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SPECIALIST STEM VOCABULARY IN GFL LESSONS: WHY? WHAT? FOR WHOM? BY WHOM? HOW?

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FACTS AND INTERESTING INFORMATION – INCLUDING FOR ENGINEERS

Growing demand for “technical” German

There is increasing demand for GFL courses targeted specifically at engineers and students in STEM subjects. They want to learn German so as to be able to use it as a convenient communication tool in their vocational and technical further and continuing education. Motivation and learning success increase significantly when learners discover that German as a foreign language (GFL) lessons can help them achieve this goal – which is why language courses with a particular focus on technical and vocational vocabulary are becoming increasingly popular.

SUBJECT? LANGUAGE? THE SUBJECT-SPECIFIC LANGUAGE AS A MEANS OF COMMUNICATION!

The main problem faced by GFL teachers is and remains their “fear of the subject”. Many stress that they are language teachers, not subject teachers; that they know nothing about math, chemistry, physics or technology; and that they fear that they will not be able to give the right answers to technical subject-related questions.

However, they are confusing two fundamental issues here: in technology-oriented GLF lessons it is not a question of imparting specialist knowledge that the students do not yet have, but of giving them the ability to convey and understand subject-specific content using the medium of the German language. This is something that can be easily learnt in a bridging course that focuses on the specific technical vocabulary used in German STEM subjects.

Young and adult GFL learners (of A2 level and above) who have already studied the subject in question require the foreign language tools to enable them to communicate within the technical context; they need to be introduced to the technical German expressions used in the subject, in both written and verbal form. They wish to be familiarized with the ways in which the German language is used in technical communication.
For example:

- How is a mathematical equation expressed?
- How does one describe an experiment?
- How should a method be explained?
- How does one ask about a result?
- How are different research results compared?
- How should a report about a specific research method be structured?

To put it simply:
The problem is not the equation itself, but how to put the equation into words in German. GFL learners familiar with the subject already understand the content (e.g. the equation); what they want to learn is how to talk about it in German. In many cases it is quite simple sentences and expressions that help learners to find their voice in technical situations – for instance when giving a presentation, discussing or arguing.
e.g.:

Symbolschreibweise (man schreibt)	**Verbalisierung (man sagt)**
$+ \; - \; \times \; \div$	addieren *zu*, subtrahieren / abziehen *von*; multipliziert *mit* ..., dividiert / geteilt *durch* ...
$< \; > \; \neq \; \infty \; \sim$	kleiner als, größer als, ungleich, unendlich, entspricht
$\sqrt{16} = 4$	Die 2. Wurzel aus 16 ist gleich 4 *oder*: Quadratwurzel aus 16 (ist) gleich 4
$a^2 + b^2 = c^2$	a Quadrat plus b Quadrat gleich c Quadrat *oder*: a hoch 2 plus b hoch 2 gleich c hoch 2
a^{-5}	a hoch minus fünf

© Maria Steinmetz(Learners already know how to work out square roots and raise numbers to a higher power; that is not why they attend a German course.)

For GFL teachers with a language background, STEM subjects are often "foreign territory", which is why they tend to avoid such topics. For the learners, however, it is precisely such content that is particularly useful: they want to learn how to form correct sentences in which equations, formulae, units of measurement, measured values, abbreviations, symbols etc. are mentioned, calculations are demonstrated and precise information is conveyed. They need to find a way into reading and processing informative texts within their subject area.

In this context, a textbook entitled “Deutsch für Ingenieure” (i.e. German for Engineers) is very useful. It provides materials and exercises that on the one hand are chosen strictly according to the principle of their subject relevance (topics relating to mathematics, chemistry, power engineering etc.), while on the other hand systematically tackling the specifics of the technical language and its particular features (word formation, syntax, communication methods, text types etc.) following a language didactic approach.

Learning goals:

- to be able to talk to fellow students / colleagues about subject-specific content
- to be able to competently research subject-specific information
- to be able to understand technical literature
- to be able to present technical topics / their own specialist field

Target groups:

- technology-oriented German courses at language schools and universities (of applied sciences) in Germany and abroad
- summer/winter schools with a technology focus
- international exchange programmes between twinned universities
- language preparation for internships and work in German-speaking countries

Prerequisites:

- general language basis in GFL: A2 to B1
- specialist knowledge: basic knowledge for university students beginning STEM degree courses
- interest in technical matters

Justification:

In the field of technical language didactics, the following model has proven useful in technical language teaching:

THREE-PHASE MODEL FOR USE IN TECHNICAL LANGUAGE TEACHING

Phase	Lesson goal and focus	Teachers
1.	Acquisition of a general language basis (A1, A2)	GFL teachers
2.	GFL lessons with a technical language focus: introduction to German STEM languages via technical content acquired during lesson time in the native or target language; with new information added to update and expand learners' knowledge	GFL teachers with support from subject-specific experts
3.	Technical knowledge acquisition in the foreign langue (German) = degree / continuing education at a German university (of applied sciences)	Subject teachers

In other words, it is only in the second phase that the GFL teaching with a technical language focus begins – for which the aforementioned textbook "Deutsch für Ingenieure" is designed.

Structured information:
The twelve chapters of the book tackle the following topics:
training/apprenticeships,
prospects and opportunities for engineers in Germany,
mathematics,
geometry,
chemistry,
materials science,
electrical engineering,
power engineering,
bionics and automation technology,
information technology.

Furthermore, it contains a great deal of information about continuing education in Germany (motivation letter, internship fairs, funding programmes etc.).
The didactic approach is presented in the introduction (workshop report).

The structured table of contents provides an overview of the topics, content, language-structure and communicative aspects dealt with in each chapter, e.g.:

Content	Language-structure aspects	Communicative aspects
Terminology and basic terms; formula symbols in accordance with the International System of Units (SI); measurement of electrical current; measuring and testing; digital measuring instrument	Verbalization and formulation of precise questions about equations and units; non-personal sentences – passive substitute forms; extra-long compound nouns	Technical vocabulary: basic terms, graphic symbols, SI units, abbreviations; use of technical vocabulary to explain, report; instructions for use; recording information

Didactic principles: subject relevance and action orientation
The principle of subject relevance means that it is always a question of content in contexts typical of the subject. Specialist vocabulary is used in and drawn from the respective context; of particular importance is the vocabulary that can be used in many specialist areas (known as “scientific language” in the STEM domain). Texts are for the most part authentic, and language exercises are based on the grammar contained in these texts; they focus on key features of the technical language and lead to subject-related communicative activities – such as describing, defining, arguing, presenting and researching.

Based on the principle of action orientation, information from texts and pictures is combined to create exercises in such a way that language activities come about that are common in technical exchanges. In other words, the focus is on genuine subject-related questions and considerations. The grammar needed to formulate correct answers (in the given example the use of non-personal sentences with “one”; the contrast between passive and active phrases; compound nouns) is incorporated into the exercises. German, in this case the foreign language, is used as the medium for subject-related communication.

Beispiel aus der Elektrotechnik (© Springer Fachmedien Wiesbaden 2014, M. Steinmetz, H. Dintera, Deutsch für Ingenieure, S. 230 – 231)

7.2.2. Fragestellungen vor der Messung

Auch wenn es sich um eine einfache Standard-Messung handelt, sollte man sich vor dem Messen folgende Fragen stellen:

1. Welchen Messwert brauche ich mit welcher Genauigkeit?
2. Wie viele Nachkommastellen* (Erklärung s.u.) brauche ich?
3. Messe ich Gleichspannung (DC), Wechselspannung (AC) oder eine Spannung mit Wechselspannungsanteil (AC)?

Je nach Antwort ist das Messinstrument auszuwählen, der Messbereich einzustellen und die Messart (z. B. Stromfehler- und Spannungsfehlerschaltung) anzuwenden.

www.elektronik-kompendium.de

Achtung * Erklärung: *Mit „Nachkommastelle" meint man die Position oder die Stelle, die eine Ziffer in einer Dezimalzahl nach dem Komma hat. Nehmen wir beispielsweise die Dezimalzahl 0,004: Hier steht die Ziffer 4 auf der dritten Nachkommastelle.*

Aufgabe 13 **a) Formulieren Sie die drei Fragen aus dem Text „Fragestellungen vor der Messung" in unpersönliche Sätze um. Verwenden Sie „man" und Modalverb (man muss, man soll ...)**

b) Zerlegen Sie den letzten Satz in drei kurze Sätze und bilden Sie daraus ebenfalls unpersönliche man-Sätze.

c) Wandeln Sie nun alle man-Sätze in Passivsätze um.

7.3. Digitales Messgerät

Aufgabe 14 **Bilden Sie mindestens zehn Sätze zur Abbildung 3. Mögliche Satzanfänge sind:**

- Hier schließt man ... an
- Hier wählt man ...
- Hier testet man ...
- Hier liest man ... ab
- Hier stellt man ... ein

Beispiele: *Hier schaltet man das Messgerät ein und aus.*
Der Ein- und Ausschalter dient zum Einschalten und Ausschalten des Messgeräts.

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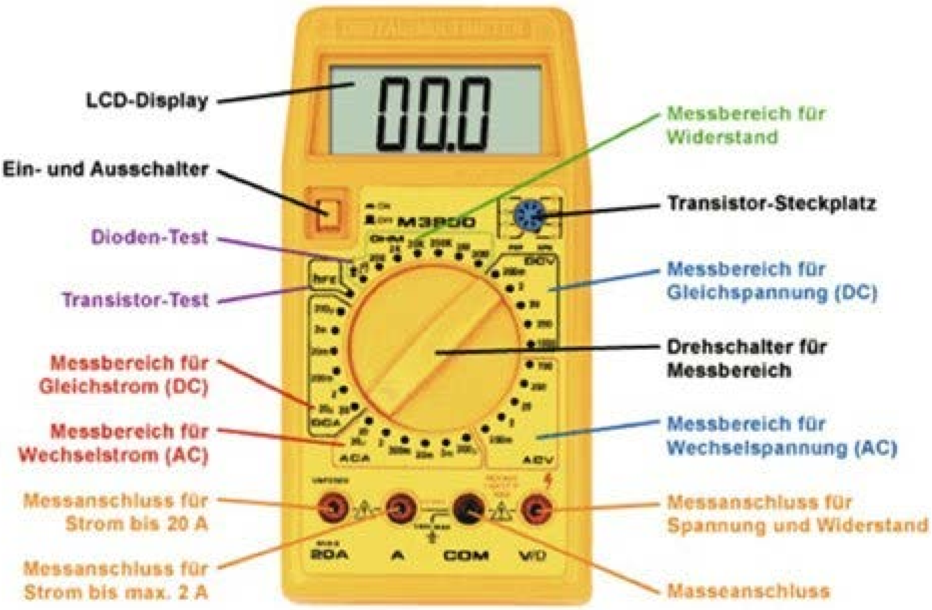

Abb. 3: Digitales Messgerät, © www.elektronik-kompendium.de

Vorteile beim Messen mit einem digitalen Messgerät

Früher hat man analoge Messgeräte verwendet, heute werden vorwiegend digitale Messgeräte eingesetzt. Denn sie besitzen eine Reihe von Vorteilen:

- kaum Ablesefehler möglich
- automatische Polaritätserkennung und -anzeige
- automatische Messbereichserkennung
- weniger empfindlich
- größere Genauigkeit
- kostengünstiger in der Herstellung wegen geringerem mechanischem Anteil

Aufgabe 15 **Beschreiben Sie die Vorteile eines digitalen Messgeräts in vollständigen Sätzen. Verwenden Sie nach Möglichkeit Aktivformen:**
z. B. Das ... Gerät ist ... / kann ... / (tut) ...

TYPES OF EXERCISE

The textbook contains over 400 exercises, divided into three groups:

1. closed-ended exercises – exercises with one clear answer
2. semi-open-ended exercises – exercises with different variants of an answer
3. open-ended exercises – exercises whose answer depends only on the learners.

The answer section contains the answers (for 1) and model answers (for 2), as well as lots of useful help, tips, suggestions for adaptations and didactical information.

WRITING

Being a combined textbook and work book, "Deutsch für Ingenieure" is designed to encourage learners to write and make notes in it.
An exercise book is needed for the many written exercises designed to take the learner further, while Internet access is required for the research. In GFL lessons with a technical language focus in particular, writing has proved especially important:

- as a means of preparing learners to speak
- as a means of giving learners structure in terms of how they think, argue, discuss and research
- as a means of consolidating vocabulary and language structures that are highly redundant in terms of the technical language
- as a basis for giving satisfactory subject-specific reports or presentations

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Dr. Maria Steinmetz

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ABOUT THE AUTHOR

Foto: Jan Strempel © ixme AydihoOriginally from Bavaria,

Maria Steinmetz read Romance and German studies and educational science at Tübingen, Paris, Berlin and Munich. After working extensively in primary and comprehensive schools, she focused her attention on further and continuing training for teachers and was involved in research into German as a second or foreign language, language and migration at the Institute of Language and Communication at TU Berlin. She worked as a DAAD lecturer in China and took her PhD on the subject of “Technical Communication and GFL Teaching” at TU Berlin.
Numerous DAAD specialist courses in Central Asia and the CIS countries with a special focus on technical language didactics and scientific writing.
Co-author of the textbook “Deutsch für Ingenieure” in 2014

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