LESSON PLANNING

AN EFFECTIVE TOOL FOR INSTRUCTIONAL QUALITY

A Guideline

Education is future

MODULAR TRAINING & EDUCATION

IN MECHANICAL & ELECTRICAL ENGINEERING

TRAINME

EDITING

1st Edition

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ABOUT THIS BOOK

This is the companion guideline - Lesson Plan - for the textbook Module 1+2 for TVET Lecturers in Mechanical and Electrical engineering.

EXPLANATION OF ICONS

Further Reading

Watch a Video

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

Cross Reference

CONTENT

Chapter 1

INTRODUCTION

Classroom instruction is the most important area of professional activity for all teachers or lecturers (Kunter, Voss 2013). The quality of classroom instruction is widely accepted as playing a key role for students' learning (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 instructional quality features and student outcome variables, e.g. students' achievement (von Kotzebue et al., 2015).

Research shows a positive effect of the three dimensions **cognitive activation**, **classroom management** and **social support** on motivational and academic student outcomes via characteristics of student learning activities such as depth of processing, time on task and intrinsic motivation.

INSTRUCTIONAL QUALITY

Basic dimensions and their effects on student outcomes

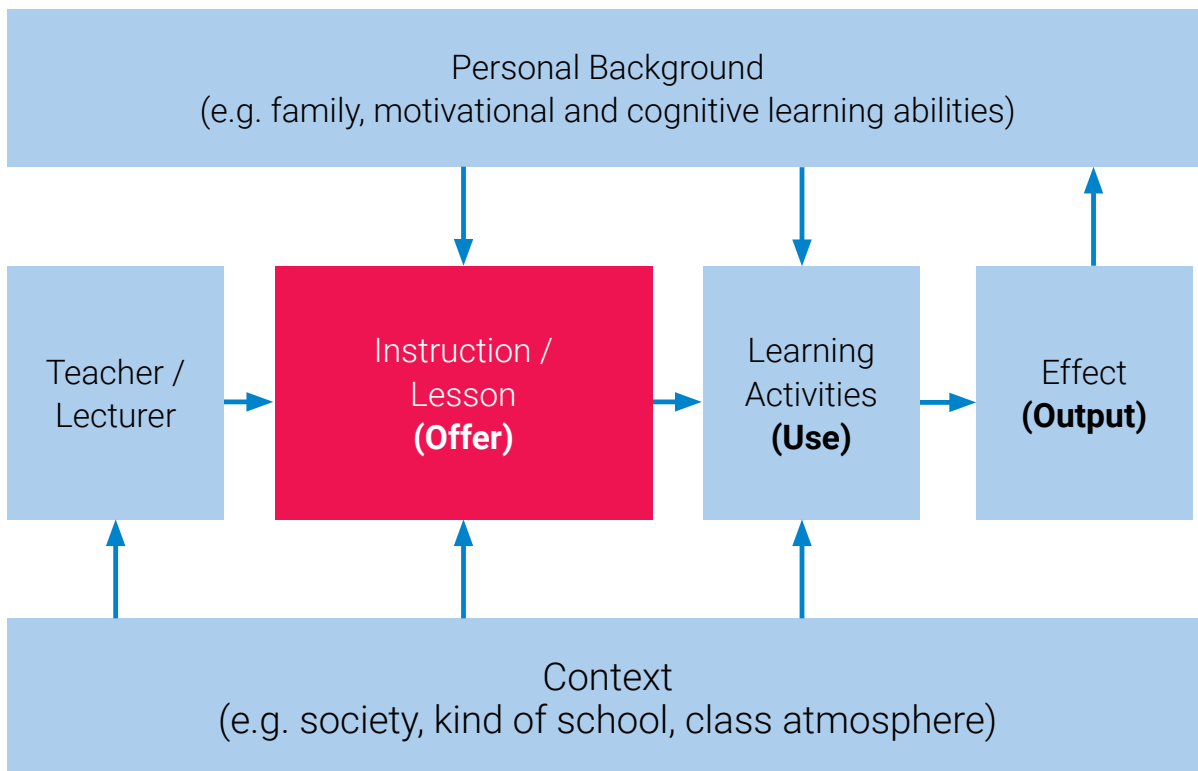|			
Personal Background (e.g. family, motivational and cognitive learning abilities)			
Teacher / Lecturer	Instruction / Lesson **(Offer)**	Learning Activities **(Use)**	Effect **(Output)**
Context (e.g. society, kind of school, class atmosphere)			

Figure 1|Offer-Use-Model (Source: Own Construction based on Helmke, 2012; modified and shortened)

You as a teacher plan & develop, implement and reflect your instruction or lesson.

Chapter 2

FUNCTION OF A LESSON PLAN

Lesson plans help teachers be more effective in the classroom by providing a detailed outline to follow each class period.
A lesson plan is a guide for what students need to learn, how it will be taught, and how learning will be measured.

During the training of lecturers, the design of lesson plans plays a decisive role, as they contribute significantly to their professional development. Lesson plans are a tool to test parts of a lecturer's competences and to develop them. It can also be a tool to reflect parts that flow into lessons routinely and intuitively through experience.

Parts of the chapter **Function is of Lesson Plan** are translated literally or rephrased from the following source: Authorengruppe des Staatlichen Seminars für Didaktik und Lehrerbildung (Berufliche Schulen). (o.J.): Hinweise zum schriftlichen Unterrichtsentwurf für die Lehrerausbildung an beruflichen Schulen. [Tips for written lesson planning in the training of lecturers at vocational colleges]. MKJS (Ed.): Retrieved from: http://www.seminare-bw.de/site/pbs-bw/get/documents/KULTUS.Dachmandant/KULTUS/Seminare/seminar-stuttgart-bs/downloadlisten/referendariat/dl-referendariat-beginn-2016/sembss_160119_Hinweise_zum_schriftlichen_Unterrichtsentwurf.pdf?attachment=true

WHEN YOU PLAN YOUR LESSON ASK YOURSELF

» What is in the curriculum?

» What do I want to achieve with this lesson?

» Where are my students currently and which competences should primarily be focused on and developed?

» Which prior knowledge and learning requirements do I assume have already been gained?

» Which understanding of the object under consideration is scientifically correct? And why do I simplify this correct understanding in my planning?

» Where do the learning opportunities lie within this topic, where do the difficulties lie, where do the connection points to prior knowledge, experiences and interests of the students lie?

» Which materials, which methods, which tasks, which social form and what media are best suited in order to reach my goal?

Answering these questions and relating them in a meaningful way incorporates a lot of knowledge and experience from the lecturer in several areas (pedagogical-psychological knowledge, pedagogical-content knowledge, content knowledge and practice)

IMPORTANT PRINCIPLES FOR THE DESIGN OF A LESSON PLAN

» Lesson specific, learning group-specific.

» Focus on the learning process of the students.

» Making planning considerations transparent.

» Only conduct the parts that are relevant and necessary for the lesson (as detailed as needed, as brief as possible).

» The use of text blocks as examples or internet material must be made visibly clear.

» Distinct under-categories/subheadings are possible.

» Limiting to 5 pages (Without cover page and attachments).

STRUCTURE OF A LESSON PLAN

☞ Template of a lesson plan, see Appendix

A self-written lesson plan should include:

1. Overview and central matter

2. Justification

2.1 Framework (e. g. learning unit)

2.2 Lesson objectives and competence development

2.3 Content

2.4 Teaching and learning arrangement

Attachment

Bibliography

Process Plan

Further materials

FRAMEWORK OF A LESSON PLAN

1	Analysis of the Conditions	1.1	Personal Background	prior knowledge, motivation, interest, beliefs, cognitive abilities, language, culture ..
		1.2	Context	society, class atmosphere ...
2	Didactic Analysis	2.1	Structure of Learning Content	Connecting the lesson specific learning aims with the (mid- and long term) competence development (Clues for the educational plan, educational standards, examinations, day-to-day relevance, etc...)
		2.2	Selection and Reduction of the Learning Content.	What effect should the lesson have to the students competency and in which area?
		2.3	Definition of Lesson Objective(s) / Learning Target and / or Competence Development	Consider - cognitive, affective and psychomotoric domains (see Module 1) - general objectives (see Bloom's Taxonomy)
3	Analysis of Methods and Media	3.1	Teaching and Learning Strategies	According to the cognitive activation, motivation & interest: » Methods » Social forms » Individual advancement » Differentiation
		3.2	Selection of Media / Technology	According to the cognitive activation, motivation & interest: » Media » Technology
4	Lesson Plan	4.1	Definition of the Task / Problem	Task / problems are: » realistic » activating » motivating » interesting » logic
		4.2	Lesson Procedure	Sequence the lesson in an engaging and meaningful manner and consider acquisition, retention, reproduction: »Engaging Opening Activity »Instructional Strategies / Learning Activities (Specify use of methods and media) »Closure Activity Create a realistic timeline Precise the learning objectives (see Bloom's Taxonomy)
		4.3	Assessment & Control	Summative or formative evaluation
5	Further materials	5.1	Sketch of Blackboard / Whiteboard organization	
		5.2	Plan of Seating Arrangement	

Chapter 3

LEARNING OUTCOMES & GOALS

Figure 4 | Pixabay License

Lesson plans help teachers be more effective in the classroom by providing a detailed outline to follow each class period.
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» Limiting to 5 pages (Without cover page and attachments).

An overview of Krathwohl and Anderson Taxonomy.

A Taxonomy for Learning and Assessing

Characteristics of learning objectives:

- Focus on behaviour that is specific, measurable, assessable, achievable, realistic, relevant, time-bound, and testable
- Use action verbs that reflect the level of learning required
- Avoid the use of vague verbs such as 'know' and 'understand'
- Use one action verb per learning outcome
- Describe the conditions/context (if appropriate)

Example:

By the end of the unit learners can:

- Demonstrate the use of a Microcontroller / 3D-Print
- Programme / Draw
- Use the appropriate procedure while applying safe practices
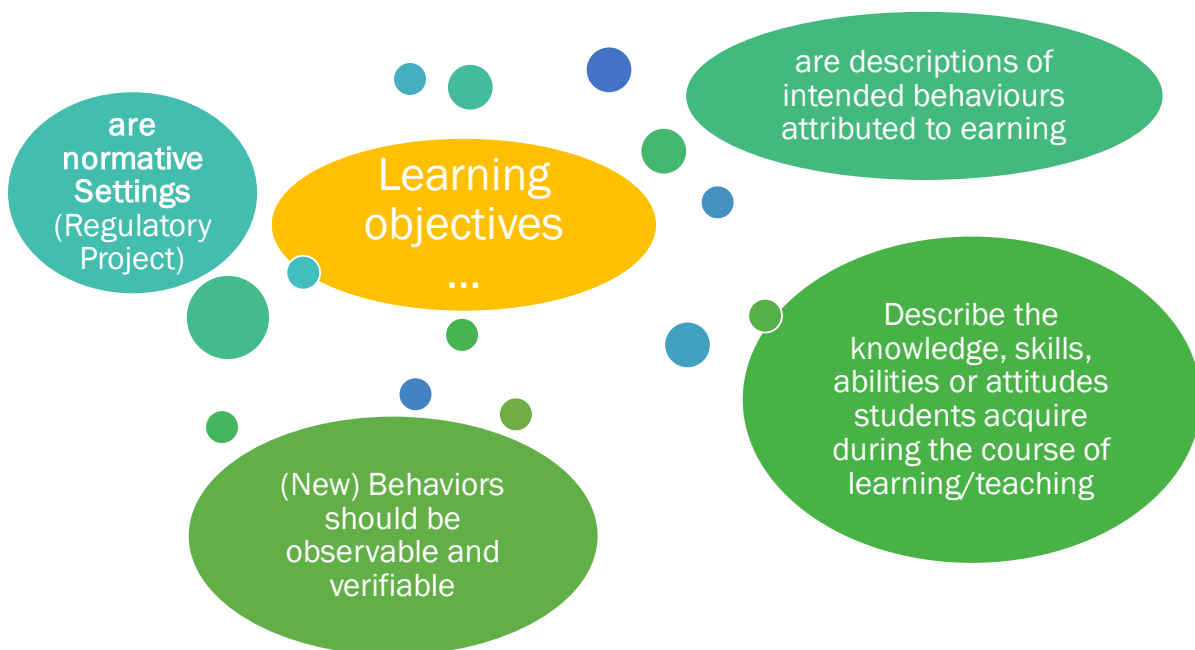- Classify a list of ...

Figure 5|Types of Lesson Goals & Objectives (Source: Own Construction)

1 3

Figure 6|Pixabay License

Chapter 4

LESSON PROCEDURE

With the lesson procedure, you provide a detailed line of your lesson. You describe the phase of strategies/activities/assessments that will be used to scaffold instruction, engage your students, facilitate attainment of the lesson objective(s), and promote higher-order thinking. Within this phase, be sure to describe how the instruction will be differentiated to meet your students' needs, interests, and abilities. We recommend three phases.

Phase 1

OPENING

YOU INTRODUCE THE OBJECTIVES OF THE LESSON AND DISCUSS KEY CONCEPTS STUDENTS SHOULD KNOW. YOU HOOK STUDENTS' INTEREST IN A TOPIC OR SUBJECT.

Phase 2

DEVELOPMENT

THIS IS THE HEART OF ANY LESSON. THIS IS WHERE YOU TEACH. THIS IS WHERE YOUR STUDENTS LEARN. THIS IS WHERE STUDENTS OBTAIN VALUABLE INFORMATION, MANIPULATE DATA, AND ENGAGE IN ACTIVE DISCOVERY THROUGH TOTAL INVOLVEMENT.

Phase 3

CLOSURE

THIS IS THE STEP WHERE YOU WRAP UP A LESSON PLAN AND HELP STUDENTS ORGANIZE THE INFORMATION IN A MEANINGFUL CONTEXT WITHIN THEIR MINDS.

Template of a lesson procedure plan, see Appendix. There are various solutions to outline your lesson procedure.

Phase Model of a Lesson

Introduction	Homework	Task	Repeating	Clarifying prior knowledge

Problematisation by

Presentation Demonstration | Cognitive Conflict | Student Activity | Brainstorming | Attunement

Assigning Topics | Stated Goals

Stating the planned assignment

Guiding Question — Clarifying the task

Developing Phase

Planning the work assignment | Formulating hypotheses | Speculative remarks | Clarifying first impressions

Introducing words | Explaining Terms | Clarifying the situation

Imitation

Guidelines for the developing phase

Teacher presentation | Materials | Attempt | Work instruction for self-production

Training

Explanatory Questions | Free expressions | Students' Questions | Classroom conversation

Work assignment (with teacher's assistance)

Single work | Partner work | Group work | Composition | Debate

Access | Analysis | Performance | Circle conversation

Conversation regarding the results formulation

Answering the guiding question | Solving the task assigned

Securing results

Securing illustrations on the board | Repeat | Summary | Method reflection
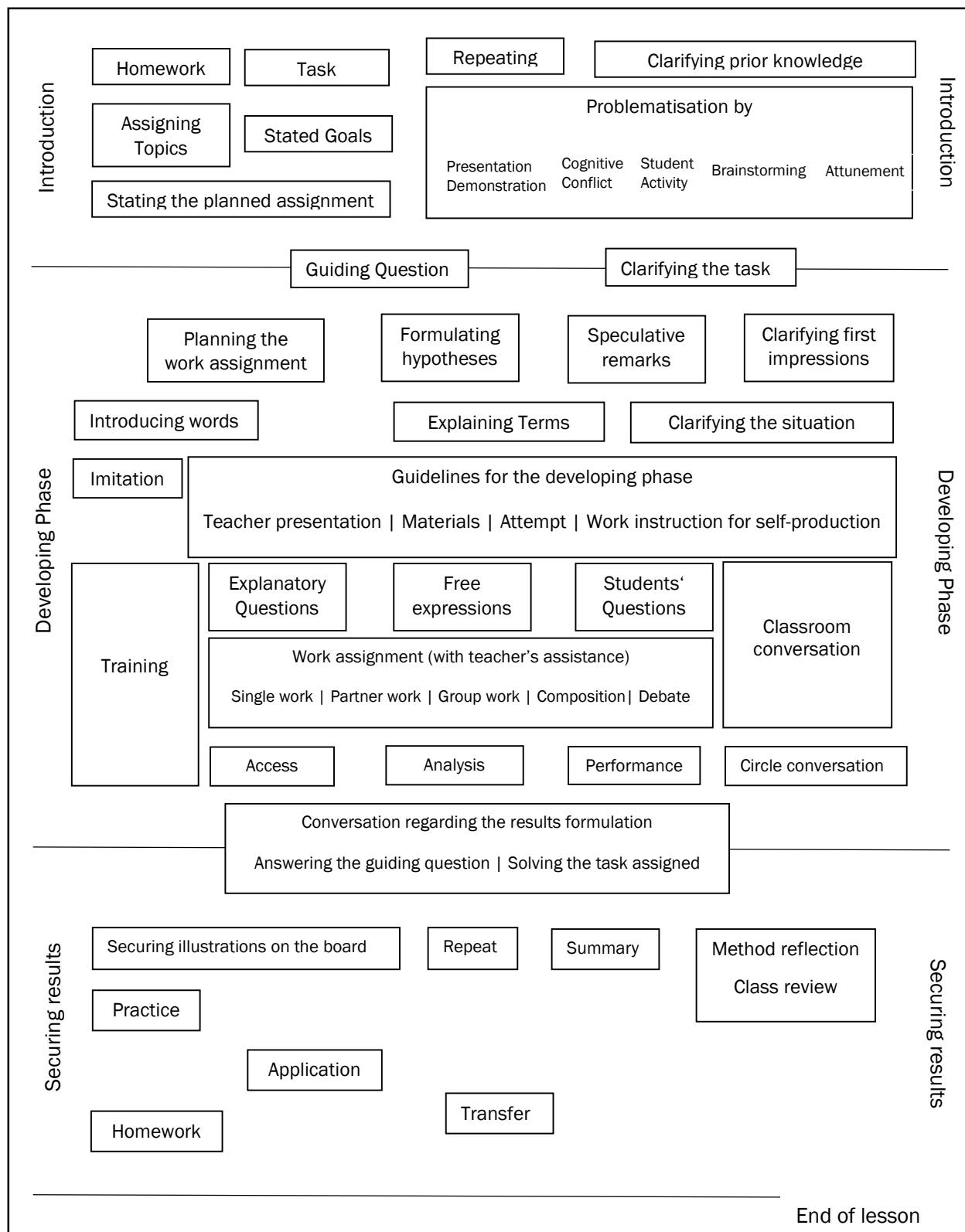
Class review

Practice

Application

Transfer

Homework

End of lesson

Figure 7 | Overview Lesson Phases (Source: Own Construction based on Meyer, 2994)

Phase 1

OPENING

The lesson opening starts a two-way process approach to the topic.

It should motivate the learners as well as clarify the lesson topic.

Figure 9|Source: Sinz, W.

Before you start, it´s important to differentiate between an introduction into a lecture and an introduction into a new topic

The lesson introduction starts a two-way process approach to the topic. It should motivate the learners as well as clarify the lesson topic. Teacher guidance or student activity may vary:

a. It informs/ gives hints for the content and practical course of the current lesson.

b. It arouses interest as well as it motivates the students.

It is either an open or guided introduction. Either way it is ensured it reaches all students.

The initial step logically leads to a question or hypothesis, the clarification of which is the goal of the work phase.

Finally, a red thread arises from the introduction which puts all lesson pieces in a logical order.

Criteria for a Good Introduction

1. Orientation frame
2. Introducing central aspects of a topic
3. Connecting to prior knowledge
4. Discipline
5. Allow active interactions

Importances of Lesson Introduction

A. Trigger Curiosity

B. Address and awaken learners' sense of responsibility for what and how they want to learn themselves

C. Discipline the learners in such a way that a successful and effective collaboration is realized (an aspect that plays a more crucial role in schools than in adult education, but it should not be completely neglected here)

E. Enable the learners to deal with the new topic in a methodical and activity-oriented manner, or even demand it

F. Helping learners to achieve self-awareness within a group, thereby strengthening both self-confidence and confidence in dealing with others

G. Provoke a questioning attitude among learners

H. Guide to the core of the matter, i.e. address central aspects of the new topic

I. Inform the learners about the planned course of further units and thus enabling them to have an accurate orientation framework

K. Build on previous experience and knowledge and connect to the new content, thus linking the old and the new

L. Question familiar and „cherished" habits and knowledge, alienating, even (apparently) devaluing and rejecting them, but also upgrading them

M. Enable all learners to have access to the learning material preferably individually
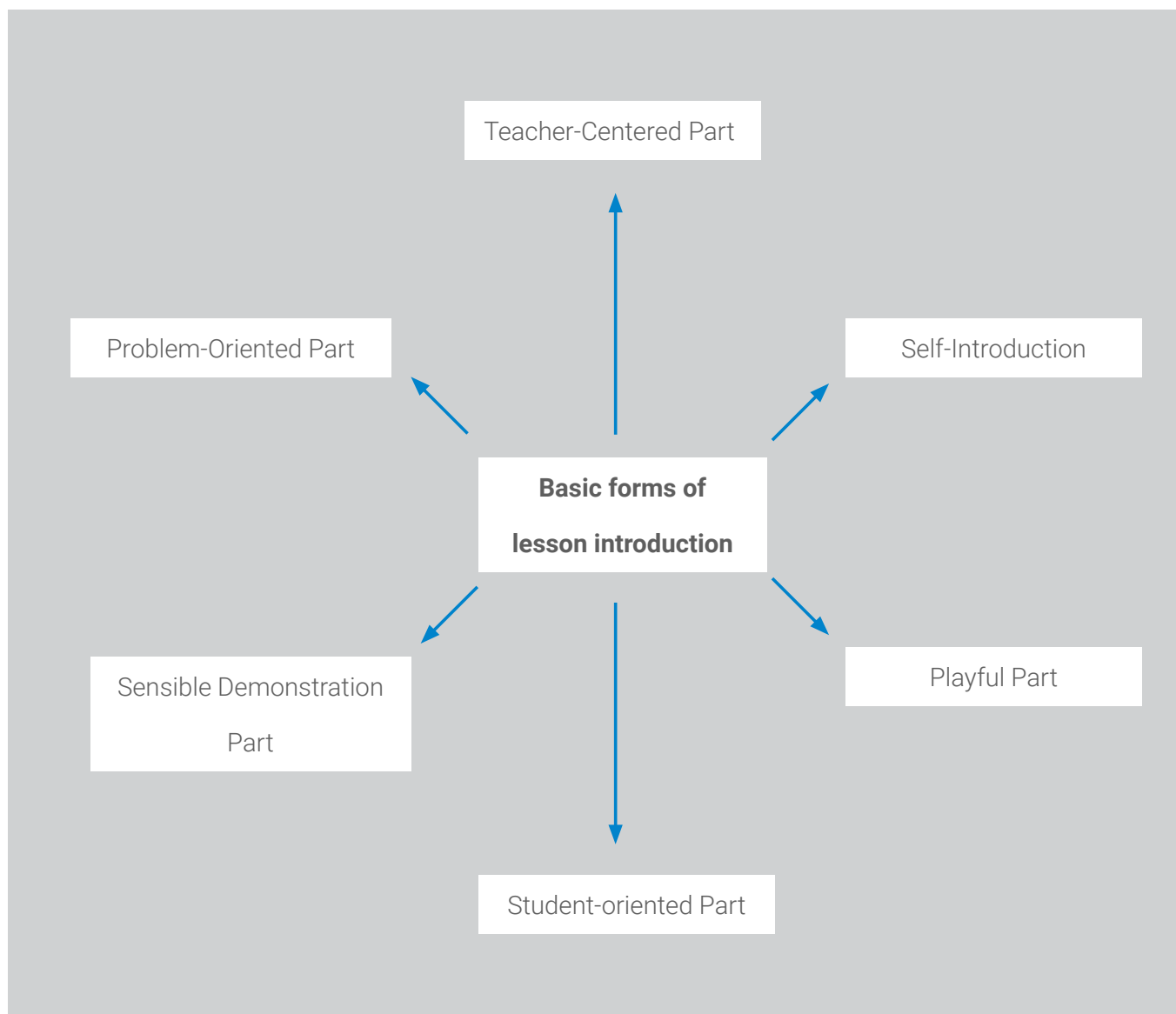
N. Intensify learning processes by slowing down

Figure 10|Basic forms of Lesson Introduction (based on Meyer, 1994)

(Following parts are translated literally or rephrased from the following source: Motivierende Unterrichtseinstiege – eDidact.de – Arbeitsmaterialien Sekundarstufe by Wolfang Sinz)

Phase 2

DEVELOPMENT

20

Objectives of the developing phase

- Clarification of the question or hypothesis raised in the introduction
- Acquisition of new knowledge
- Establishment of expertise and subject competence
- Developing the method competence
- Advancing social and communicative competence

Procedure

- Deepening the previous raised topic by formulating work assignments or other methods (see p. 3)
- Discussion about the material (mostly a proactive student method where they can practise in a set of learning tasks)

Design

- The developing phase is characterized by interactions and a variety of activating methods

Phase 3

CLOSURE OR SECURING PHASE

The goal of closure is to record the new findings in an overarching context (Some of the results may already be saved during the introduction phase).

A possible closing can be...

- Summary: New findings will be summarized on a whiteboard picture, timeline, protocol, etc.

- Repetition: Core points of what was learned (cognitive results) is written down in a logical order. The new knowledge will be repeated in the context of the previous lessons' topic.
- Discussion/ Argument: The new findings are part of a concluding discussion which is embedded in a larger context.

Criteria for a Good Closure

1. Protocolling and documentation
2. Practise and further advancement
3. Critical assessment and reasonable understanding

APPENDIX

LESSON PLAN

SUBJECT:		LEVEL:	
LESSON NUMBER:		WEEK NUMBER:	
DATE:		DURATION:	
TOPIC:			
SUBJECT OUTCOME:			
LEARNING OUTCOMES:			

LESSON AIM(S) Related to curriculum and industry

KEY QUESTIONS (Questions you will ask in class or use as assessment)

LESSON SUPPORT MATERIALS e.g. textbooks, resource books, workbooks, DVDs, posters, textbook, worksheets, handouts, checklists, PP presentations, task instructions, etc.	**ADVANCE PREPARATION** (special) equipment, machines or tools required, space-classroom-workshop, IT facilities, data projector, etc.

	TEACHING ACTIVITIES What will the lecturer do?	**LEARNING ACTIVITIES** What will students do?	**MINUTES**
Introduction and ice-breaker			
Main activities			
Consolidation and ending			

ASSESSMENT
Opportunities and evidence – indicate **informal** or **formal**
EXERCISE/HOMEWORK
In exercise books, on worksheets and /or self-assessment activity
LECTURER'S REFLECTION ON CURRENT LESSON
After your lesson- what went well, where can you improve, what will you do different
FOLLOW-ON
What will be done in the next lesson (adjustments in lesson plan)

EDUCATOR: _____   **DATE COMPLETED:** _____

4.1 THE KNOWLEDGE DIMENSION

MAJOR TYPES AND SUBTYPES	EXAMPLES
A. FACTUAL KNOWLEDGE—The basic elements students must know to be acquainted with a discipline or solve problems in it	
AA. Knowledge of terminology	Technical vocabulary, music symbols
AB. Knowledge of specific details and elements	Major natural resources, reliable sources of information
B. CONCEPTUAL KNOWLEDGE—The interrelationships among the basic elements within a larger structure that enable them to function together	
BA. Knowledge of classifications and categories	Periods of geological time, forms of business ownership
BB. Knowledge of principles and generalizations	Pythagorean theorem, law of supply and demand
BC. Knowledge of theories, models, and structures	Theory of evolution, structure of Congress
C. PROCEDURAL KNOWLEDGE—How to do something, methods of inquiry, and criteria for using skills, algorithms, techniques, and methods	
CA. Knowledge of subject-specific skills and algorithms	Skills used in painting with water colors, whole-number division algorithm
CB. Knowledge of subject-specific techniques and methods	Interviewing techniques, scientific method
CC. Knowledge of criteria for determining when to use appropriate procedures	Criteria used to determine when to apply a procedure involving Newton's second law, criteria used to judge the feasibility of using a particular method to estimate business costs
D. METACOGNITIVE KNOWLEDGE—Knowledge of cognition in general as well as awareness and knowledge of one's own cognition	
DA. Strategic knowledge	Knowledge of outlining as a means of capturing the structure of a unit of subject matter in a text book, knowledge of the use of heuristics
DB. Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge	Knowledge of the types of tests particular teachers administer, knowledge of the cognitive demands of different tasks
DC. Self-knowledge	Knowledge that critiquing essays is a personal strength, whereas writing essays is a personal weakness; awareness of one's own knowledge level

5.1   THE COGNITIVE PROCESS DIMENSION

CATEGORIES & COGNITIVE PROCESSES	ALTERNATIVE NAMES	DEFINITIONS AND EXAMPLES
1. REMEMBER—Retrieve relevant knowledge from long-term memory		
1.1 RECOGNIZING	Identifying	Locating knowledge in long-term memory that is consistent with presented material (e.g., Recognize the dates of important events in U.S. history)
1.2 RECALLING	Retrieving	Retrieving relevant knowledge from long-term memory (e.g., Recall the dates of important events in U.S. history)
2. UNDERSTAND—Construct meaning from instructional messages, including oral, written, and graphic communication		
2.1 INTERPRETING	Clarifying, paraphrasing, representing, translating	Changing from one form of representation (e.g., numerical) to another (e.g., verbal) (e.g., Paraphrase important speeches and documents)
2.2 EXEMPLIFYING	Illustrating, instantiating	Finding a specific example or illustration of a concept or principle (e.g., Give examples of various artistic painting styles)
2.3 CLASSIFYING	Categorizing, subsuming	Determining that something belongs to a category (e.g., Classify observed or described cases of mental disorders)
2.4 SUMMARIZING	Abstracting, generalizing	Abstracting a general theme or major point(s) (e.g. Write a short summary of the event portrayed on a videotape)
2.5 INFERRING	Concluding, extrapolating, interpolating, predicting	Drawing a logical conclusion from presented information (e.g., In learning a foreign language, infer grammatical principles from examples)
2.6 COMPARING	Contrasting, mapping, matching	Detecting correspondences between two ideas, objects, and the like (e.g., Compare historical events to contemporary situations)
2.7 EXPLAINING	Constructing models	Constructing a cause-and-effect model of a system(e.g., explain the causes of important 18th Century events in France)
3. APPLY—Carry out or use a procedure in a given situation		
3.1 EXECUTING	Carrying out	Applying a procedure to a familiar task (e.g., Divide one whole number by another whole number, both with multiple digits)
3.2 IMPLEMENTING	Using	Applying a procedure to an unfamiliar task (e.g., Use Newton's Second Law in situations in which it is appropriate)

5.1 THE COGNITIVE PROCESS DIMENSION (CONTINUED)

CATEGORIES & COGNITIVE PROCESSES	ALTERNATIVE NAMES	DEFINITIONS AND EXAMPLES
4. ANALYZE—Break material into its constituent parts and determine how the parts relate to one another and to an overall structure or purpose		
4.1 DIFFERENTIATING	Discriminating, distinguishing, focusing, selecting	Distinguishing relevant from irrelevant parts or important from unimportant parts of presented material (e.g., Distinguish between relevant and irrelevant numbers in a mathematical word problem)
4.2 ORGANIZING	Finding coherence, intergrating, outlining, parsing, structuring	Determining how elements fit or function within a structure (e.g., Structure evidence in a historical description into evidence for and against a particular historical explanation)
4.3 ATTRIBUTING	Deconstructing	Determine a point of view, bias, values, or intent underlying presented material (e.g., Determine the point of view of the author of an essay in terms of his or her political perspective)
5. EVALUATE—Make judgments based on criteria and standards		
5.1 CHECKING	Coordinating, detecting, monitoring, testing	Detecting inconsistencies or fallacies within a process or product; determining whether a process or product has internal consistency; detecting the effectiveness of a procedure as it is being implemented (e.g., Determine if a scientist's conclusions follow from observed data)
5.2 CRITIQUING	Judging	Detecting inconsistencies between a product and external criteria, determining whether a product has external consistency; detecting the appropriateness of a procedure for a given problem (e.g., Judge which of two methods is the best way to solve a given problem)
6. CREATE—Put elements together to form a coherent or functional whole; reorganize elements into a new pattern or structure		
6.1 GENERATING	Hypothesizing	Coming up with alternative hypotheses based on criteria (e.g., Generate hypotheses to account for an observed phenomenon)
6.2 PLANNING	Designing	Devising a procedure for accomplishing some task (e.g., Plan a research paper on a given historical topic)
6.3 PRODUCING	Constructing	Inventing a product (e.g., Build habitats for a specific purpose)

Procedure Plan (Suggestion 1)

Duration (min)	Aims/Structure sub-phases	Lecturer actions Learning impulses through the lecturer	Student actions Anticipated learning process of the students	Learning situation Teaching/learning arrangement	Media Material
	Lesson Beginning (Introduction)				
	Working out the problem (Work assignment)				
	Evaluation (Presentation)				
	Reflection and deepening (establishing the assessment and securing the results)				
	Transfer/ Homework				

Procedure Plan (Suggestion 2)

Duration	Lesson phase, content	Method, actions	Material, media	Intended result, expected student response

Procedure Plan (Suggestion 3)

Duration	Phase	Lecturer action	Student action	Media

This guide 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 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).