagnosis, teachers can assess students learning progress and outcomes. This assessment provides information about the discrepancy between learning objectives and individual progress, and is the starting point for the design of further learning processes or interventions (Klieme et al. 2010). Collecting student assessment information is essential to improve teaching and learning strategies, and meet information needs at the level of students, parents and teachers. Competence assessment of students also plays an integral role to measure the learning progress and performance of individual students at vocational colleges under scientific as well political perspectives (Samsudi, 2016; Winther, Achtennhagen, 2009; Mudau, 2018). Winther and Achtenhagen also stress the importance of assessment as a prerequisite for maintaining academic standards both on a national and international level (ebd.) for the improvement of teaching, learning and sharing with relevant stakeholders. The assessment itself is the process of collecting evidence and making judgements on whether knowledge and competency has been achieved, to confirm that an individual can perform to the standard or level of achievement required within a subject. When assessing student learning, three essential elements will be considered: assessment design, feedback and marking.

Sephokgole, Makgato (2019): Student perception of lecturers' assessment practices at technical and vocational education and training (TVET) colleges in South Africa

2.2 ASSESSMENT PURPOSES

Student assessment refers to learning processes and learning outcomes of the students. These learning outcomes can be described in terms of different behaviour dimensions and classified by different norms. Student performance can be assessed referring to the students themselves in comparison to other students and in relation to the learning content. Therefore different methods to measure students performance are required in terms of the contents and goals (OECD, 2013, p. 140 ff):

- **Student Summative Assessment**, or assessment of learning, aims to summarise learning that has taken place, in order to record, mark or certify achievements (EPPI, 2002).
- **Student Formative Assessment**, or assessment for learning, aims to identify aspects of learning as it is developing in order to deepen and shape subsequent learning.
- **Diagnostic Assessment** is one type of formative assessment, which often takes place at the beginning of a study unit in order to find a starting point, or baseline, for learning and to develop a suitable learning programme. Diagnostic assessment may also serve to identify students who are at risk of failure, to uncover the sources of their learning difficulties and to plan for an appropriate supplemental intervention or remediation."

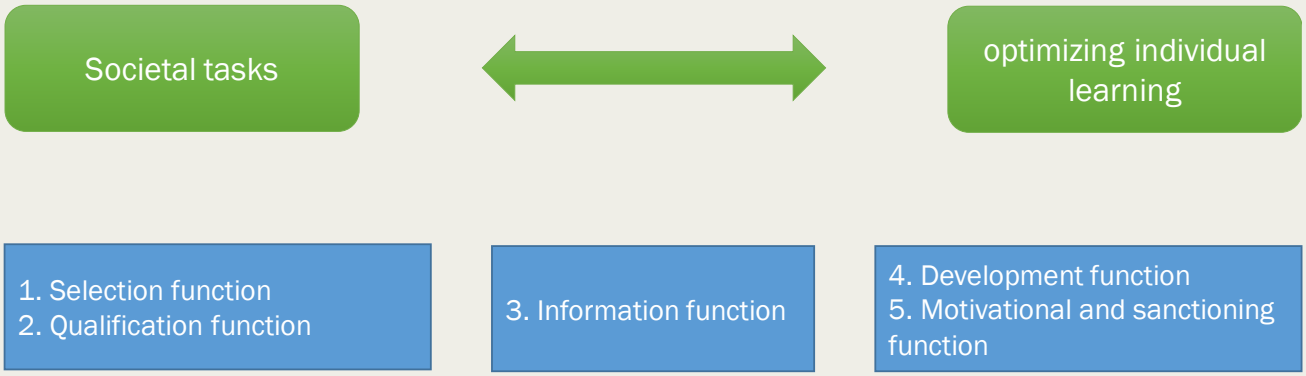


Figure 40| The Function of Assessment (Source: Own construction based on Jürgens & Lissmann 2015, S. 70ff.)

2.3 KEY CONCEPTS OF ASSESSMENT

Assessment does not only take place in the classroom in diagnostic processes, but also in the context of feedback - as the main principle of assessment - to the students about their learning processes as well as in the context of the award of grades (Opitz & Nührenbörger, 2010). Klieme at al. (2010, p. 73) argue that "an argumentative, activating, individual performance assessment, based on reference standards with differentiated (criterial or process-related) feedback, [represents] an important quality feature of teaching." Thus following topics are particularly important:

- quality criteria
- reference norm (or standard)
- assessment errors and
- assessment effects

2.3.1 QUALITY CRITERIA

From the psychological test theory, three quality criteria define pedagogical diagnosis and assessment: The most used academic performance criteria are school grades. However, research shows that **grading** - the usual criterion and predictor for student performance and success - is neither objective nor reliable.

Haladyna (2019): Assigning a Valid and Reliable Grade in a Course

Quality Critera

- **Objectivity:** Would another teacher reach the same conclusion?
- **Reliability:** Would a retake test held shortly thereafter produce the same result?
- **Validity:** Is the student feature under consideration truly the only one measured?

The assessment depends on
• complexity of the performance that is assessed,
• the group of learners,
• age or experience of the assessor,
• objectives and expectations that are linked to the assessment,
• ideas or misconceptions of the assessor about the achievement,
• assessor's expectations and prejudices about the students.

2.3.2 REFERENCE NORM

A *reference norm* serves as a basis for comparison (see Paradies, Wester & Greving, 2012, p. 37; Rheinberg, 2014, p. 59). Only when a value is related to a reference variable (standard or reference norm), a concrete statement can be made (see Heckhausen, 1974, p. 48; Klauer, 1987, p. 180f.). Values or judgements are therefore always based on a comparison, e.g. , X is better or worse than Y or X is larger or smaller than Y.
This also applies to a statement such as: Z is good. However, if "Z", is being classified as "good", a reference norm is needed that justifies the judgement "good" (Hippe, 2015). Pedagogical diagnosis distinguishes four perspectives of reference norms: individual, social and criterion-oriented (or subject-criterial).

Reference Norms

- **individual**, i.e. comparing performances of students with previous performances
- **social**, i.e. comparing performances of a student with the performance distribution of a group
- **criterion-oriented**, i.e. comparing performances of a student with an objective requirement

Teachers differ in their causal attribution to explain performances of their students. This is related to their reference standard orientation (German: *Bezugsnormorientierung* (BnO); Rheinberg 2006). Teachers with social orientation pay particular attention to the differences in performance between their students (interindividual cross-sectional comparisons). The performance scores of the individual student are highly dependent on the class average. In order to compare performance, these teachers use the same or equally weighted tasks for all students, which makes differences in performance between pupils particularly clear. The performance remains relatively stable in such classes, individual performance changes do not stand out clearly.
Teachers who (additionally) apply the individual norm, pay more attention to the performance development of the individual students (intraindividual longitudinal comparisons) when sanctioning. This makes individual learning growth more pronounced. Less time-stable causal attributions such as interest serves the declaration of performance, tasks are more individualized (Rheinberg 2006).

Rheinberg (2001): Teachers Reference-Norm Orientation and Student Motivation for Learning

2.3.3 ASSESSMENT ERRORS

The most used academic performance criteria are school grades. However, empirical research (Edgeworth, 1888; quotes from Kronig, 2007, p. 11; and von Ingenkamp, 1969, 1971a) demonstrates that grades lose their significance outside the individual school class. Depending on the level of achievement of a college class, students can achieve completely different grades for the same performance (Kronig, 2008). Grading may be influenced by assessment or judgement errors. These errors have often been described in the context of socio-psychological textbooks (based o Hasemann, 1964, p. 82 6 ff.; Jürgens & Lissmann 2015).

Assessment Errors

- **Bias towards middle/extreme judgment**, i.e. grading extent not fully utilised
- **Mild/strict effect**, i.e. students judged in a beneficial/disadvantageous way
- **Primacy/ Recency effect**, i.e. first/last seen material influences the overall judgement
- **Contrast effect**, i.e. the order of exams affects the judgement
- **Logical error**, i.e. false logical conclusion from one feature to another
- **Halo effect**, i.e. falsifying judgements based on a protruding feature
- **Big-Fish-Little-Pond effect**, i. e. combination of social reference norm and contrast effect
- **Pygmalion effect/Rosenthal effect**, i. e. good expectations lead to good performances and vice-versa

2.3.4 ASSESSMENT EFFECTS

Assessment influences all aspects of students' education (Brown, Rust & Gibbs 1994; Gibbs, 2006). According to empirical findings the increased use of formative assessment (or assessment for learning) methods and systems influence student behaviour and learning. Negative performance assessment can cause negative emotional reactions, which in turn block learning motivation. Together with overwork and monotony, negative assessment leads to the so-called anti-flow. If these intense feelings of displeasure become particularly strong, this can lead to effort avoidance. If teachers apply the individual norm for assessment which promotes internal, unstable and controllable attributions (attributions are perceptions about the causes of success and failure, see Determinants of Student Performance), then students show less fear of failure and belief more in success; in less fear of examination and lack of school; in more realistic objectives, in more favourable causal attributions and self-assessments; im more achievement motivation and less helplessness; in higher co-operation in lesson, in more fun in subject lesson and finally in better performances (Hofman & Siebertz-Reckzeh,

The Impact of Assessment for Learning on Learner Performance in Life Science

Backwash Effect

The backwash effect has been generally defined as the effect of assessment on teaching and learning. Research on the backwash effect argues that quantitatively oriented assessment methods influence students to adopt superficial surface approaches to learning rather than the deep meaning-oriented approaches necessary to achieve high quality learning outcomes (Tang, 1996; Thomas & Bain, 1984; Watkins, 1983). According to Bachman (1990), positive washback occurs when the assessment used reflects the skills and content taught in the classroom. However, in many cases and particularly in high stakes testing, the curriculum is driven by the assessment leading to negative washback; when certain skills are tested with, for example, a multiple choice item format. Hughes claims for the mistrust in tests, since the results of tests do not reflect the students' real abilities. This is why tests are considered inaccurate.

2.4 EFFECTIVE FEEDBACK

Formative assessment is key to helping students improve their learning, help them to assess their current position in relation to specified goals or outcomes and to equip them with the tools to bridge the gap between the two. Research shows that classroom assessments that provide accurate, descriptive feedback to students (even if negative), and involve students in the assessment, process can improve motivation and learning (Black and Wiliam, 1998). Thus, effective feedback must help students answer the following questions (Black & Wiliam, 2009, p. 5):

- **Where Am I Trying to Go?** Teachers need to clarify learning intentions and criteria for success.
- **Where Am I Now?** Teachers need to engineer effective classroom discussions and other learning tasks that elicit evidence of student understanding.
- **How Do I Close the Gap?** Teachers need to provide feedback that moves learners forward.

Formative Assessments Why- When - Top 5 Examples

If feedback is to be effective …

… a review of the relevant literature would suggest the following (Rust, 2002):

- be prompt;
- start off with a positive, encouraging; comment
- include a brief summary of your view of the assignment;
- relate specifically to the learning outcomes and assessment criteria;
- balance negative and positive comments;
- turn all criticism into positive suggestions;
- make general suggestions on how to go about the next assignment;
- ask questions which encourage reflection about the work;
- use informal, conversational language;
- explain all your comments;
- suggest follow-up work and references;
- suggest specific ways to improve the assignment;
- explain the mark or grade, and why it is not better (or worse!);
- offer help with specific problems,
- offer the opportunity to discuss the assignment, and comment.

Black, William (2009): Developing the theory of formative assessment

NOTES

Chapter 3

Determinants of Student's Performance

3.1 INTRODUCTION

School performance counts as a central target criterion, upon which school and class success is measured. Quality teaching is therefore considered to be successful if it is possible to achieve favourable performances (or objective, goals, outcome; see Introduction of this textbook) of students. From a cognitive-psychological perspective, performances can be characterised as declarative, procedural, conceptual and metacognitive knowledge (Schrader, Helmke, 2008, p. 285), where in the context of school, university and further education knowledge acquisition typically means learning (see Unit 1, Chapter 3.1.).

Learning (and teaching) always takes place in context, therefore school performance depends on a variety of factors that can predict and explain differences in performance between schools, classes and individual students. In the Introduction of this textbook, you have already been introduced to the relations of instructional quality features (cognitive activation, classroom management and social support) and student outcome variables, e.g. students' achievement (or performance). However, research studies show that students' performance depends on many more - inter-connected - conditional factors (see Helmke and Weinert 1997, 2010).

More about declarative and procedural knowledge, go to Pedagogical-Psychological Basics Section 3.1

Students‘ performance is the result of a chain of effects that may affect outcome directly and indirectly. Since performance is always the result of individual learner‘s activities, process-related individual student characteristics such as cognitive, motivational or volitional characteristics have the highest correlation with school performance (Helmke, 2006). Individual features are affected by process characteristics of teaching (clarity, comprehensibility, fit, etc.) which in turn are related to characteristics of the school and classroom context (size of the equipment of the school, size, competence level, heterogeneity of the class) as well as the characteristics of the teachers (attitudes, teaching skills etc.).
In addition, extracurricular factors such as the family learning environment, media or peers also play an important role (see also Helmke & Schrader 2006). These various influences are interconnected by way of complex structures.
Teachers relate student performance particularly to student‘s individual characteristics (intelligence, ability, etc. and effort (endurance, diligence, etc.), but also to context factors (e.g. family). The danger of short-term interpretation or false specification is always present. In order to explain school performance or learning difficulties of students, teachers need to relate determinants of performance in assessment processes.

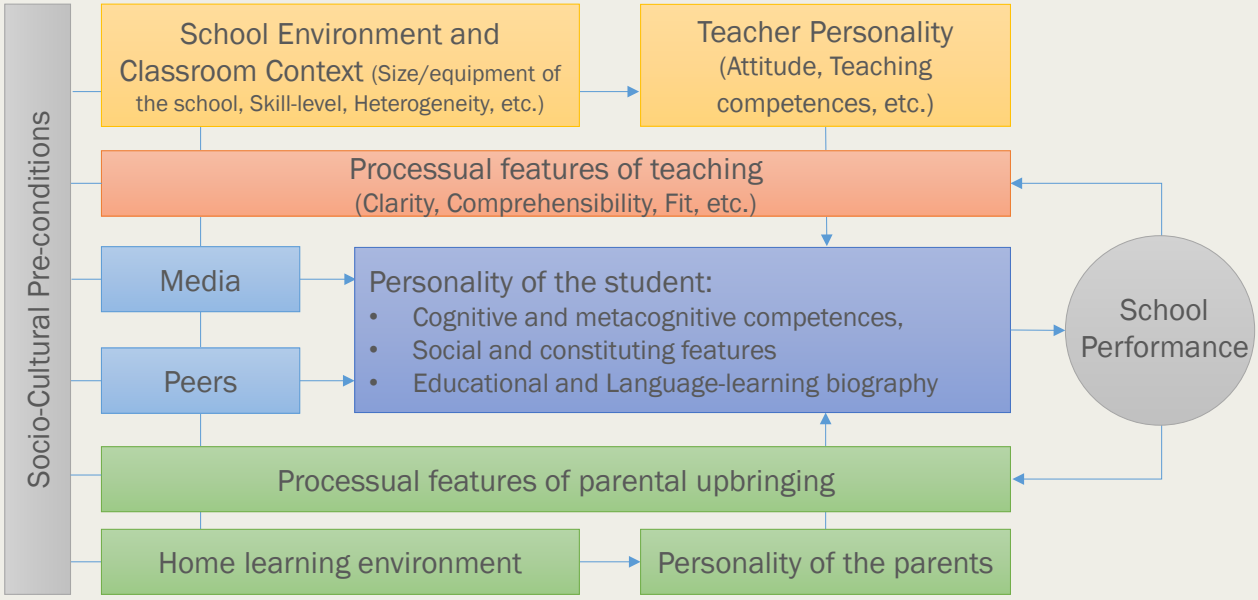


Figure 41| Conditional Factors for School Performance (Source: Own construction based on Helmke & Schrader, 2010)

3.2 PERSONAL BACKGROUND

"Personality" is the "total system of its (relatively) time-stable, individual characteristics" (Pekrun & Helmke 1991: 33), i.e. characteristics that have a certain time-long period and which distinguish individuals from each other. Such characteristics are more physical (e.g. genetic information, neural structures, appearance) and psychological (e.g. cognitive structures, emotional and motivational processes). Most individual characteristics of students are directly linked to their learning success or school performance.

Cognition

The personal feature of student performance is not intelligence, but subject-specific **prior knowledge**. Prior knowledge is significant, as a sustainable factor of new knowledge acquisition demands the linkage of the new information with the already present knowledge. Knowledge deficits cannot be compensated by a high level of intelligence. Intelligence and prior knowledge are not independent of one another. Highly intelligent people are better and faster at building up a high quality knowledge basis, and possibly reach a high-quality level of knowledge than less intelligent people. General **intellectual qualities** seem to be of importance especially at the beginning of the learning process, when relationships and regularities must be recognized and strategies built up and automated. The understanding of teaching plays an important role in the teaching-learning process, which especially depends on language skills. In the custom in which the prior knowledge is gained, general intellectual skills lose their importance" (Schrader & Helmke 2008, p. 292). Highly intelligent students find it easier to close gaps in accounts through their own thoughts and the independent understanding of rules and relationships than less intelligent students. Students with high intelligence are thus able to compensate poor teaching quality within a certain frame, whereas less intelligent and a poor-performing students are more reliant on high quality teaching support (Schrader & Helmke 2008, p. 292). Action-guiding cognitions such as the **self-concepts**, **interest**, **attributions** or **beliefs** are also linked to learning success and (achievement motivation) (Hofman & Siebertz-Reckzeh, 2008).

Metacognition and Learning Strategies

Metacognition generally refers to the ability to think, plan, monitor and regulate own learning processes. Metacognitive skills are an important basis for the successful use of learning strategies. Learning strategies "are target-oriented and consciously controlled efforts to affect one's own learning process" (Schrader & Helmke 2008 p. 292). They are important preconditions for success while learning, whereas insufficient or disproportional use of learning strategies is often a result of deficits in the field of metacognitive competences or metacognitive knowledge. Strategies of high quality such as elaboration (establishment of connections, active exposure to texts, finding examples) accompany a high quality of gained knowledge.

Motivation and Volition

Motivational factors are important at the beginning of a learning activity, when the activity is defined and the learning purposes (intentions) are set. Connections between motivational features and performance depend on their context and can vary significantly. Motivational features with the strongest regard are: Aspects of self-concept (self-concept of own abilities, feeling of self-worth, self-efficacy, confidence), fear of performing, learning motivation specifically, i.e. the appreciation of certain learning-results and their effects. Apart from motivaton, volitional factors ensure that the learning intentions are implemented, in particular they serve to shield the once formed intentions against internal and external interferences.

Attention Deficits

Successful learning requires adequate control of attention. Deficiencies in this area, which may cause significant learning difficulties (ADD; ADHD), are considered to be multifactorial disorders and can result in severe learning difficulties (Schrader & Helmke 2008 p. 292). Aside from genetically effected impairments of brain functions, temperament-factors and metacognitive steering processes also play a role.

Emotional Aspects

Emotions are multi-dimensional constructs that consist of affective, physiological, cognitive, expressive and motivational components. Emotional aspects (e.g. joy of learning, fear of failure, fear of success) contribute to the habitual experience in performance situations.

Home Learning Environment

Familiar conditions lie in various attitudes and behaviours of the parents (e.g. accordig to gender etc.), with which the educational and learning opportunities of their children are affected. The choice of school or type of education is exemplary for this, as is their assistance in homework or any other supporting outreach. The level of education of the household head plays a significant role here (Statistics South Africa, 2015).

Social Background

School performance is affected to a varying degree of closeness by the social origin (see Stereotype Threat; international studies such as PISA, TIMSS). Features of the educational system such as early assistance, full-day tuition and early selection of students also play a role. The social class affects „the learning process effectively only in a mediated way and not directly. Social class membership is effected by material and learning resources (such as the availability and quality of books) and in turn influences the familiar learning environment“ (Schrader & Helmke 2008 p. 289).

Spencer et al. (2016): Stereotype Threat

Peer Group

Peers are an important socialisation entity. They support scholastic learning, but can also affect it in an unfavourable way.

Media

TV as the most important medium (Positive and negative effects on the cognitive and social development and school success; effect is dependent on the type of programmee and the age and development status of the child, a high amount of TV consumption affects the child's time-budget in an unfavourable way and limits the quantity of learning)
Use of computers offers several advantages in learning (Possibilities of a better individualisation, realisation of authentic learning environments, enabling circumstanced learning and provoking interactive and cooperative processes).

3.3CONTEXT

Intelligence and prior knowledge are the strongest predictors of school performance (see, among others, Helmke & Schrader 2006). At the same time, there are learning processes at college that influence acquisition of knowledge extendedly (Ceci 1991; Helmke & Schrader 2006).

Teacher Personality and Competence

Active teachers play an important role in the learning success of students. In surveys on what affects the learning performance of students, all interviewees, except teachers, mention the teacher-student relationship. Recognition in the classroom, listening, empathy, care, positive attitude towards others. Student-centered teachers find more engagement and respect and less defiant behaviour in the classroom. Clarity of teachers through organisation, explanation, giving examples, guided exercises and grading.

School and classroom context

The equipment of the school, characteristics of school quality (e.g. the school climate) and characteristics of the school's organisation are important factors in the School context. In the classroom context, they are the performance level, the heterogeneity of the classroom, the amount of student with language problems and classroom size

Process Characteristics of Tuition

Promotive learning and class climate, diverse motivation, structuredness, clarity, target- and competence orientation, support, student-oriented, promoting independent learning, securing, sensible handling of heterogenic learning requirements, cognitive activation, securing the learning process, dealing with mistakes.

Excursus

CAUSAL ATTRIBUTION & STUDENT'S PERFORMANCE

Causal attributions are subjective attributions of causes of perceived events in the environment (Heider, 1958). Causal attributions have a major influence on students' perception about their ability to learn, how they approach learning tasks, and whether they are motivated to stay focused on tasks to completion. Thus, causal attributions for failure and success are determinants of the student's academic achievement. To find explanations for why students behave in a particular way, teachers make causal attributions. Also students make causal attributions when they look for a reason that may have caused the (positive or negative) result. Students differ in their subjective interpretations by relying more on success and failure on **internal** or **external**, **stable** or **unstable**, based on **controllable** or **uncontrollable factors.**

Basic Concept of Weiner's Attribution Theory (1979)
To what do you attribute your performance?

	internal		external	
	stable	*unstable*	*stable*	*unstable*
controllable	Usual Effort / Motivation	Current Effort / Motivation	Usual Support	Current Support
uncontrollable	Ability	Mood, Health	Task Difficulty	(Bad) Luck

Figure 42| Possibilities of a student to explain success or failure in performance situations based on subjectively perceived internal or external, stable or variable and controllable or controllable uncontrollable causes (Source: Own construction based on Weiner, 1979)

To which causes a person relates action results influences their motivation and emotional reactions (anger, pride, gratitude, guilt, shame, and others) as well as expectancy of future success which, in turn, affect achievement strivings and reactions toward others. Impact of success and failure on motivation depends on which causes attributes one's own performance. If students experience frequent failure, they become more helpless and depressed (Burger u. Arkin,1980 in Heckhausen, 1989). *Helpless* learners mainly deal with the causes of their failure, which they mainly think of due to loss of ability (e.g. messing up) or lack of ability (e.g. poor memory). In addition, *helpless* learners concern themselves more often with ineffective solution strategies (than performance-oriented learners; Diener u. Dweck, 1978, p.459 in Heckhausen, 1989). According to available research results, pupils (or students) argue that school contexts mainly cause school failures (Krüger et al. 1972; Reid, 1983). Furthermore, high self-esteem grade school children are more likely than low self-esteem children to attribute their success to "ability" and their failure to either "lack of effort" or "bad luck". Teachers relate student performance particularly to student's individual characteristics (intelligence, ability, etc. and effort (endurance, diligence, etc.), but also to context factors (e.g. family).

Weiner (2010): Attribution Theory

GENDER DIFFERENCES IN ATTRIBUTION STYLES

Various studies have shown that girls have unfavourable attribution patterns. Girls attribute success less to their abilities and attribute failures more to a lack of skills (Dickhäuser & Meyer, 2006; see also Horner's study *Fear of Success*).

Reasons for Differences:

Negative self-awareness of women and girls (Deaux, 1984; Rustemeyer, 1998).
Adoption of skill assumptions or attribution patterns communicated by teachers and parents (Dickhäuser & Meyer, 2006; Graham, 1990; Meyer, 1982; Tiedemann, 1995, 2000).

"SELF-HANDICAPPING": THE FEAR OF FAILURE?

Fear of failure has been defined as "persistent and irrational anxiety about failing to measure up to the standards and goals set by oneself or others" (American Psychological Association 2007, p. 369 in Martin, A., 2012). Research suggests that students who fear failure are likely to utilize cognitive strategies such as putting a barrier or handicap (including procrastination, test anxiety, illness, shyness, drug or alcohol use, lack of sleep, and overinvolvement with friends or activities) in the way of one's own success. If one fails, then the failure can be attributed to the handicap rather than on (the lack of) one's innate ability. Self-handicapping was first defined in 1978 by Steven Berglas and Edward Jones as "any action or choice of performance setting that enhances the opportunity to externalize (or excuse) failure and to internalize (reasonably accept credit for) success" (Berglas & Jones, 1978, p. 406). Well-known triggers for self-handicapping are low, unstable and contingent self-esteem, high self-doubt, and uncertainty about their ability to avoid failure or achieve success (Covington 1992 in Martin, A.., 2012). For teachers, these findings mean that excuses for a lack of effort of students may not be due to their unwillingness or lack of motivation, but should also be viewed from the perspective of protecting their self-esteem. In particular, it is also important for parents' conclusion the appreciation of one's own children does not be related to achievement.

Midgley, Urdan (2001): Academic Self-Handicapping: What We Know, What More There is to Learn

THE "FEAR OF SUCCESS"

The concept of fear of success was first examined by Martina Horner (1970, 1972) when she looked at the stereotypes and biases which discouraged both men and women from pursuing careers in non-traditional fields. In her study, Horner specifically examined stereotypes and biases that were discouraging women from pursuing a career in medicine, a traditionally male-oriented field at the time. Horner concluded that women have "a motive to avoid success or a fear of success'". They feared the negative consequences for their succeeding in traditionally male domains. Such fears are attributed to **societal expectations.** Horner's findings were considered a psychological explanation for women's failure to achieve success at the same level as men in society (Eagle, 2003).

FEEDBACK AND CAUSAL ATTRIBUTIONS

Feedback and the stimulation of appropriate causal attributions can promote a positive self-assessment and the increased willingness to continue to seek performance situations and achieve success in the future. The attribution of failures to changeable causes is particularly beneficial (see Stöger & Ziegler, 2009).

Examples of favourable attribution feedback:

- Success feedback- self-esteem focus (especially if the learner has low self-confidence)
  - You have a lot of understanding of his question.
  - This time, too, you solved the tasks well, you have it under control.
  - Do you see what skills you have in you?
- Motivational focus
  - You learned this thing really well.
  - You learned skillfully.
  - You see, if you pay attention and concentrate, you can do it.
- Failure feedback- motivational focus
  - You gave up too quickly, actually you can.
  - This time you calculated too hastily.
  - If you take a closer look at this, it will definitely work next time.
- Consistency
  - Well done again.
- Consensus information
  - You have solved one of the most difficult tasks.

Liden, Mitchell (1985): Reactions to Feedback: The Role of Attributions

3.4 SCHOOL ABSENTEEISM & DROP OUT

In South Africa, dropout has reached a national crisis. Approximately 60% of first graders will ultimately drop out rather than complete 12th Grade (Department of Basic Education, Republic of South Africa, 2015; Mkwananzi & de Wet, 2014). Whereas gender gap in drop out rates has emerged in many societies in South Africa, there is no gender differential in the levels of school dropout (; Mkwananzi & de Wet, 2014). Those who often stay away from school are more likely to perform worse and therefore face a repeat of a class (PISA 2012). Intensive school absenteeism is one of the significant factors for later school drop out and additionally increases the "risk of many different life-course problems, such as risky sexual behavior, teenage pregnancy, psychiatric disorders, externalizing behavior, delinquency, and the abuse of alcohol, tobacco, marijuana, and other substances" (Stamm 2008; Gubbel et al., 2019). Drop out also has important negative consequences for society (forgone national income and tax revenues, increased demand for social services, increased crime rates; Rumberger, 1987). In order to reduce the risk for school absenteeism and school drop out, it is useful to deal with the issue of school absenteeism as soon as possible (Gubbel et al., 2019). The longer students stay away from school, and distance themselves from school internally, the greater is the effort to motivate them to attend school regularly again. This is partly due to the fact that increased absenteeism usually leads to knowledge gaps, which can lead to poorer grades and frustration, and increase the likelihood of further absences.

de Wet, Mkwananzi (2014): School Dropout among African Adolescents in South Africa:Is there any gender differential?

Risk factors

School absenteeism and dropout are associated with multiple children-, family-, school and peer-related factors. Having a low IQ or experiencing learning difficulties, and a low academic achievement showed large effects (Gubbel et al., 2019). Whereas Gubbel et al. (2019) note that most risk domains for school absenteeism and dropout seem similar for boys and girls, in the South African case there is a significant gender gap in characteristics, reasons and determinants of school dropout among African adolescents (Mkwananzi & de Wet, 2014): "Boy dropout occurs largely as a result of individual choice yet girl dropout in South Africa has underlying reasons embedded in the gender roles and expectations placed on adolescent females. These pressures lead to dropping out of school due to pregnancy, looking after children and not being allowed to go to school by family."

NOTES

Chapter 1

Classroom Heterogeneity

1.1 INTRODUCTION

Vocational education must offer a differentiated and flexible education offer, in order to satisfy the various skills and talents within their possibilities, and support and advance handicapped and disadvantaged students (KM BW, 2007)

In South Africa, as elsewhere, the TVET colleges attract students from diverse academic, socio-cultural and linguistic backgrounds (Mudau, 2018; KM BW, 2019) - and all of them learn differently. The differentiation of the students and the recognition of diversity as a value are the guiding principles of educational policy frameworks. As international comparison display, positive promotion of diversity is an important factor for successful educational processes (Fischer et al., 2014, 16).

DHET (2014): Policy Framework on Differentiation in the South African Post-School System

However, in accordance with the UN Convention on the Rights of Persons with Disabilities, heterogeneity is more than cultural differences. Instead Differentiation demands for consideration of the learning and education requirement for all students in order to promote them in their competency development:

- provide all students with the opportunity to explore their personality
- enable students to take responsibility for their learning
- enable students to learn independently
- enable all students to advance their competences

COLLEGE STRUCTURAL DIMENSION

Student Involvement e.g.,
- Student Tutors
- Student Mediators
- Student Companies

Support Tools e.g.,
- Support Talks
- Remedial Courses
- Supplementary Courses

Counselling e.g.
- Development Talks

Cooperation e.g.,
- Among colleagues
- With Experts
- With Parents
- With Companies

Framework Conditions e.g.,
- Factual
- Spatial
- Organization

STRUCTURAL DIMENSIONS OF A LESSON

Diagnosis and Feedback e. g.,
- Standardized Tests
- Competency Guide
- Observation Forms
- Assessment Forms
- Support- and Development-Plans
- Classwork, Homework

Lesson Principles e.g.
- Competence orientation
- Differentiated Teaching & Learning
- Individualized Teaching & Learning
- Co-operative Learning

Lesson Methods e.g.
- Cooperative Methods
- Project Forms
- Presentation
- E-Learning/ Blended-Learning

Individual Learning and Development Documentation e.g.,
- Observation Forms
- Learning Diary
- Portfolio
- Individual Development Reports

POSITIVE SUPPORTIVE ATTITUDE, BUILDING RELATIONSHIPS UND EXPECTATIONS

Figure 44| Dimensions of Differentiation at TVET Colleges (Source: Own Construction based on Ministry of Culture, Youth and Sport Baden-Wuerttemberg, 2011)

1.2 HANDLING INDIVIDUAL DIFFERENCES: DIFFERENTIATION

Central in the current discussion on good teaching is the question of how to best support students in their individual development.

Differentiation in the sense of social support of the learners is a central dimension of teaching (Helmke, 2017). Differentiation is the design of learning processes that is best tailored to individuals; and comprises three steps:

1. diagnosis of the individual learning requirements and diagnosis-based planning of the learning path,
2. implementation of support measures by structuring the learning time, and
3. reflecting on the success of the measures by reviewing the learning success

Differences in performance and need of any student is the norm in everyday classrooms.
What teachers are preoccupied with are the questions:
- How to react to differences in classes?
- What are the possibilities of differentiation and individualisation?

Heterogeneity Characteristics of Students
(according to Wellenreuther 2005, S. 437)

"The heterogeneity of the students manifests itself in the following characteristics:

Knowledge: Each student in a class has different knowledge skills in the different prior knowledge, so that for each pupil the amount of information to be learned is different.
Intelligence: Students also differ in how quickly they record information and how much information they store in their memory.
Motivation: Besides, students are different in their desire to learn, their fears and their motivations. This has an impact on the level of learning activities in the areas as well as the ability to process information effectively.
Metacognition: For learning, metacognitive differences in the strategies and procedures for problem-solving and their critical assessment is significant."

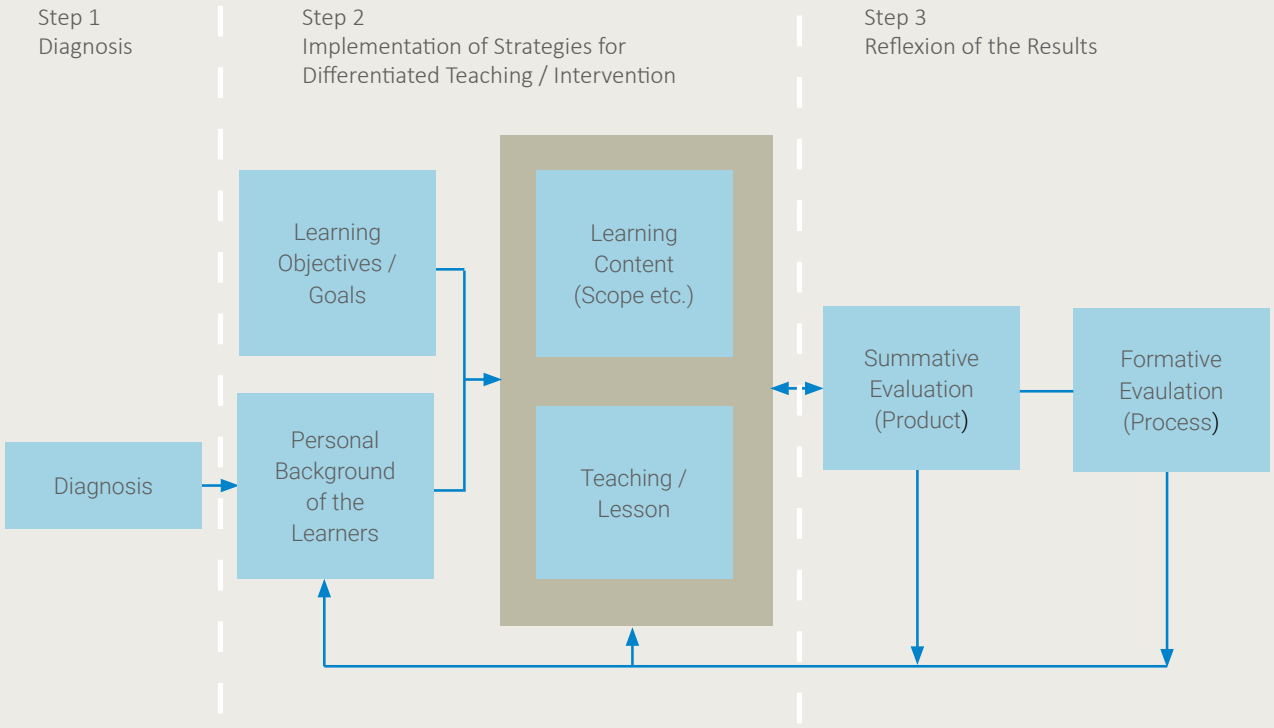


Figure 45| Approach to Differentiation (Source: Own construction based on Oaksford & Jones, 2001 in Coubergs et al., 2017)

INDIVIDUALISED LEARNING & PRACTICING

Individualised teaching is ideal for practicing and strengthening, repeating and controlling what has been learned. In doing so, the individual requirements of the students are:

- "Practice is a form of internalization,
- Intelligent practicing requires tasks that make sense,
- Students should explain as often and as much as possible themselves,
- Practicing in concentric circles is: repeat- vary- repeat" (Stricker et al., 2012).

1.2.1 PRINCIPLES OF DIFFERENTIATION

Tomlinson (2005), a leading expert in this field, defines differentiated instruction as a philosophy of teaching that is based on the premise that students learn best when their teachers accommodate the differences in their readiness levels, interests and learning profiles. A chief objective of differentiated instruction is to take full advantage of every student's ability to learn (Tomlinson, 2001a, 2001c, 2004c, 2005). Thus, a teaching / learning setting towards individual promotion has to be changed with respect to:

- less teacher-centered, guided lessons
- diverse methods and content
- more space for open, collective, cooperative and individualized instruction
- suitable, adapted and supportive materials, task orientation & self-evaluation

Certain teaching principles are essential for differentiation of students in the classroom. These principles include:

- **Differentiated Instruction**
- **Adaptive Instruction**
- **Cooperative Learning**
- **Individualized Instruction**
- **Scaffolding**
- **Competence Orientation**

The term **External Differentiation** describes measures at the level of schools or courses with the aim of forming homogeneous groups permanently or for a longer period of time (e.g. assigning learners to different types of school or setting up support courses within the school).

SOCIAL PARTICIPATION AND TEACHER'S REFERENCE NORM IN DIVERSE CLASSROOMS

Extensive research documents the influence of the quality of teacher–student relationships on children's current and future school adjustment and achievement (Furrer & Skinner, 2003; Hughes, Cavell, & Jackson, 1999; Meehan, Hughes, & Cavell, 2003; Pianta, Steinberg, & Rollins, 1995). Different studies predict that the teachers' high individual reference norm orientation is associated with positive students' peer acceptance, classroom engagement, and sense of school belonging in diverse (and inclusive) settings (Hughes et al, 2006; Krawinkel et al., 2017).

DIFFERENTIATION OF INSTRUCTION

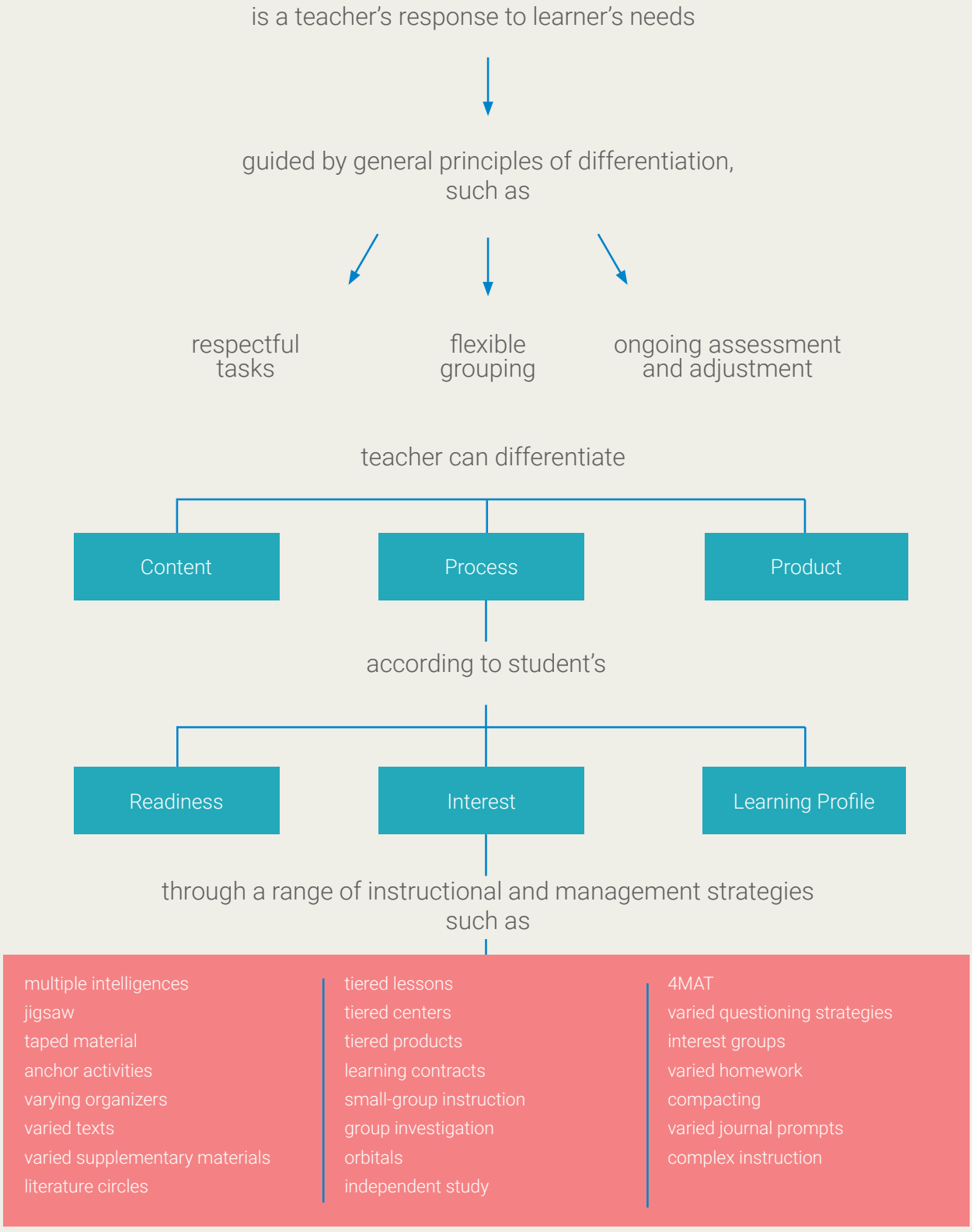


Figure 46| Differentiated Instruction Flow Chart (Source: Own construction based on Tomlinson, 1999, 2008)

Methods of Differentiation
in detail, see Appendix

Differentiated Instruction

Differentiated instruction refers to the criteria-related formation of learning groups with the aim of improving different learning opportunities for different students in the learning group (class) (personal differentiation) or differentiation by objectives, content or methods and media (didactic differentiation).

Flexible groups are at the heart of differentiated teaching. Teachers design their lessons around the needs of each group. The same students are not in the same group for every activity or assignment, but each student moves around according to his or her abilities. For example, one group might write a paragraph after listening to a reading, while another group puts on a skit. A third group might create a poster or an art project to show what they've learned. Students may read books on topics that are closely matched to their reading levels.

Differentiated Instruction Why- How- and Examples

Adaptive Instruction

Adaptive teaching is a teaching principle that tries to create an optimal fit between student's individual differences (prior knowledge, learning style etc.) and resulting requirements at achieving a common instructional goal. Adaptive teaching according to Borich (2011, p. 41) applies "different instructional strategies to different groups of learners so that natural diversity prevailing in the classroom does not prevent any learner from achieving success". For certain students, certain teaching methods and styles are more appropriate than others. Lessons that explore the potential and possibilities in this direction can lead to better learning outcomes for the students.

Ikwumelu (2015): Adaptive Teaching: An Invaluable Pedagogic Practice in Social Studies Education

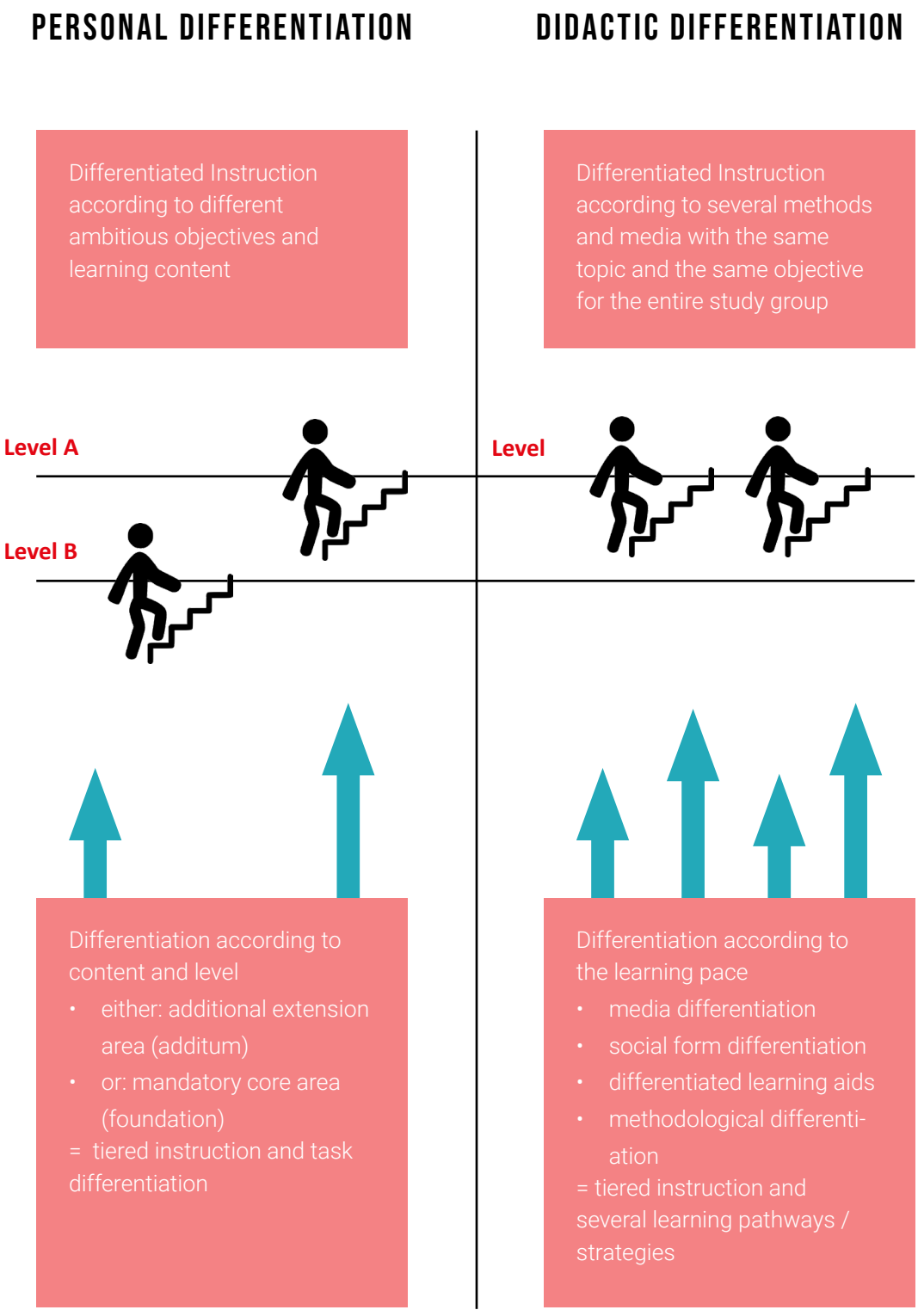


Figure 47| Possible Approaches to Differentiated Instruction (Source: Own construction based on Staatsinstitut für Schulqualität und Bildungsforschung, 2017)

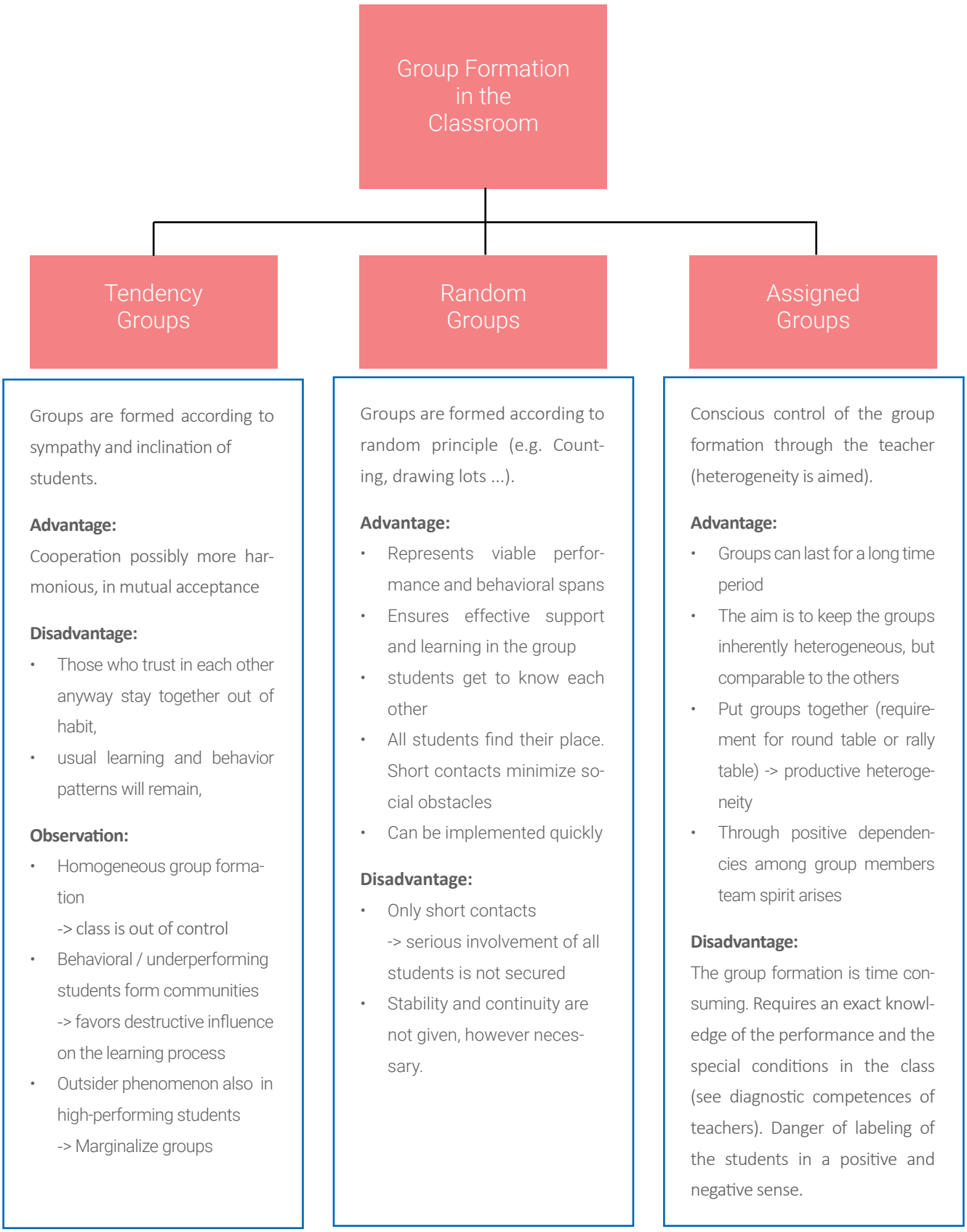


Figure 50| Group Formation in Classrooms (Source: Own construction based on Staatsinstitut für Schulqualität und Bildungsforschung, 2017)

Differentiation by Changing Form of Representation

Students differ in the way they perceive their environment and process their impressions cognitively and emotionally. Howard Gardner speaks of “multiple intelligences” in this context. When you offer content in various forms, your students can learn a topic either by means of a technical text, i.e. on a linguistic level, or by means of a diagram, i.e. symbolic representation. There are many other conceivable forms of representation in the classroom. Forms of representation also can be representational, figurative, linguistic or symbolic. The forms thus show different levels of abstraction and can be used for differentiated instruction (Leisen, 2004 in Staatsinstitut für Schulqualität und Bildungsforschung, 2017). At the same time, a change of presentation forms promotes situational interest and motivation.

Spatial Analog Representations:

Objects, Experiments: Language becomes clear and concrete. Especially for foreign speakers non-verbal language is important to ensure understanding.

Non-Spatial Analog Representations:

Image sequences: Here, technical processes (e.g. experiments, design descriptions) are broken down into a sequence of images in order to precisely document the procedure in individual steps. Additionally, students add verbal descriptions next to the individual images.

Video: Learning tutorials are very popular among students. With the help of an educational film, documentation or similar, students learn and talk about a subject, a topic or a sequence. This form of representation has a motivating effect on the learners. As a variant, a film sequence without sound can also be shown and the students set it to music independently. As linguistic support, an outline and / or technical terms can be offered. Another possible product of action within a learning situation could also be one by the students self-created learning tutorial.

Gardner (N.N): Theory of Multiple Intelligences

Differentiation by Changing Form of Representation (continued)

Symbolic Representations:

- Tables: In tables, relationships, contrasts, etc. can be shown in clear and concise linguistic form. Results are often presented in this form.
- Process: Description (Flow chart): Recurring processes are very often documented in the context of quality assurance through process descriptions. These can also be used for a better understanding of the text. Issues are brought into a structured order, e.g. the procedure when assessing property, plant and equipment.

Linguistic Representations:

- Official documents, legal texts; commentary or annotated legal texts
- Information in understandable language: With the help of different methods, texts can be optimized in a more understandable way. Rules for optimizing texts refer to a word, sentence and text level as well as to the layout.
- Examples of rules for text optimization: Name the work situation or problem (create a heading), adhere to the logical order, structure optically with paragraphs, dashes and markings, form short sentences (only one piece of information per sentence), etc. A text-optimized variant e.g. can also be offered parallel to a technical text.

Linguistic Aids or Text Comments:

- For example, speech bubbles or text fields with additional explanations or definitions, such as for technical terms. The linguistic aids can focus on individual terms, words or groups of words, or sentence constructions. The help can be provided spontaneously, if necessary (e.g. teacher offers additional material for a given task) or building on during the course of the school year (e.g. the pupils continuously create a technical dictionary or an index card system). Further possibilities are e.g. formulation aids in the form of discussion plans, markings, structures, picture-word cards, word railings, etc.

Mathematical Representation:

- Formal language and mathematical representations are abstract representations of facts and phenomena, and generally understandable.

(Adapted and translated from Schulqualität und Bildungsforschung, 2017)

Cooperative Learning

In cooperative (collaborative) learning, students work in small groups, to support each other in order to build acquiring knowledge and skills. Here learning is active, independent and social. Cooperative forms of teaching are learner-centered, because during the learning process, the teacher is generally in the background. At least two, but mostly three to five learners constitute a study group. Some methods are specially developed for dyadic tutorial learning: Occasionally the terms Peer-Assisted Learning (or Peer Learning or Peer Tutoring) are used to implement learning in (mostly heterogeneous) groups (Hasselhorn & Gold, 2017, p. 301). Cooperative learning follows a socio-constructivist idea of teaching and learning. The teacher acts as a advisory moderator who initiates learning primarily to accompany learning processes for which the learners increasingly take responsibility. Cooperative learning is used as a solution for a variety of pedagogical problems:

- improves well-being and
- enhances relationship between students
- prepares for a cooperative work environment
- has preventive effects towards an inclusive, culturally diverse society

Meta-analyses prove the effectiveness of cooperative learning compared to conventional, mostly teacher-centred teaching methods (Hattie, 2013; Johnson, Johnson & Stanne, 2000; Kyndt et al., 2013; Rohrbeck, Ginsburg Block, Fantuzzo & Miller, 2003; Slavin, 2000). Students benefit in particular from the structuring elements of cooperative learning methods or peer tutoring. The guidelines help them to stay motivated and get support from their peers to help them complete the tasks and to understand the content (Büttner, Decristan & Adl-Amini, 2015; Gillies & Ashman, 2000; McMaster & Fuchs, 2002; McMaster, Fox & Fox, 2006). Cooperative Learning does not only improve learning, but improves social relationships and the motivational and emotional conditions of students (Ginsburg Block, Rohrbeck & Fantuzzo, 2006; Slavin, 2000). On children with migration backgrounds and/or from precarious (family) backgrounds cooperative learning has a significantly positive effect.

Zepkte (2018): Supporting TVET Learners' Success with Peer-Facilitated Learning and Active Citizenship

Individualised Instruction

Individualised Instruction focuses on the needs of the individual student, however, Individualisation as a teaching principle does not mean that student is offered individualised lesson. Instead, Individualisation in the classroom takes into account the different performance and achievement levels of the students, different interests and inclinations as well as the emotional situation of students. Thus, instruction is specific and targets one need at a time. Indiviualised Instruction can be used on its own, or it can be part of Differentiated Instruction. Some students who receive Individualised Teaching need teachers to help them understand and learn. Other students using the same teaching method can skip topics they already know and go on to advanced information.

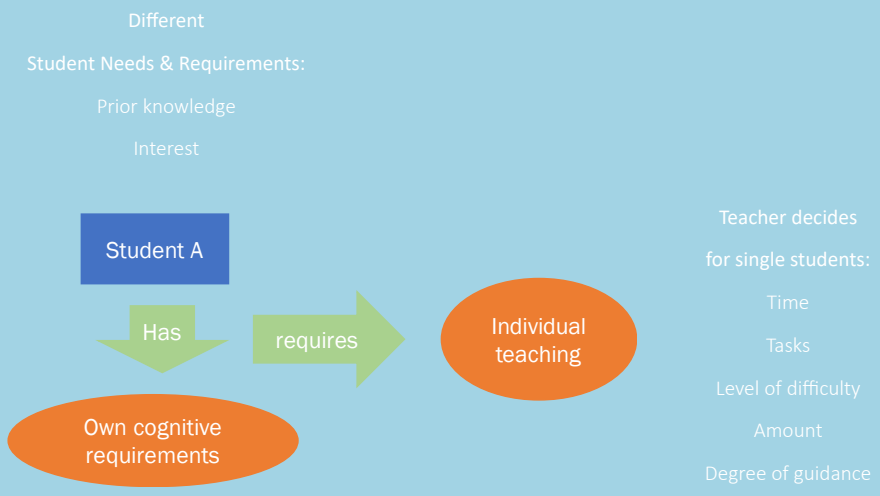


Figure 51| Framework of Individualized Teaching (Source: Own construction based on Wischer 2008)

Individualisation can be implemented in a number of ways, for example:

- Diagnostics and planning of the next steps of learners (self- and external assessment, competence grid, learning diary)
- Self-reflection of learning progress of learners (learning diary, portfolio, plan for promotion and development)
- Different task and time specifications
- Let the learners select individual priorities for learning
- Transparent performance expectations

Scaffolding

Depending on the level of performance of the students, it makes sense that the teacher should provides different support. The students then work on the same task and different support can be used depending on the performance. The learning paths are thus individualised. This is so-called Scaffolding.

Scaffolding instruction as a teaching strategy originates from Lev Vygotsky's sociocultural theory and his concept of the zone of proximal development (ZPD). In scaffolding instruction a more knowledgeable other provides scaffolds or supports to facilitate the learner's development. The scaffolds facilitate a student's ability to build on prior knowledge and internalize new information.

Scaffolding Instruction for Differentiated Instruction

Scaffolding: Dealing with Linguistic Diversity in the Classroom

International achievement studies show the lack of success in educating linguistically and culturally diverse populations worldwide. The Programme for International Student Assessment (PISA), for instance, has revealed that in many countries immigrant pupils (both first and second-generation) perform significantly worse on literacy and mathematics than their native peers (Gille et al., 2010; OECD, 2003, 2004; Schleicher, 2006). In South Africa's diverse classrooms typically involve more than one language other than the language of instruction. Usually only the English language can be used to support multilingual students' proficiency in subject-specific language so they can become productive members of classrooms and, later in society. In practice, this means that very often learners need support for interaction at early stages of learning in their second or foreign language English. Methods of scaffolding can promote pupils' language development and subject-specific competence development.

Ability Grouping

Ability Grouping is the separation of students into classrooms or courses of instruction according to their actual or perceived ability levels. “Opponents of ability grouping argue that such policies tend to segregate students along racial and socioeconomic lines and that those channeled into lower-level classes are frequently provided a substantially different curriculum, thereby continuing a cycle of inequality (Vergon, C., 2008).”

Oswald, Rabie (2017): Rethinking gifted education in South Africa: The voices of gifted grade 11 students

Promotion of Gifted and Talented Students

If highly gifted students should learn appropriately in regular classes or whether they are provided appropriate promotion within grouping, is still much and controversially discussed. Surveys show no uniform picture. Gifted and talented education has also come to the forefront in South African educational policy in general. “Gifted students represent an important component of a nation’s intellectual capital. They possess the qualities needed to find innovative solutions for many scientific and social challenges. Despite inclusive education policy initiatives aimed at ensuring quality education for all, the extant research indicates that gifted students from all socio-economic levels and cultures are neglected in South African classrooms (Oswald, M & Rabie, E., 2016).”

Acceleration	***Enrichment***	***Mixed Forms (Acceleration/Enrichment)***
• Early School Entrance • Mixed Age Groups and Flexible School Entrance • Grade-Skipping (individually or in groups) • Participation in Classes of Higher Grades	• Individualisation • Extracurricular Workshops • Additional (Advanced) Courses • Nationwide Academies & Competitions • Cooperation with Universities and Business Companies • Student Exchange Programmes	• Intensive Courses • Accelerated Classes • Schools with Bilingual Classes • Schools/Classes for gifted and talented Learners • Participation in University Courses (Junior Studies)

Figure 52| Models of Gifted Education and Talent Support (Example from Germany) (Source: Own Construction based on BMBF, 2009)

NOTES

Chapter 2

Cognitive Apprenticeship

2.1 INTRODUCTION

School systems distance themselves more and more from practical work and knowledge is transferred primarily through books and teachers. Hence, the knowledge to be learned is often removed from its practical use and its meaning for practicality, and its application is thus often ignored/not given enough attention. Cognitive Apprenticeship is a teaching and learning model that tries to go back to this practice, but includes elements of the conventional education system. Transferable skills are considered more important than the specific contents of the learning materials (Brown, Collins & Duguid 1989, p. 33 – 39).

Dennen (2004): Cognitive apprenticeship in educational practice: Research on scaffolding, modeling, mentoring, and coaching as instructional strategies

With Cognitive Apprenticeship, abstract themes and topics can also be transferred to students. When solving an abstract problem, the inner processes are made visible. Through this, metacognitive features are transferred to students. The students are taught how to gain knowledge through a certain kind of process, and to come up with solutions independently. The students require a role model in the form of their teacher, who articulates his thought-processes clearly.

2.2 IMPLEMENTATION

A situated learning environment, which is predestined for cognitive control, should fulfil the following 5 requirements:

1. Complex initial task
2. Authenticity and situatedness (Learning environments that orient themselves on life-like/realistic problems and situations)
3. Multiple contexts/perspectives (for the transferability in similar tasks)
4. Articulation and reflection
5. Social context/social exchange

PHASE	DESCRIPTION
modeling	• Teacher serves as an expert who is observed in his actions by the students. • The solving of tasks as well as other cognitive processes is verbalised through the teacher and is thus observed by the students.
scaffold-ing	• Support the students through the teachers. • Teacher is available for feedback and provides assistance when necessary • Teacher is in contact with the students, through which the students slowly edges towards the 'Expert level'.
fading	• Feedback and assistance are individually adjusted for the students (e.g.: demon-strating apart-sequences, written guidelines or hints). • Slowly withdrawing support in order to allow the students to work independently.
coaching	• Other problems or tasks are independently dealt with. • Serves the students to repeat and to compare with the model approach of the teacher.

Figure 53| Methodical Implementation of Cognitive Apprenticeship (Source: Own construction)

2.3 CORNERSTONES OF THE COGNITIVE INSTRUCTION MODEL

The Cognitive Instruction Model has four cornerstones, which help define and implement a learning environment.

Contents

Facts and *modi operandi* are normally the only types of content that recognizes conventional instruction methods which often lie outside the context/scope. This type of knowledge must be integrated in the problem-solving strategies of experts. This includes metacognitive strategies such as planning, defining aims, evaluation and monitoring of one's own learning and teaching strategies, which enable to recognize coherences between the different areas, connecting knowledge and experience to form new knowledge, and learning how one learns as opposed to learning how to memorize for a test.

Methods

Instruction methods must extend beyond traditional teaching models, in which the teacher is a knowledge provider and the students must absorb this knowledge like a sponge. Students should have the opportunity to observe, invent, discover and work with their teacher, who functions as an intermediary. The teacher offers guiding questions or clues, and controls both individual and class progress with regards to the defined goals and aims.

Sequence

Learning should be structured so as to allow students to partake in ever-complex tasks. A lot of features and skills are necessary in order to work in a particular field. Skills should be learned in a defined order, in which students gradually build upon what was previously learned.

Sociology

The learning environment should mirror a realistic scenario as much as possible. Students keep and transfer knowledge best when it is learned in an authentic context. This includes the necessity to learn and work with others to solve problems/tasks and, to execute solutions.

Figure 54| Cornerstrones of Cognitive Apprenticeship (Source: Own construction)

NOTES

Chapter 3

Classroom Management

3.1 INTRODUCTION

"Efficient classroom management is not everything, but without it nothing else will work." — Helmke & Helmke, 2014

"In fact classroom management is a key factor of teaching. Studies show 30% of successful teaching depends on classroom management" — Hattie, 2009

Definitions of Classroom Management cover a variety of aspects that include **activities** and **strategies** that teachers can use to guide student behaviour (Emmert, Evertson, 2017, p. 1), mainly to aim at the maximization of the time-on-task. However, Classroom Management means "everything that a lecturer contributes through activities and attitude to manage all interactions in class while being always aware of the facts that a class is more as the sum of individual parts as well as individual and social learning processes influence each other. The goal must be to establish a class atmosphere in which good teaching and learning processes are made possible, the individual development and protection of a student is guaranteed and paves the way for students to learn (Bildungsdirektion, 2006, p. 1). In addition, efficient classroom management contributes to the learners well-being and reduces stress on the teacher (Eder, 2004; Hascher, 2004; Helmke, 2003; Schönbächler, 2006, 259). A classic and still currently valid research about classroom management can be found in Kounins understanding of Classroom Management. Classroom or teaching management is about supporting a teacher to get along with the learners, **minimize disturbances or difficulties**, **increase the time on task** and to **improve the atmosphere** during a lesson.

Classroom Management

According to the study „Techniques of classroom management", conducted by Jacob Kounin in 1970, prevention of disturbances is the key factor for effective teaching. After years of research, he identified a number of principles of effective classroom management.

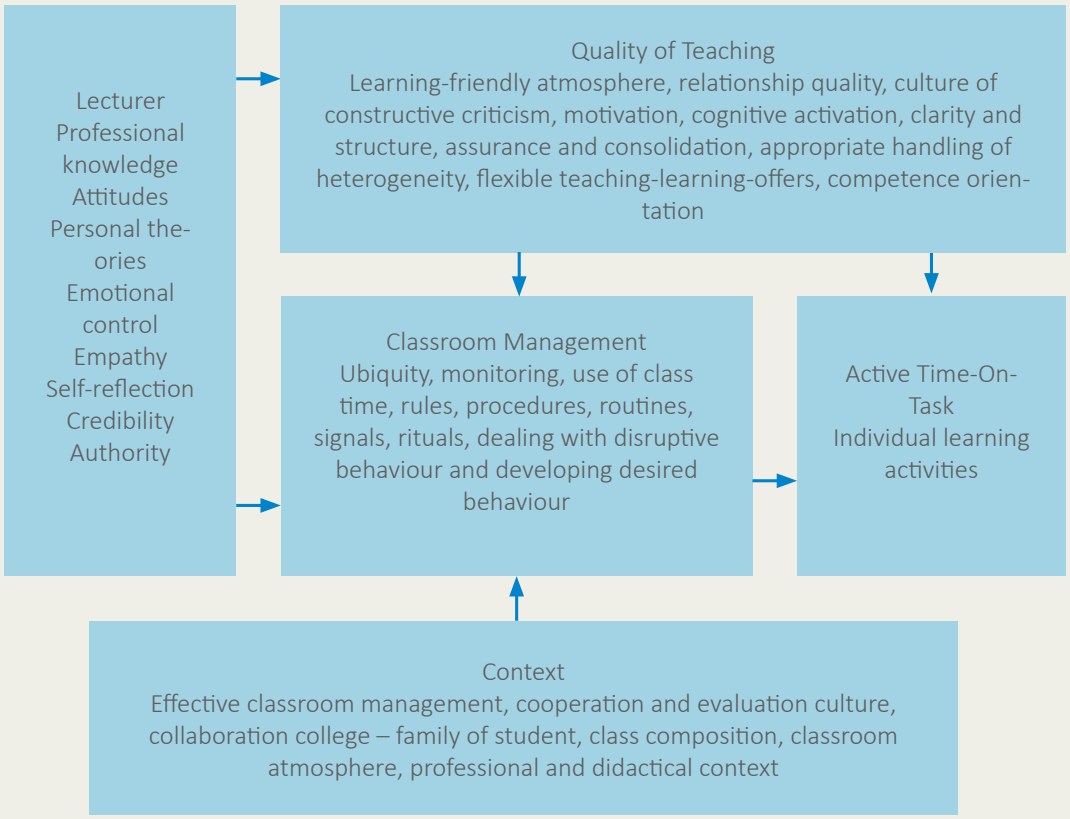


Figure 55| Active Structure of classroom management – General Overview (Source: Own construction based on Helmke, 2014)

Andersen et al. (1980): Dimensions in Classroom Management Derived from Recent Research

3.3 TECHNIQUES FOR BETTER CLASSROOM CONTROL

Everything the teacher does has implications for the classroom, from creating the setting, decorating the room, and arranging the chairs, speaking to the students and and handling their response, developing rules and so on" (Evertson, Poole, 2008, p. 131). Teachers also need to be aware of the students' interests and take them into account in their lessons and assignments. Often, students are not intrinsically interested in learning subjects and get bored if learning activities are not interactive enough (Emmert, Evertson, 2017, p. 7, after Brophy, 2009; Renninger, 2009).
Lesson content, activities and assignments that appeal to the age- and grade-level interests of the students will be more likely to engage them and make classroom management easier. Similarly, having a well-managed classroom will make teaching easier (Emmert Evertson, 2017, p. 7). The prevention of disturbances in the classroom aims to maximize the time on task and is thus an important feature of classroom management.

Monitoring Student Behaviour

To be an effective monitor of classroom behaviour, you must know what to look for. Two categories of behaviour are especially important:

- Students involvement in learning activities
- Student compliance with classroom rules and procedures (Emmer & Evertson, 2017)

Evertson et al. (1994) and Weinstein (2006) are internationally recognized in the research area of classroom management and identify some characteristics to prevent low-level disruptions in the classrooms:

- Before the students' arrival,
- proactive interactions teachers plan once students arrive,
- and proactive reactions teachers prepare when students misbehave

3.3.1 BEFORE THE STUDENTS' ARRIVAL

Preparing the classroom (Physical space)

'Depending on the intention of the lesson, the tables and chairs are aligned accordingly. (For example, if I want all the students to join in a discussion, I suggest a circle of chairs, I guide the lesson, offer front-facing tables, etc.) Thereby the paths to the bookshelves, the exit, and other materials that support the lesson should be considered. The goal is to avoid potential disruptions' (Evertson & Poole 2008, pp. 130 - 139).

Preparing the classroom (Instructional Space)

'The actions that a teacher takes before students' arrival prepares the physical, social, and instructional space to ensure that appropriate goals are set and can be accomplished. Ignoring preparation before students' arrival invites unnecessary complexity to teaching. A lack of action sets up the process of teaching much like building a plane while piloting it in the air, literally flying by the seat of your pants. Effective teachers practice proactive classroom management before students' arrival' (Evertson & Poole 2008, pp. 130 - 139).

Rules, Routines, Rituals

Rules should be introduced as binding agreements of wanted behaviour in a manageable and not overwhelming number at an early stage, clearly communicated and comprehensibly punished. Moreover, their liability character can be increased e.g. in poster form in the classroom or by the students symbolically sealing the deal with their signatures. Rules are particularly effective if they are not unilaterally established, but are reasonable, accepted, and apply throughout the building in the sense of a college-wide policy.

Routines in the sense of procedures, which are often heralded by known signals, ensure a schematized and smooth running of frequently recurring standard situations, for example at the beginning and at the end of the lesson, between lesson phases or in organizational activities.

Even **rituals** are characterized by a consistent behavioural and procedural pattern, but they are more concerned with ceremonial acts with a symbolic-meaningful sense, which is as understandable as possible to all involved. Timing and dosage of rituals must be appropriate in order not to run into an emptiness or provoke defense reactions through exaggerated and meaningless application.

A step-by-step, regular practice is essential to all these controls.

3.3.2 ONCE STUDENTS ARRIVE

Building on Kounin's previous disciplinary criteria, maximizing the time available for teaching is at the forefront of this. The use of the learning time is due to the variables of the disturbance control and the rule-guided procedure. The maximization of the learning time tries to eradicate "time thieves" by the preventive measures. That means the lesson:

- starts on time
- has smooth transitions between the topics
- avoids unnecessary waiting times
- minimises administrative activities or difficulties in dealing with technology and the media.

It is recommended to take enough time at the beginning of the year to teach units with a high emphasis on procedures to set standards for an effective classroom when teaching more complex units. This teaching includes imposing the rules, discussing what these rules look like in action (which can include student role-play), and identifying the consequences of breaking the rules. Teaching these procedures includes explaining the desired behaviour, demonstrating the behaviour, helping students practice the behaviour, providing positive consequences to students for meeting the expectation, and providing instructive feedback when students are not meeting the expectation in full.

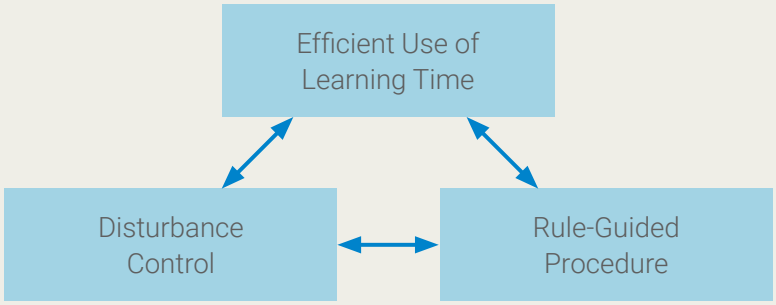


Figure 56| Variables of the Disturbane Control (Source: Own construction based on Evertson & Poole, 2008)

Relational Interactions

To establish an effective classroom building 'trust is a key component' (Evertson & Poole, 2008, 134). 'In learning-centered classrooms, teachers establish norms of participation by creating activities that allow students to practice participating in discussion and then recognizing student behaviours both publicly and privately that support the norm. Making public what is meant by a successful assignment — defined not by mere completion, but by having garnered information from others and have contributed to others' collective knowledge—helps students understand how participation in the classroom manifests itself in academic work.' (ibid.) There are several advantages of that style of learning. First, the teacher can walk through the class giving positive feedback to an individual´s behaviour more easily and support a student more effectively. Second, students can interact with each other without the teacher controlling the conversation. In total there is more participation in class and so a higher learning effect can be reached.

Instructional Interactions

'Teachers use proactive classroom management to keep the interactions going smoothly. Teachers can assess if students are following the flow of teaching by checking student understanding. This check can occur as verbal questions and answers during teaching, seatwork, written summaries, homework, labs, quizzes, tests, or other forms of assessment. By checking to make sure students understand the content presented, a teacher can supplement instruction as needed to avert potential frustration and possible subsequent misbehaviour. Teachers can also assist students with understanding their own learning process by providing instructional feedback. For example, if homework demonstrates a misunderstanding of subject-verb agreement, a written comment to see the teacher for a minilesson can provide timely and informative feedback.'

Evertson, Neal (2006): Looking into Learning-Centered ClassroomsImplications for Classroom Management

NOTES

Appendix

CHECKLIST: HOW CAN YOU PROMOTE INTEREST AND MOTIVATION?

- Offer choices.
- Give opportunities for self-learning in the classroom.
- Involve students in the planning.
- Give individual feedback.
- Compliment students for their progress and positive behaviour
- Do not praise generally, but praise individually. In other words, highlight the special feature of the performance.
- Do not praise on every occasion, but at intervening periods.
- Resort to rebuke and penalties sparingly. Expression of criticism in such a way that the students are not hurt in their sense of honour.
- Avoid condemning students in failure situations. Exposures are to be avoided. Ultimately self-confidence and performance improvements can only be initiated through encouragement and support.
- Don't pamper your students: Pampering encourages the postponement of their needs
- Be careful when attributing performance causes.
- Avoid telling students that their failure is a result of talent deficiencies
- Compare the performance of individual students not only to the average performance of the class but also to the previous individual performances.
- Create a positive class atmosphere.

- Make sure that students feel comfortable.
- Do not only appeal to the students to learn, but also show them how to make learning easier and more efficient.
- Design an interesting beginning of the lesson, which brings the students quickly to the point
- Offer content relevance („personal use“).
- Keep students informed on the intended goals to be achieved together.
- Point out the link between short-term learning goals and long-term goals, in order for students to see a sense of purpose in their daily efforts.
- Master the teaching content according to the principle of gradual achievement of goals
- Combine target achievement with incentives.
- Guide your students step-by-step.
- Support to maintain and increase interest, even with regard to the more difficult and dull sections.
- Design the difficulty level of the learning material in such a way that neither overstraining nor understraining occurs.
- Structure your lesson.
- During lesson planning, think carefully about how the stimulating effects of tension, discovery, and curiosity can be created.
- And at last: BE INTERESTED.

SELECTED DIAGNOSTIC TOOLS

DIAGNOSIS OF THE LEARNING REQUIREMENTS

Biographical Analysis	• Shows previous development of the student up until the current diagnosis • Emphasises special events (Crises, stable phases, ...)
Cognitive map (Mind-map)	• A significant term is noted • Features, and associated terms and associations are added through arrows and connections • Prior knowledge, conceptual knowledge, assessments and connection points for the course of the lesson can be developed and accessed.
Analysis of the learning dynamic	Everything that is either promotive or obstructing to learning contributes to the learning dynamic. In order to analyse the learning dynamic you can ask for following aspects: Action: • Orienting on significant situations or vital needs • Person-, situation- or application-based learning type • Independence • The ability to analyse and plan complex actions • Concentration and attention • Teacher-student-interaction • Necessity of learning aids Learning behaviour: • Learning speed • Stamina/Signs of tiredness • Delayed perception activities • Stamina and perseverance • Ability to adapt or hold on to the known/previously learned • Characteristics of creativity • Motoric clumsiness Memory: • Degree of memory-building/Memory recollection • Salience when using the learning strategies Communication: • Difficult communication due to physical/mental handicaps • Ability to interpret human expressions and signals Flexibility & confidence: • Confidence of the student

DIAGNOSIS OF THE LEARNING PROCESSES

Goals	• Facilitate lesson planning • Provide an overview of students´ previous knowledge and emotional attitudes
Errors Analysis	• Errors as important learning sources • Show where students think differently • The teacher can identify these errors the moment they happen, discuss them immediately and correct them. This immediate correction of an error ensures that there are no feelings of judgement and thus the working and learning process is improved (Pitsch 2015, p. 514).
Learning Diary	• Includes, amongst others, personal successes, aims, and personal learning activites, which are reflected through guiding questions
Researcher Notebook	• Serves to visualise learning and working strategies, thought processes
Portfolio	• Collection of working processes • Usually only working methods are recorded which the students believe that they master • Subsequently a determination can be made according to the missing working methods and techniques which gaps are still there and how they can be closed.
Observation during classroom sessions	• Diagnosis of learning processes allows for inference according to the learning results • Teacher adds to these results through their observation • The classroom session is affected through the task at hand, as the teacher can bring adequate observation situations into the lesson planning
Observable tasks	• Student's/Teacher's activities, behaviours, assignments, impulses, suggestions, learning proposals and consequences
Questions for observation in a classroom session (according to Kornmann, 2012)	• Do the students grasp the impulses and do they show signs of joy and enthusiasm during their activity? • Does the difficulty level of the activity correspond to the possibilities of the individual? • Do the students conform to rules during their activities that serve the spirit of communal playing, learning and working? • Do the students support each other in their activities? • Do the students also find possibilities for independent work/activities? • Do the students monitor their activities?

DIAGNOSIS OF THE LEARNING OUTCOMES

International school performance comparison studies	• Are independent of teaching plans in order to guarantee an international comparison • Thus the use of problem solving tasks
Exams	• Often unsuitable when wanting to display the entire bandwidth of performance possibilities and the aspired targets (Pitsch 2015, p. 519). • Another possibility than the conduction of an exam is classwork attainment. Via a collective review of themes and methods, teachers receive feedback on how their teaching was received by students, what the students understood, and whether certain sub-topics need to be repeated (Pitsch 2015, p. 520). • The division of an exam in a practical and theoretical part allows for both theoretical and practical knowledge to be put to the test.

METHODS FOR DIFFERENTIATION

Rally Coach

Differentiation according to content, level, and tasks ☐	Differentiation according to learning pace ☐	Differentiation according to media and material ☐
Differentiation according to social form ☐	Differentiated according to learning pathway and strategy ☒	Methodical differentiation ☒

This method can be used consolidation and development of learning content. In this method, individual teams compete against each other. The prerequisite in phase 3 is therefore to target the group composition control (seating groups).

Phase 1: Development of a learning area
Phase 2: Determining the performance level
Phase 3: Forming exercise groups

Conditions:
- Each group must have the same number of members.
- The group has a heterogeneous composition.
- The overall performance of each group is equal.

Phase 4: Practicing in small groups or working out new learning areas in the group. The focus here is on cooperative learning. The groups are up to their choice. Free learning strategy. The teacher may be advisory at the side.

Phase 5: Determining the learning success
Each student writes their own test to determine their individual learning success.

Phase 6: Calculating the growth rate, determining the group values with subsequent awards

Phases 4 to 6 are repeated several times with the same group composition.
Phase 3 and 4 are primarily about the principle of “learning through teaching ”.
Through the individual responsibility of the individual for the team result, the positive dependency and interaction cooperative learning is possible.

Think-Pair Share

Differentiation according to content, level, and tasks	Differentiation according to learning pace	Differentiation according to media and material
☐	☒	☐
Differentiation according to social form	**Differentiated according to learning pathway and strategy**	**Methodical differentiation**
☐	☒	☐

This is one of the basic principles of cooperative learning. The process will be in divided into three steps or phases:

1. Think = individual work, individual thinking time
2. Pair = partner or group work, exchange
3. Share = subsequently plenary session and presentation

If necessary, the teacher gives feedback and the results are brought together in a plenary session.

Station Rotation Model

Differentiation according to content, level, and tasks	Differentiation according to learning pace	Differentiation according to media and material
☒	☒	☒
Differentiation according to social form	**Differentiated according to learning pathway and strategy**	**Methodical differentiation**
☒	☒	☒

A Station Rotation Model is in all phases of the lesson applicable (more about lesson phases in your Guideline Lesson Plan). More information in Unit 3 in your textbook of Module 2.

INDIVIDUAL LEARNING AND DEVELOPMENT DOCUMENTATION

Feedback

In methodically structured discussions, the feedback participants exchange their experiences with learning processes to learn from them for the further development of learning, the design of learning environments, and, if necessary, learning about the school conditions. The learners' feedback also gives teacher recommendations, for example, whether tasks are presented in a clearer, more understandable, or more challenging manner or whether or which competencies for self-regulation should be trained in even smaller steps. Feedback is one of the most important factors influencing the performance development of the learners.

Pedagogical diagnosis and learning path planning

Concrete and targeted feedback from the teacher or from classmates form an important basis for decision-making for the learners' own learning path planning.
The feedback from the students to the teacher enables the teachers to create a good fit of the learning opportunities.

Learning time management

Effective feedback is integrated into lessons and planned in line with the specific teaching activities.
On one hand, feedback in the classroom enables teachers to monitor the cognitive activation of the students. On the other hand, feedback integrated into the lessons enables targeted impulses, hence enhancing constructive support.

Reflection

Feedback from students allows teachers to see their teaching through the eyes of the learners. Simple praise or criticism are hardly effective. It is about students and teachers investigating questions in concrete teaching, reflecting on their own learning process and highlighting learning difficulties.
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Figure 58| Feedback as a methodical element of individual support (adapted and translated from Ministerium für Ministry of Culture, Youth and Sport Baden-Wuerttemberg, 2019)

Learning Diary / Portfolio

Students write down in the learning diary daily on which interdisciplinary and professional competencies they have successfully worked on, what was important to them, or where questions remain unanswered. Reflection creates a basis for planning the further learning steps.
Portfolio work includes collecting, selecting, and commenting on learning products and how they came about. Learning thus becomes individually comprehensible. Depending on the reference, purpose, and content, a distinction can be made between a development portfolio (self-determined, learning-related) and an assessment portfolio (performance-related, self-controlled, assessed). Learning diary and portfolio can serve as a basis in the learning counseling session.

Pedagogical diagnosis and learning path planning	*Learning time management*	*Reflection*
The learning diary/portfolio documents the learning paths and learning results of an individual student. The teachers derive the learning level by comparing the current learning level with the requirements specified in the education plan. The learning path can thus be always adapted to the level of learning time..	Learners collect and document their learning results in their portfolio and thus obtain an overview of learning products and learning paths. Learning successes become visible and can contribute to the motivation of the students. For teachers, the portfolio offers the possibility of providing assignments and/or learning aids. Individualized tasks or working procedures can also be made available.	The learning diary/portfolio serves as an instrument for evaluating learning. • Make learning (, i.e., the learning process and the solution path followed) comprehensible and visible through documentation, • Identify learning strategies, • preparing for learning consultation sessions, • to recognize the influence in which previous learning experiences have shaped one‘s learning and influence it currently, • Identify factors conducive to learning and the influence of previous learning experiences.

Figure 59| Learning Diary / Portfolio as a methodical element of individual support (adapted and translated from Ministry of Culture, Youth and Sport Baden-Wuerttemberg, 2019)

Self-Asessment/External Assessment

Regular self-assessment trains the ability to perceive one's own professional and interdisciplinary competencies. Possible guiding questions are: What makes me stand out? What can I do? Do I have an idea of what makes me happy and satisfied? Where do I want to go? Is what I am currently doing helping me to achieve my goal? The effectiveness of self-assessments is supported by comparing them with external assessments by the teacher.

Pedagogical diagnosis and learning path planning	*Learning time management*	*Reflection*
The external assessment by the teachers provides relevant information on the learning level of the students. It is the prerequisite for an educational diagnosis. In comparison with the self-assessment of the students, the understanding of one's learning path is deepened.	Regular self-assessments regarding various technical and interdisciplinary competencies enable the pupils to increasingly perceive their level of learning or development realistically and to select suitable learning opportunities. Similar external assessments by teachers support the certainty of the students' perceptions.	Self-assessment of one's achievement level has the highest effect on learning. Aids for reflection and referencing: • Competency frameworks • I-can lists • Level-differentiated learning tasks • Tools for self-evaluation (guiding questions, learning diary/portfolio) Instruments for comparison with an external assessment are: • Performance diagnostics • Learning consultation ses-

Figure 60| Self-assessment/external assessment as a methodical element of individual support (adapted and translated from Ministry of Culture, Youth and Sport Baden-Wuerttemberg, 2019)

Advanced Organizer (AO)

An AO provides an overview that is reduced to the essentials, links new information with existing prior knowledge and everyday knowledge thus offering the learners constructive support.
As many aspects of learning content as possible are presented in a meaningfully ordered context. For instance, Image, concept, color, episode, and personal experience thus forming a meaningful field to which new things can be connected.

Pedagogical diagnosis and learning path planning	*Learning time management*	*Reflection*
The AO outlines the upcoming learning path in terms of content. This makes it possible to compare the students' learning status in a structured manner. Planning of the learning path can thus always be based on previous knowledge in a meaningful and cognitively active way.	The AO provides orientation in what is to be learned and is thus an important instrument for self-direction in learning. It also serves as a justification for the selection of a suitable learning offer by the learners. The learners can supplement the AO accordingly in case of in-depth (additional) tasks.	With the AO, learners can reflect on how much prior knowledge they can link to the learning situation, • how much prior knowledge can be linked to the learning situation in advance, • which contents are relevant for the perception of the learning situation, • whether the knowledge they have acquired in the learning process is related to the subject matter, • to which „branches" they would like to link their further learning • Individually created AO makes it possible to make the structure and the result of one's own learning visible.

Figure 61| Advance Organizer (AO) as a methodical element of individual support (adapted and translated from Ministry of Culture, Youth and Sport Baden-Wuerttemberg, 2019)

Goal-setting process

To set targets, the specific goals of the learner are discussed and recorded to guide the further learning process. By regularly reflecting on the achievement of goals, positive and negative factors can be identified.

The target formulation should consider the „SMART“ formula: S- specific, M- measurable, A- accepted, active, R- realistic, T – Time-bound. Goals that are not comprehensible are often not pursued or only pursued in the short term.

Pedagogical diagnosis and learning path planning	*Learning time management*	*Reflection*
The comparison of the learning objective with the current level of learning opens up possibilities for tailor-made/goal-oriented learning path planning. Goals formulated by the students themselves contribute to motivation according to experience and are more likely to be implemented later on.	The concrete goals of the target agreement help the learners to select suitable tasks themselves and to organize their learning paths.	Self-assessment of one‘s achievement level has the highest effect on learning. Aids for reflection and referencing: • Competency frameworks • I-can lists • Level-differentiated learning tasks • Tools for self-evaluation (guiding questions, learning diary/portfolio) Instruments for comparison with an external assessment are: • Performance diagnostics • Learning consultation ses-

Figure 62| Goal-setting process as a methodical element of individual support (adapted and translated from Ministry of Culture, Youth and Sport Baden-Wuerttemberg, 2019)

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This book has been developed within the bilateral programme TRAINME in order to promote in-service lecturers in the fields of mechanical and electrical engineering at South African TVET colleges. The programme is designed by Inter-Company Training Center in Eastern Bavaria (ÜBZO) and the University of Stuttgart on behalf of the German Federal Ministry of Education and Research, and DLR in cooperation with the South African Department of Higher Education (DHET).