

RESEARCH ARTICLE

Pharmacy students' perceptions of a competency-based subject catalogue for the first state examination in Germany

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Keywords

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Abstract

Background: Competency-based education models (CBEM) are gaining growing importance in the qualification of healthcare professionals. However, the need for a pharmaceutical CBEM in Germany, particularly a competency-based Subject Catalogue (SC), remains controversial and has not been previously explored. Hence, a survey was conducted to evaluate the expectations of German pharmacy students regarding this topic. **Methods:** An anonymous online survey was administered between December 2022 and January 2023 to all pharmacy students in Germany. The questionnaire primarily used a 4-point Likert scale ranging from “disagree” to “agree”. **Results:** The majority of participants (N = 605) expected benefits from a competency-based SC. More than 90% supported a detailed and precise formulation of learning objectives, along with additional elements, such as competency levels and application examples. **Conclusion:** The study provides recommendations to improve the SC, facilitating pharmacy students' preparation for the first state examination. Furthermore, findings highlight the need for better integrating theoretical knowledge into application-related content.

Introduction

Global developments indicate that competency-based education models (CBEM) are becoming increasingly important in the qualification of healthcare professions such as dentistry, medicine, and pharmacy (Nash *et al.*, 2015; Koster *et al.*, 2017; Medina, 2017; Sánchez-Pozo, 2017; Katoue & Schwinghammer, 2020).

Competency-based frameworks for vocational and higher education programmes, such as the Qualifications Framework for the European Higher Education Area and the European Qualifications Framework for Lifelong Learning, require defined learning objectives (Karseth, 2008; Fischer *et al.*, 2015). For example, in pharmaceutical education, the Netherlands and Switzerland have developed competency-based national catalogues for undergraduate pharmaceutical training (Schalekamp

and Haisma, 2016; Bundesamt für Gesundheit Schweizerische Eidgenossenschaft, 2018).

The German university pharmacy programme is a four-year curriculum divided into eight terms (two terms per year). It is taught at 22 universities and focuses on scientific (drug-orientated) rather than clinical (patient-orientated) aspects of pharmacotherapy (Baecker *et al.*, 2022). A one-year internship is required after the university programme to become a full pharmacist. The legal framework of the German pharmacy programme is governed by the licensing regulations for pharmacists (Approbationsordnung für Apotheker, AAppO), which include the type and content of the state examinations (Bundesministerium der Justiz, 1989).

The state examination is divided into three sections. The first state examination (P1), a nationally standardised written multiple-choice test, consists of four individual examinations, i.e., General, Inorganic,

and Organic Chemistry; Pharmaceutical Biology and Human Biology; Physics, Physical Chemistry, and Pharmaceuticals; and Pharmaceutical Analysis. It can be taken after the second academic year (after the fourth term). Students registered for P1 can continue their studies in the fifth term (third year) even if they have not passed all four individual examinations. However, successful completion of P1 is required for the sixth term. The second and third state examinations are oral examinations after the fourth academic year (after the eighth term) or after the internship, respectively. Examination contents are available in Annexes 13–15 of the AAppO as a list of generic terms divided into sub-areas. For P1, which covers the basics of natural and pharmaceutical science topics (Baecker *et al.*, 2022), the test subjects are specified in more detail in a Subject Catalogue (SC; Gegenstandskatalog), issued by the German Institute for State Examinations in Medicine, Pharmacy, Dentistry, and Psychotherapy (Institut für Medizinische und Pharmazeutische Prüfungsfragen, IMPP). This SC is hierarchically structured into subjects and subject areas (Institut für medizinische und pharmazeutische Prüfungsfragen, 2019). However, many things remain unclear, such as the depth of learning, as neither operationalised learning objectives nor competencies are formulated.

In the 2000s, the German Science and Humanities Council published recommendations for improving teaching and studies in Germany. State examination programmes should be transferred to the Bachelor's and Master's degree systems (Wissenschaftsrat, 2002). Further, degree programmes in all subjects should be clearly structured, course content and timing should be coordinated, and requirement levels and learning objectives should be transparent (Wissenschaftsrat, 2008). Indeed, CBEM is now widely or about to be implemented in German state examination courses in medicine and dentistry (Fischer *et al.*, 2015; Institut für medizinische und pharmazeutische Prüfungsfragen, 2021; Söhnle *et al.*, 2023). Initial proposals were made to modernise undergraduate pharmaceutical training (Alban *et al.*, 2017; Biel *et al.*, 2017; Bunjes *et al.*, 2017; Clement *et al.*, 2018; Friedrich *et al.*, 2018; Ritter, 2018; Laufer *et al.*, 2019) and establish a competency-based catalogue of learning objectives for community pharmacy (Bundesapothekerkammer, 2017). However, these endeavours have not yet been implemented in undergraduate pharmaceutical training. It is, therefore, understandable that the Federal Association of Pharmacy Students in Germany (Bundesverband der Pharmaziestudierenden in Deutschland e.V., BPhD) has been calling for a national competency-based catalogue of learning objectives for pharmacy (NKLP) for years (BPhD, 2023).

There is still a long way to go before an NKLP is established, partly due to unclear responsibilities and partly because it remains debated whether adopting competency-based education in an NKLP should place more emphasis on professional practice. One potential solution to this problem is introducing operationalised learning objectives or competencies into the SC, as the IMPP is responsible for its revision. Given the limited knowledge regarding the benefits and acceptance of a competency-based SC for the P1 examination, this study aimed to explore pharmacy students' perceptions of a competency-based SC and clarify their understanding of "competency-based education".

Methods

Design and sampling

An anonymous online survey collected pharmacy students' opinions and self-evaluations between 20 December 2022 and 31 January 2023. The questionnaire was created using LimeSurvey®, an open-source platform (LimeSurvey GmbH, Hamburg, Germany). The questionnaire was revised by a working group of BPhD and by IMPP staff familiar with surveys and undergraduate pharmacy programmes. In these steps, particular attention was paid to wording, question construction, and objectivity. In an attempt to reach all German pharmacy students, an invitation to participate in the online survey was sent to all 22 local student councils of pharmacy (Fachschaft Pharmazie) via e-mail with the request to forward it to the students at their location. A similar e-mail was sent to the BPhD, requesting that it be forwarded to members and site representatives. Three reminders were sent out to increase the response rate. There were no inclusion or exclusion criteria for the participation. The total theoretical number of students is approximately 11,800, according to the last published official number of pharmacy students with state examination from the winter term 2020/2021 (Destatis, 2022). Thus, a minimum sample size of 373 was calculated (95% power at a significance level of 0.05).

Survey tool

The questionnaire, parts of which are based on a previous survey (Jünger *et al.*, 2006), comprised four sections with 66 items, including 39 four-point Likert scale items, 18 closed questions (6 single-choice, 6 multiple-choice, and 6 yes/no), open-ended questions (5 free text fields), and 4 ranking items.

The first section (12 items) collected respondents' characteristics. The second part (8 items) assessed

students' understanding of "competency-based education" and "learning objectives", as well as their application in the participants' training. The third section (25 items) explored the use of the current SC, the perceived added value of a competency-based SC, and its preferred design. The fourth section (21 items) included self-assessment statements covering the principal areas of pharmaceutical training up to the first state examination, along with self-assessment statements on interdisciplinary competencies. The English translation of the questionnaire is presented in Appendix A.

A four-point Likert scale ranging from 1 (disagree) to 4 (agree), intentionally excluding the options of "neutral" or "not sure" to encourage respondents to express a tendency towards a positive or negative opinion (Chyung et al., 2017).

Participation in the survey was voluntary and anonymous, with no personal data collected. Informed consent was provided at the start of the electronic survey. The study was conducted by the Department of Pharmacy at the IMPP. As the survey was anonymous and individuals were not identifiable, it was deemed exempt from ethical review.

Statistical analysis

Survey responses were analysed using descriptive statistics. Data processing was conducted using IBM SPSS version 29 (IBM, Armonk, New York, USA) and GraphPad Prism version 6 (GraphPad Software LLC, Boston, MA, USA). Categorical data and Likert scale responses were reported as percentages. Each Likert category was assigned a score from 1 (disagree) to 4

(agree) to ensure standardised labelling of the response scale. Mean values derived from the response scales were used to calculate an overall score, allowing for a collective assessment of multiple questions on the same topic, such as an overall motivation score. Unless otherwise specified, mean values \pm SD are reported. For subsequent analyses, survey participants were divided into subgroups based on their academic year, the status of their first state examination (already passed vs not yet passed), or their answer (yes/no) to the statement 'I have a concrete idea of what is meant by the term competency-based education.' A Mann-Whitney U test was used to identify differences between two groups, while comparisons among more than two groups were performed using the Kruskal-Wallis test with Dunn's multiple comparison test. A p -value < 0.05 was considered statistically significant.

Results

Participant characteristics

A total of 605 questionnaires were completed, corresponding to a response rate of 5.1%. Students from the third academic year represented the largest group, accounting for 35.7% of responses. Additionally, 59% reported having successfully passed P1 (Table I). Around three-quarters of participants had not completed any prior training or university degree before studying pharmacy and had no previous professional experience. However, around half of the survey participants have worked or are currently working alongside their studies (Table II).

Table I: Study location, academic year, and status of the first state examination

University	Participants (n)	First-year (n)	Second-year (n)	Third-year (n)	Fourth-year (n)	Exam passed (n)
Berlin	20	0	1	7	12	16
Bonn	29	3	11	13	2	12
Braunschweig	8	0	2	3	3	5
Düsseldorf	36	3	5	20	8	18
Erlangen	45	0	2	20	23	39
Frankfurt	31	7	8	12	4	14
Freiburg	24	2	2	4	16	17
Greifswald	63	7	15	23	18	35
Halle	2	0	1	0	1	1
Hamburg	6	0	0	5	1	6
Heidelberg	19	5	4	5	5	10
Jena	9	3	2	2	2	4

University	Participants (n)	First-year (n)	Second-year (n)	Third-year (n)	Fourth-year (n)	Exam passed (n)
Kiel	39	5	8	14	12	22
Leipzig	18	0	4	7	7	12
Mainz	22	7	4	5	6	10
Marburg	65	9	8	30	18	33
München	10	1	2	5	2	6
Münster	44	6	11	14	13	27
Regensburg	11	2	3	1	5	6
Saarbrücken	11	6	2	3	0	3
Tübingen	1	0	0	1	0	1
Würzburg	92	14	18	22	38	60
Total	605	80	113	216	196	357

Table II: Participants' professional background and social environment (multiple selections possible)

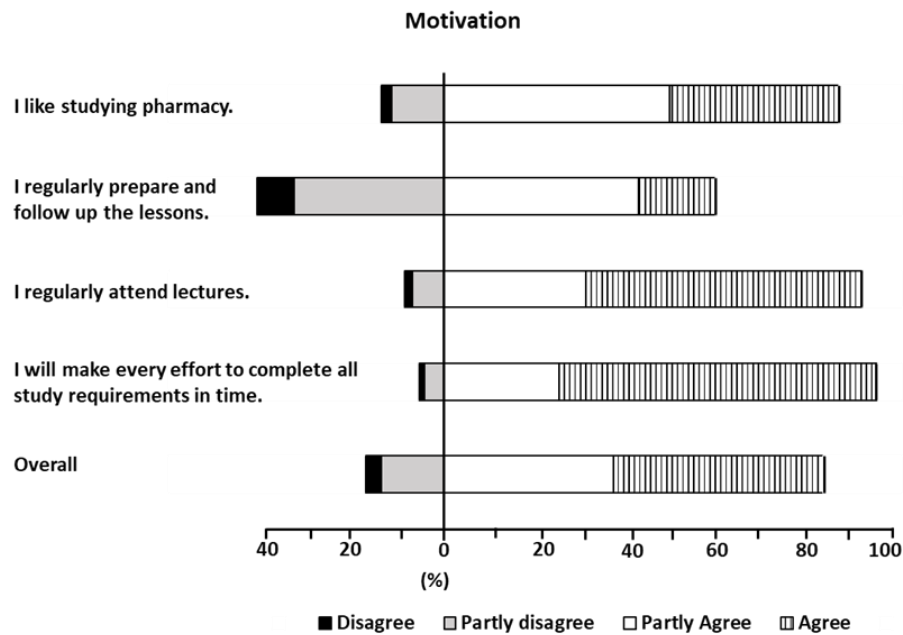
	Participants (n)	Percentage (%)
Did you complete any other training or study programme before starting your studies?		
Pharmaceutical or natural sciences sector	114	18.7
Medical or other healthcare sector	23	3.8
Social science or pedagogical field	5	0.8
Other area	15	2.5
No previous studies or previous training	453	74.3
Did you work in another profession before starting your studies?		
Pharmaceutical or natural sciences sector	79	12.8
Medical or other healthcare sector	37	6.0
Social science or pedagogical field	11	1.8
Other area	37	6.0
No previous employment	452	73.4
Are you or have you ever worked alongside your studies?		
Pharmaceutical or natural sciences sector	167	25.5
Medical or other healthcare sector	44	6.7
Social science or pedagogical field	22	3.4
Other area	107	16.4
No work while studying	314	48.0
In which areas are people in your immediate family professionally active?		
Pharmaceutical or natural sciences sector	150	16.9
Medical or other healthcare sector	154	17.3
Social science or pedagogical field	127	14.3
Other area	457	51.5

Motivation

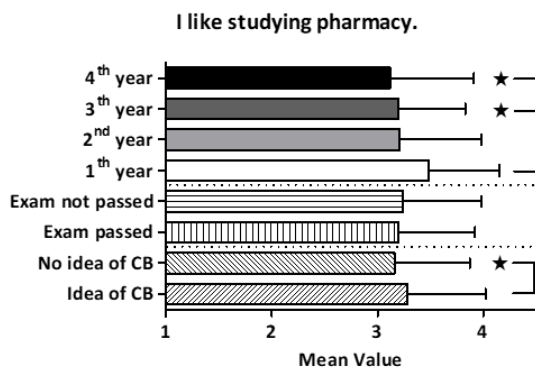
Survey participants demonstrated a high level of motivation to excel in their studies, with a mean motivation score of 3.26 ± 0.81 . However, overall

motivation appears to decline as students progress through the programme, as reflected in reduced preparation and follow-up of lectures and a slight decrease in their positive attitude towards their studies (Figure 1).

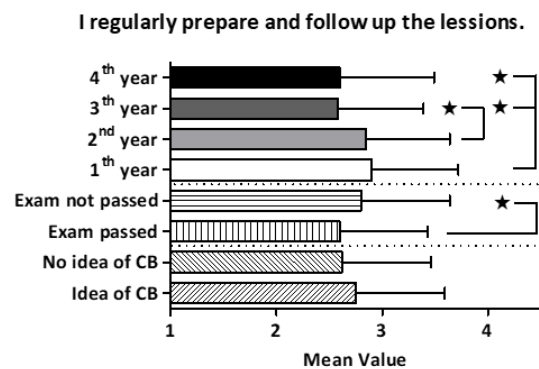
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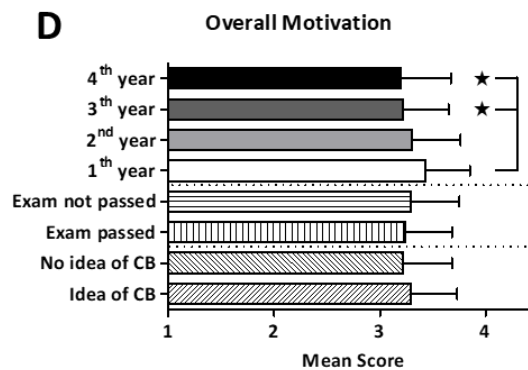
B



C



D



A) Percentage of ratings with one of the Likert categories of the statement given on the left. n = 605. B-D) Analysis of subgroups for the statements (B) 'I like studying pharmacy.' and (C) 'I regularly prepare and follow up the lessons.', and (D) for the overall motivation score depending on the examination status (first state examination (Exam) passed, n = 357; first state examination not passed, n = 248), the self-assessment in relation to the term competency-based education (CB) (Idea of CB, n = 277; No idea of CB, n = 328), and the academic year (first year, n = 80; second year, n = 113; third year, n = 216; fourth year, n = 196). Given are means ± SD. ★ p < 0.05 vs Idea of CB, Exam passed, first year, or second year, respectively.

Figure 1: Overall motivation

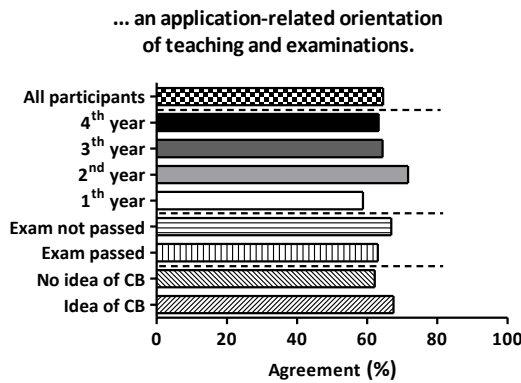
Experiences with competence orientation

Of the total sample, 277 respondents reported having a clear idea of the term competency-based education. Before studying pharmacy, 42 participants stated that they had frequently encountered competency-based education, while 333 indicated occasional exposure,

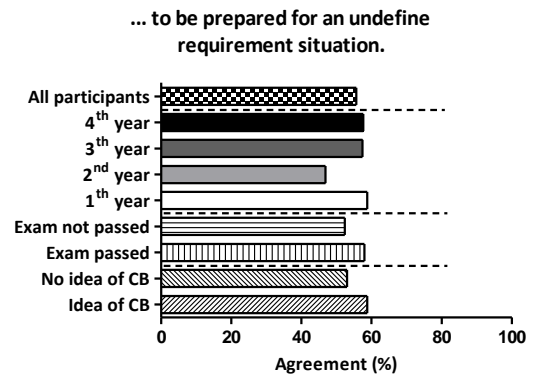
and 230 reported having no prior awareness of competency-based education.

Slightly more than half to a maximum of two-thirds of all participants agreed with the preformulated statements on competency-based education (Figure 2).

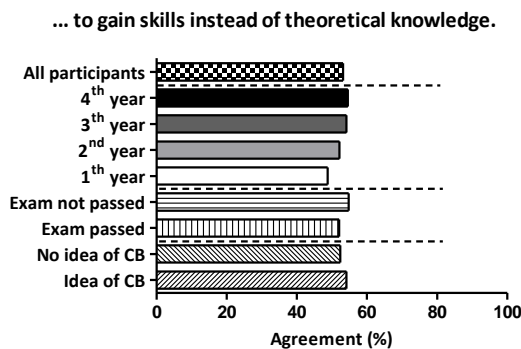
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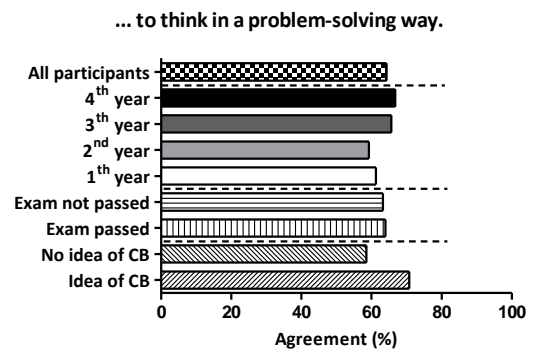
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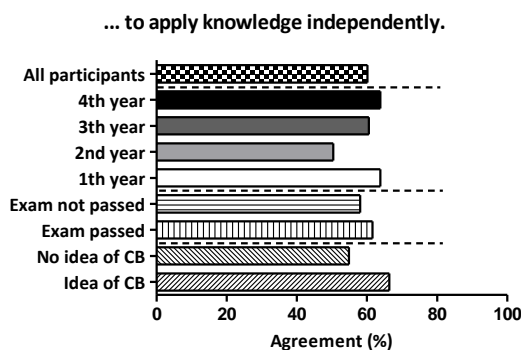
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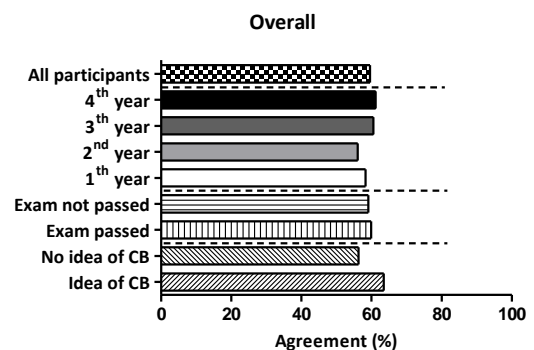
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Understanding competency-based education either for all survey participants (n = 605) or depending on the examination status (first state examination passed, n = 357; first state examination not passed, n = 248), the self-assessment with regard to the term competency-based (CB) education (Idea of CB, n = 277; No idea of CB, n = 328) or their academic year (first year, n = 80; second year, n = 113; third year, n = 216; fourth year, n = 196). A-E) Given is the percentage of agreement with the statement given on the headline. F) Percentage of agreement with all statements given.

Figure 2: Survey participants' understanding of the term competency-based education

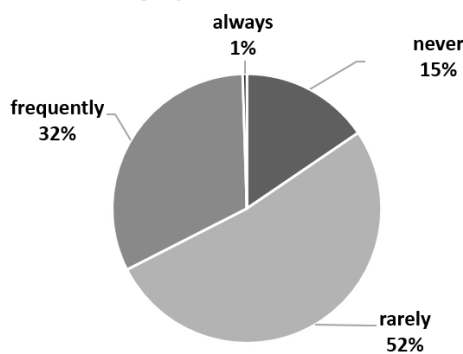
Only minor differences were observed between subgroups (Figure 2F). However, the difference was more pronounced between those who reported having a clear understanding of competency-based education and those who did not (Figure 2F). This difference was most noticeable in the statement “to think in a problem-solving way”, where agreement was higher among those with a clear understanding (71%) compared to those without (59%) (Figure 2D). Nine participants selected the “Other” option. Of these, five expressed hope that competency-based education would lead to a stronger focus on essential content with relevance to the job profile. Three expected it to strengthen their skills (scientific reasoning, critical thinking, and empathy), and one had no specific expectations.

Use and expectations of operationalised learning objectives

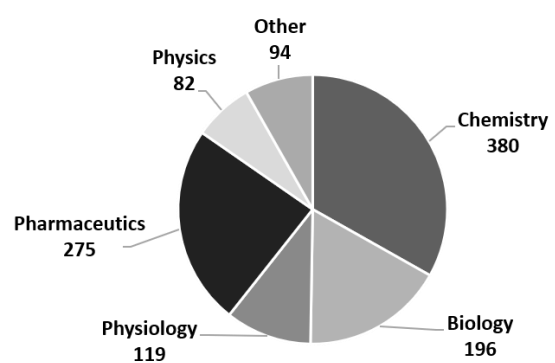
Only around one-third of participants stated that operationalised learning objectives are always or frequently used in the courses they currently attend (Figure 3A), mainly in chemistry, pharmaceutical analysis, and pharmaceuticals (Figure 3B). Of the examples of learning objectives entered by 160 participants, around 26% could be categorised as operationalised learning objectives, 58% as keyword-type learning content, and 16% as other, e.g., preparation for the first state examination (Figure 3C). The vast majority of participants partly agreed or agreed with the statement: “Learning objectives help me to better assess what is expected of me in an exam” (Figure 3D). No differences were found between subgroups in the assessment of this statement.

A

In the courses I am currently attending, operationalised learning objectives are formulated.

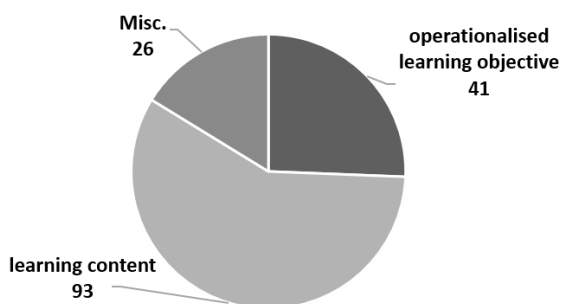


In which subjects of the first part of the degree programme were learning objectives defined?



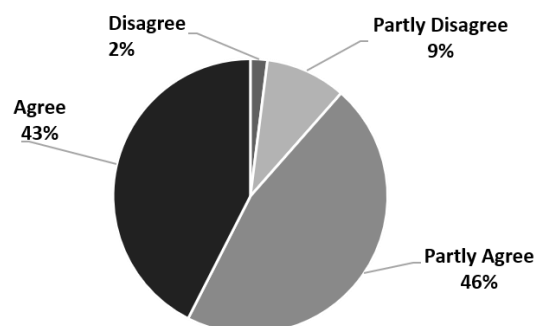
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Categorisation of the examples given in the free text for defined learning objectives in lectures



D

Learning objectives allow me to better assess what is expected of me in an exam.



A) Percentage of agreement with the respective statement. n = 605. B) Number of approvals by subject (multiple selection possible), C) Number of assignments for the corresponding categorisation and D) Percentage of ratings with one of the Likert categories of the respective statement. Misc., miscellaneous. n = 605.

Figure 3: Use of operationalised learning objectives in the first two years of the undergraduate course in pharmacy in Germany

Use of the current subject catalogue (SC)

Of the 357 respondents who reported having passed P1, 208 indicated that they have used the most recent SC. Among those who had not yet completed P1, approximately three-quarters (178) indicated that they plan to use the current SC to prepare for the exam, while 165 stated that they are currently using the SC for the first time, including 127 survey participants who have not yet passed P1.

Benefit of a competency-based SC

Participants were given access to the complete draft version to assess the benefits of the competency-based SC (Lüdeke et al., 2025).

The vast majority of survey participants partially or fully agreed with the pre-formulated benefits of such an SC (Figure 4). The perceived benefits were particularly pronounced among those who had not yet completed their first state examination and those who reported having a concrete understanding of CB compared to their respective control groups (Figure 4B-G).

Additionally, 74 participants provided further insights in a free-text field. Their responses generally aligned with the predefined benefits, with many viewing a competency-based SC as a valuable learning aid that clarifies what needs to be learnt for the exam and to what depth (40 comments). Several participants highlighted that application examples help illustrate the relevance of subjects (14 comments) and clarify the relationship between application, learning, and examination material (14 comments). Others suggested that a competency-based SC could assist lecturers in teaching and assessment, enhance comparability between pharmacy schools in Germany and streamline the catalogue. However, seven participants stated that they did not see any advantages.

Design of a competency-based SC

Survey participants expressed a preference for a clear structure, correct operationalisation of learning objectives, and the provision of additional information,

such as competence depth or application examples. No differences were found between subgroups (Table III).

For a potential online version of the SC, participants emphasised the importance of easy navigation through hierarchy levels and related learning objectives via clickable links. First-year students, in particular, valued the availability of a printable version (Table III).

Lastly, participants ranked four examples of a competency-based SC design (Appendix A). Example 4 was the most favoured, with total scores of 1161, 1479, 1608, and 1802, corresponding to mean values of 1.9 ± 1.1 , 2.4 ± 0.9 , 2.7 ± 1.1 , and 3.0 ± 1.0 for examples 1, 2, 3, and 4, respectively.

Criticism and suggestions

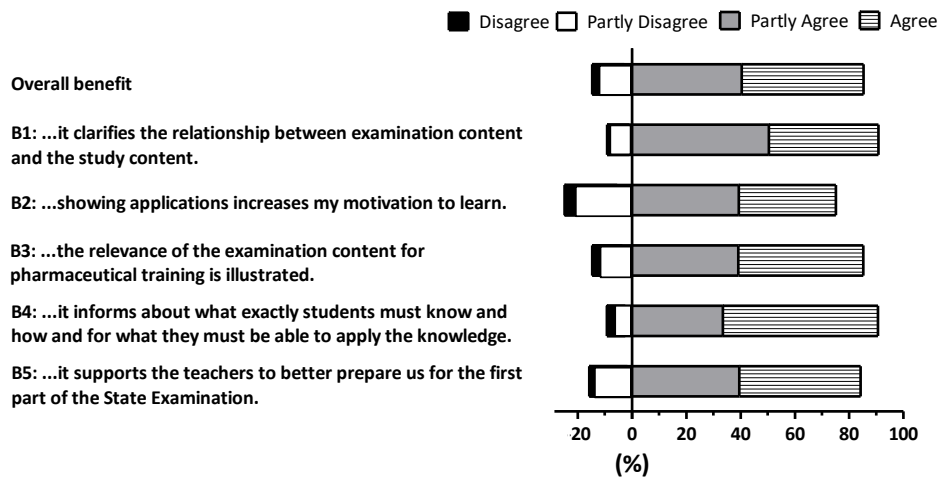
Most participants (574) did not perceive any disadvantages for themselves as students or for instructors in adopting a competency-based design for the SC. However, 31 participants expressed concerns, primarily regarding the potential for unclear competencies or learning objectives, making it confusing or more complicated to understand the actual content and requiring significantly more reading. Some respondents preferred a concise, enumerated list of subjects, particularly for factual knowledge. Despite these concerns, 99% of participants favoured student involvement in the development process of a competency-based SC.

Further aspects

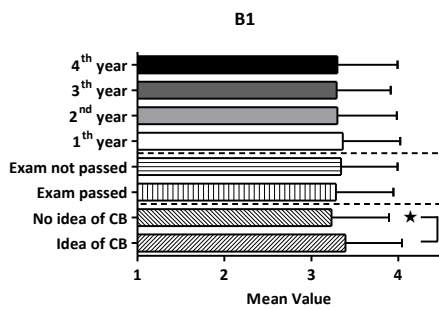
The two free-text fields allowed participants (57 and 56 respondents, respectively) to provide additional information on a) the benefits of a competency-based SC and b) its design. Regarding benefits, participants emphasised the importance of clarifying the relevance of subject areas for examination and their practical application in later studies or professional practice. Additionally, some viewed a competency-based SC as a valuable framework for university teaching or curriculum development. In terms of design, participants highlighted the importance of content relevance, additional information, and various design aspects.

A

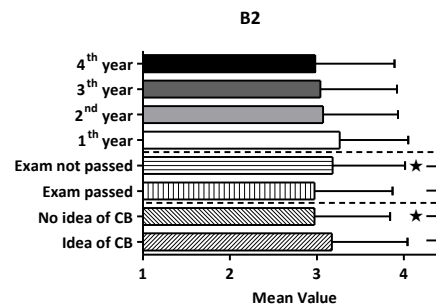
For students, the benefit of a competency-based subject catalogue compared to the current keyword-based subject catalogue is that ...



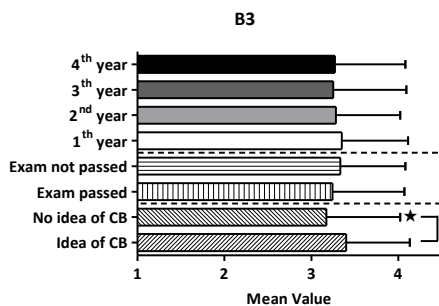
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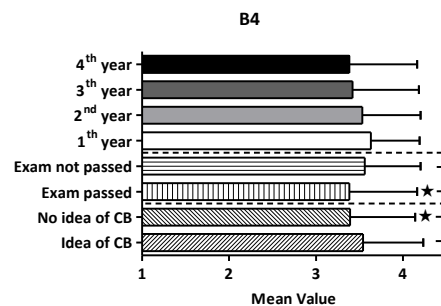
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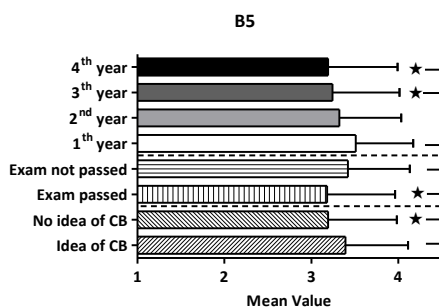
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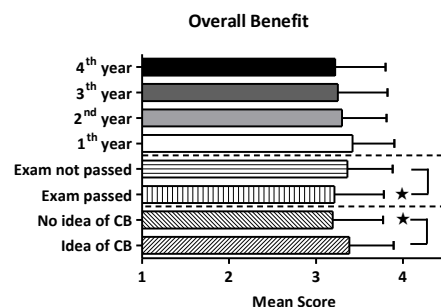
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F



G



A) Percentage ratings with one of the Likert categories of the respective statement. n = 605. B - G) Analysis of subgroups for the different statements (B - F), and (G) for the overall benefit score depending on the examination status (first state examination (Exam) passed, n = 357; first state examination not passed, n = 248), the self-assessment in relation to the term competency-based education (CB) (Idea of CB, n = 277; No idea of CB, n = 328), and the academic year (first year, n = 80; second year, n = 113; third year, n = 216; fourth year, n = 196). Given are means ± SD. ★ p < 0.05 vs Idea of CB, Exam passed, first year, or second year, respectively. ★ p < 0.05 vs Exam not passed, No idea of CB, or first year, respectively.

Figure 4: Benefits of a competency-based subject catalogue

Table III: Evaluation of the answers regarding the statements on the design and the online version of a competency-based (CB) subject catalogue. Shown are mean values \pm SD.

All participants (n=605)	Exam passed (n=357)	Exam not passed (n=248)	CB Idea (n=277)	CB no idea (n=328)	1 st year (n=80)	2 nd year (n=113)	3 rd year (n=216)	4 th year (n=196)
A. Design of competency-based subject catalogue								
A1. There is a clear hierarchical structure/ organisation.								
3.64 \pm 0.61	3.63 \pm 0.60	3.66 \pm 0.63	3.65 \pm 0.61	3.64 \pm 0.61	3.74 \pm 0.55	3.53 \pm 0.73	3.70 \pm 0.53	3.61 \pm 0.63
A2. The subject catalogue is kept as concise as possible (no details, "less is more").								
2.37 \pm 0.93	2.35 \pm 0.94	2.40 \pm 0.93	2.36 \pm 0.93	2.38 \pm 0.94	2.53 \pm 0.89	2.30 \pm 0.90	2.30 \pm 0.95	2.43 \pm 0.96
A3. Learning objectives are formulated in detail and precisely.								
3.64 \pm 0.57	3.63 \pm 0.59	3.66 \pm 0.54	3.64 \pm 0.58	3.64 \pm 0.56	3.63 \pm 0.54	3.66 \pm 0.53	3.61 \pm 0.62	3.67 \pm 0.55
A4. Learning objectives are specified by additional information (labelling of the depth of competence, application examples, etc.).								
3.50 \pm 0.67	3.49 \pm 0.68	3.53 \pm 0.65	3.48 \pm 0.68	3.52 \pm 0.65	3.50 \pm 0.66	3.53 \pm 0.63	3.52 \pm 0.67	3.47 \pm 0.69
B. Online-version of competency-based subject catalogue								
B1. Can be navigated through hierarchy levels with a click of the mouse.								
3.38 \pm 0.72	3.38 \pm 0.74	3.38 \pm 0.70	3.37 \pm 0.75	3.38 \pm 0.70	3.43 \pm 0.65	3.31 \pm 0.73	3.37 \pm 0.74	3.40 \pm 0.73
B2. Choice between different representations.								
2.84 \pm 0.94	2.78 \pm 0.97	2.93 \pm 0.89	2.87 \pm 0.94	2.81 \pm 0.95	3.06 \pm 0.88	2.83 \pm 0.90	2.83 \pm 0.93	2.76 \pm 1.00
B3. That related learning objectives are linked.								
3.50 \pm 0.71	3.52 \pm 0.72	3.47 \pm 0.69	3.50 \pm 0.71	3.50 \pm 0.71	3.44 \pm 0.74	3.45 \pm 0.68	3.53 \pm 0.71	3.52 \pm 0.71
B4. In addition to the digital version, there is also a print version (PDF) in the style of earlier softcover versions of the subject catalogue.								
2.83 \pm 1.10	2.71 \pm 1.10	3.00 \pm 1.08 [‡]	2.85 \pm 1.08	2.80 \pm 1.13	3.28 \pm 0.98	2.88 \pm 1.13	2.76 \pm 1.07*	2.69 \pm 1.12*

‡ $P < 0.05$. vs Exam passed; * $P < 0.05$ vs first year

Self-assessment

Finally, participants provided a self-assessment of selected competencies expected to be developed during the undergraduate pharmacy programme (Figure 5). Progress in individual competencies generally seemed to depend on the academic year,

with either gradual or jump-like increases. While some competencies were reported to reach a maximum level in the first year, others showed declines at later stages, such as the ability to name a compound according to the IUPAC rules, which decreased after the second year (Figure 5A-E).

Discussion

This study sought to capture pharmacy students' opinions and investigate the relationships between their perceptions of competency-based education, a competency-based SC, and its perceived value for examinations, contributing to understanding the potential impact of competency-based learning in the German pharmacy curriculum.

Among all survey participants, third-year students constituted the largest subgroup, an essential factor for this study given that these students are currently preparing for the P1 or have just completed it. Around one-quarter of respondents had completed a previous vocational or higher education before studying pharmacy, aligning with a survey in which 18% of participants reported vocational training before starting their studies (BPhD, 2020). Consistent with that survey (BPhD, 2020), around half of the respondents reported working alongside their studies, mainly in the pharmaceutical or natural sciences sector.

In this study, students self-assessed their competencies using a questionnaire, with most of these competencies used in the proposed draft of a competency-based SC. Some competencies, such as blood pressure measurement and interdisciplinary skills, were included in the questionnaire, as they are not specifically mentioned in the current SC but are at least partially covered in training. The self-assessment results closely matched the participants' academic year and the teaching content of the corresponding study year.

Although the subjective competence assessment primarily served as an internal control of the reported study year, the results may provide initial indications for potential curriculum improvements. However, further studies are needed to determine whether students' self-perceived competencies accurately reflect their practical skills. While subjective competence expectations are believed to correlate with actual performance (Bandura, 1993), discrepancies can arise due to flawed self-assessment, overestimation, or underestimation—phenomena well-documented in medical education (Mavis, 2001; Barnsley et al., 2004; Dunning et al., 2004; Jünger et al., 2006).

About half of the respondents reported being entirely unfamiliar with the concept of competency-based education. This finding is somewhat surprising, given that participants should have at least partially experienced competency-based learning in their prior schooling. Moreover, one of the primary demands of the BPhD in recent years has been the implementation of an NKLP (BPhD, 2023). A possible explanation is that

insufficient emphasis has been placed on explaining the underlying didactic concept to students or familiarising them with it. This lack of familiarity could also explain why only slightly more than half of the participants agreed with the pre-formulated statements regarding expectations for a competency-based SC. Conversely, nearly half of the respondents stated that they had a clear idea of the term competency-based education. While this understanding is somewhat reflected in their responses to the related survey items, the difference is relatively small, indicating the possibility of a subjective misinterpretation, potentially influenced by an overconfidence effect. However, further investigation is required to confirm this hypothesis.

Learning outcomes should be defined in a way that integrates not only specialised knowledge but also its application and purpose (following the *What-With What-What For* structure). Therefore, it is unsurprising that the vast majority of participants believe they are better prepared for the exam with operationalised learning objectives. However, the survey suggests that such objectives are rarely used in lectures. This result should be interpreted with caution, as students, even when presented with an operationalised objective, may retain the knowledge component (subject or topic) better than the behavioural component (verb or action), especially if they are unfamiliar with the technical term. Interestingly, this finding contrasts with a parallel survey in which around half of pharmacy lecturers reported always setting learning outcomes in their courses, yet confirms the statement that around two-thirds of lecturers are unfamiliar with the term “operationalisation” (Lüdeke et al., 2025). This discrepancy may stem from different levels of knowledge of the technical term. Overall, the findings indicate the need for a broader understanding of the didactic concept, particularly given the varying definitions of competence-related terms in the literature (Nash et al., 2015; Nunes-da-Cunha & Fernandez-Llimos, 2019).

It is widely accepted that competency-based education guides students in their studies, helps them prepare for their examinations more effectively, and demonstrates the relevance of the learning content to everyday working life through application examples (Katoue & Schwinghammer, 2020; Brauer, 2021). Accordingly, survey participants expressed requests aligning with this perspective, such as prioritising subject areas, identifying challenging topics in the SC, or demonstrating practical relevance for community pharmacists. They also suggested streamlining learning content to create a standardised core curriculum across institutions. However, such a harmonised curriculum requires a complex, multi-institutional process that could span several years. While participants viewed the

SC as a learning aid for their exams, they remained undecided about the level of detail required. Nonetheless, application or content examples that build upon the knowledge tested in P1 were highly valued. Therefore, a majority of participants also favoured a design that includes such examples, although their feedback indicates example selection could be improved in some areas. Specifically, students suggested including more application examples from community pharmacy to emphasise the relevance of learning objectives to daily practice. Given these findings and concerns, it is understandable that students advocate for their involvement in further SC development.

In the international context of pharmacy education, competency catalogues are published frameworks for the required competencies (Royal Pharmaceutical Society, 2013; National Association of Pharmacy Regulatory Authorities, 2014; Pharmacy Council of New Zealand, 2015; Pharmaceutical Society of Australia, 2016; International Pharmaceutical Federation, 2020; Pharmaceutical Society of Ireland, 2022). Some of these frameworks are designed as catalogues of learning outcomes for national pharmacy programmes (Medina *et al.*, 2013; Bundesapothekerkammer, 2017; Bundesamt für Gesundheit Schweizerische Eidgenossenschaft, 2018). Ideally, examinations assessing the learning outcomes that qualify for these competencies are conducted at the end of the academic curriculum or after pre-registration training. In contrast, P1 is an examination students must pass to continue their studies. As a knowledge-based assessment, P1 does not reflect all the learning objectives covered in the first two years. Nevertheless, the knowledge evaluated in P1 contributes to the milestone objectives of the second year. Therefore, the competency-based SC is intended to demonstrate how P1 aligns with the desired learning outcomes after the second year of the curriculum (Biggs, 2003). In the context of a catalogue of learning outcomes, such as those quoted above, the SC can be seen as a specification of the 'Foundational Knowledge' domain.

Limitations

The survey relies on voluntary participation, which might attract students who have strong opinions or interests regarding competency-based education, potentially skewing the results. It is also likely that many of the participants have similar traits, as students are more likely to recruit other students with similar characteristics (highly motivated students). Thus, a selection bias cannot be ruled out. The response rate was approximately 5.1%, which may not reflect the entire population of pharmacy students in Germany. This low participation might lead to sampling bias and

limit the generalisability of the findings. Although this study may not be representative, response rates of 5% to 10% and sample sizes exceeding 500 participants, as in this study, have been found to yield reliable results (Fosnacht *et al.*, 2017).

Conclusion

This exploratory analysis was conducted to gain insights into a competency-based SC for pharmacy students in Germany. The perceived added value of such an SC was assessed positively by most students across all subgroups. Participants made specific recommendations for its design to better support students in preparing for the first state examination. Additionally, students' feedback highlights the need to strengthen the link between theoretical and application-related content throughout the pharmaceutical curriculum. Moreover, the observation that students and teachers lack a concrete understanding of competency-based education models (CBEM) or learning objectives/outcomes indicates a need for better training. Finally, the self-assessment results provide an initial insight into the development of pharmaceutical competencies currently taught in Germany. However, further studies are necessary to investigate this question in more detail.

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Conflict of interest

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Appendix A: Questionnaire in German, as used in the online survey

Questions about the participant and the degree programme

1. In which semester of pharmacy are you currently attending courses? (free text)
2. In which university semester are you studying now pharmacy? (free text)
3. Have you already successfully completed the first pharmaceutical state examination? (single selection)
 - Yes
 - No
4. At which university are you currently studying? (single selection)
 - Berlin
 - Bonn
 - Braunschweig
 - Düsseldorf
 - Erlangen
 - Frankfurt
 - Freiburg
 - Greifswald
 - Halle
 - Hamburg
 - Heidelberg
 - Jena
 - Kiel
 - Leipzig
 - Mainz
 - Marburg
 - München
 - Münster
 - Regensburg
 - Saarbrücken
 - Tübingen
 - Würzburg
 - Other location
5. Did you complete any other training or study programme before starting your studies? (multiple selection)
 - Pharmaceutical or natural sciences sector
 - Medical or other health care sector
 - Social science or pedagogical field
 - Other area
 - No previous studies or previous training
6. Did you work in another profession before starting your studies? (multiple selection)
 - Pharmaceutical or natural sciences sector

- Medical or other health care sector
 - Social science or pedagogical field
 - Other area
 - No previous employment
7. Are you or have you ever worked alongside your studies? (multiple selection)
- Pharmaceutical or natural sciences sector
 - Medical or other health care sector
 - Social science or pedagogical field
 - Other area
 - No work while studying
8. In which areas are people in your immediate family professionally active? (multiple selection)
- Pharmaceutical or natural sciences sector
 - Medical or other health care sector
 - Social science or pedagogical field
 - Other area

Motivation

9. I like studying pharmacy. (select one category)
- agree
 - partially agree
 - partially disagree
 - disagree
10. I regularly prepare and follow up the lessons. (select one category)
- agree
 - partially agree
 - partially disagree
 - disagree
11. I regularly attend lectures. (select one category)
- agree
 - partially agree
 - partially disagree
 - disagree
12. I will make every effort to complete all study requirements in time. (select one category)
- agree
 - partially agree
 - partially disagree
 - disagree

Experiences with competency-based education

13. I have a concrete idea of what is meant by the term “competency-based education”. (single choice)
- Yes
 - No
14. I have already come into touch with competency-based education before my pharmacy studies (school, training, other studies). (select one category)
- frequently
 - occasionally
 - never
15. What I expect most from a competency-based study program (multiple selection)
- ... to apply knowledge independently
 - ... to think in a problem-solving way
 - ... to gain skills instead of theoretical knowledge

- ... to be prepared for an undefined requirement situation (knowledge transfer)
- ... an application-related orientation of teaching and examinations
- ... Miscellaneous (free text)

Competency-based education in the pharmacy studies

16. In the courses I am currently attending, operationalised learning objectives are formulated. (select one category)

- always
- often
- rarely
- never

17. If learning objectives are defined, please give an example: (free text)

18. In which subjects of the first part of the degree programme were learning objectives defined? (multiple selection)

- Chemistry/Analytics
- Pharmaceutical biology
- Physiology
- Pharmaceutics
- Physics
- Other

19. Learning objectives enable me to better assess what is expected of me in an exam. (select one category)

- agree
- partially agree
- partially disagree
- disagree

Use of the current item catalogue

20. If you have already completed the first pharmaceutical state examination: I have used the current subject catalog to prepare for the exam. (single choice)

- Yes
- No

21. If you have not yet completed the first pharmaceutical state examination: I plan to use the current subject catalog to prepare for the exam. (select one category)

- agree
- partially agree
- partially disagree
- disagree

22. I am currently working with the subject catalog for the first time. (single choice)

- Yes
- No

Hypothetical benefits of a competency-based subject catalogue for students

If you are interested, you can now take a first look at what a competency-based subject catalogue might look like by clicking below:

- 1 General, Inorganic, and Organic Chemistry
- 2 Pharmaceutical Biology and Human Biology
- 3 Physics, Physical Chemistry, and Pharmaceutics
- 4 Pharmaceutical Analysis

23. For students, the added value of a competence-oriented subject catalogue compared to the current keyword-based subject catalogue is that ...

23a. ... it clarifies the relationship between examination content and the study content and applications that build on it. (select one category)

- agree
- partially agree
- partially disagree
- disagree

23b. ... showing applications increases my motivation to learn. (select one category)

- agree
- partially agree
- partially disagree
- disagree

23c. ... the relevance of the examination content for pharmaceutical training is illustrated. (select one category)

- agree
- partially agree
- partially disagree
- disagree

23d. ... it informs about what exactly students must know and how and for what they must be able to apply the knowledge. (select one category)

- agree
- partially agree
- partially disagree
- disagree

23e. ... it supports the teachers to better prepare us for the first pharmaceutical state examination. (select one category)

- agree
- partially agree
- partially disagree
- disagree

24. What other advantages do you see? (free text)

Design of the subject catalogue

25. In terms of design, it is particularly important to me that the catalogue...

25a. ...has a clear hierarchical structure/is hierarchically organised. (select one category)

- agree
- partially agree
- partially disagree
- disagree

25b. ...is concise (no details, "less is more"). (select one category)

- agree
- partially agree
- partially disagree
- disagree

25c. ...contains detailed and precise learning objectives. (select one category)

- agree
- partially agree
- partially disagree
- disagree

25d. ...comprises additional information for the specification of learning objectives (competency levels, application examples, etc.). (select one category)

- agree
- partially agree
- partially disagree
- disagree

26. Here are four examples of the design of the subject catalogue. Please rank these four examples in order of preference (top: I like it best - bottom: I like it least). (Ranking)

- Example 1: focus on operationalised learning objectives
- Example 2: with additional sub-headings as in the keyword-based catalogue
- Example 3: same as 2, with competence levels highlighted in colour
- Example 4: same as 2, but with application examples

Beispiel 1: operationalisierte Lernziele im Vordergrund

1.1 Allgemeine Chemie

1.1.1 Sie können chemische Grundbegriffe und Definitionen im Dialog mit Fachleuten nutzen und sind fähig, Fachliteratur zu lesen. Hierfür erinnern sie Grundlagen über:

1.1.1.1 Stoff, Stoffumwandlung (chem. Reaktion), Element, Verbindung

1.1.1.2 Atom- und Molekülhypothese nach Dalton bzw. Avogadro; Gesetze der Massenerhaltung, der konstanten und multiplen Proportionen

1.1.1.3 Definition und Beziehungen von Masse, Volumen, Stoffmenge, relative Atom-/Molekülmasse, Gehalts- und Konzentrationsgrößen inkl. Einheiten und Symbole

1.1.1.4 Bedeutung chem. Elementsymbole, Formeln und Gleichungen, stöchiometrische Berechnungen

1.1.2 Sie können den Aufbau von Atomen beschreiben und können aus der Stellung eines Elements im Periodensystem Informationen über seine Eigenschaften und die seiner Verbindungen ableiten. Hierfür nutzen sie Kenntnisse über bzw. Kenntnis der:

1.1.2.1 Atombau Protonen, Neutronen, Elektronen; Atommodelle; Quantenzahlen und Orbitale (räumliche und energetische Aspekte)

1.1.2.2 Elektronenbesetzung von Orbitalen Pauli-Prinzip und Hund'sche Regel; Grundzustand und angeregte Zustände; Singulett- und Triplettzustände; Absorption und Emission von Strahlung

1.1.2.3 Radionuklide Isotope, radioaktiver Zerfall und Strahlungsarten; Bedeutung für Radiotherapie, Radiodiagnostik und (Bio)analytik

1.1.2.4 Periodensystem Aufbau des Periodensystems über die Elektronenbesetzung von Orbitalen; Elektronenkonfiguration, Valenzelektronen, Edelgaskonfiguration

1.1.2.5 Namen und Symbole der wichtigsten Elemente

1.1.2.6 Anordnung in Perioden und Gruppen sowie deren Bezeichnung

1.1.2.7 Periodische Eigenschaften Atomradien, Ionenradien, Hydratationsradien, „Schrägbeziehung“, Elektronegativität (EN), Ionisierungsenergie, Elektronenaffinität, Oxidationszahlen, Standardpotentiale; Metalle, Halbmetalle, Nichtmetalle

Beispiel 2: mit Teilüberschriften wie im Stichpunktkatalog

1.1 Allgemeine Chemie	
1.1.1 Grundbegriffe und -gesetze	Sie können chemische Grundbegriffe und Definitionen im Dialog mit Fachleuten nutzen und sind fähig, Fachliteratur zu lesen. Hierfür erinnern sie Grundlagen über: <ul style="list-style-type: none"> 1.1.1.1 Stoff, Stoffumwandlung (chem. Reaktion), Element, Verbindung 1.1.1.2 Atom- und Molekülhypothese nach Dalton bzw. Avogadro; Gesetze der Massenerhaltung, der konstanten und multiplen Proportionen 1.1.1.3 Definition und Beziehungen von Masse, Volumen, Stoffmenge, relative Atom-/Molekülmasse, Gehalts- und Konzentrationsgrößen inkl. Einheiten und Symbole 1.1.1.4 Bedeutung chem. Elementsymbole, Formeln und Gleichungen, stöchiometrische Berechnungen
1.1.2 Atombau und Periodensystem der Elemente	Sie können den Aufbau von Atomen beschreiben und können aus der Stellung eines Elements im Periodensystem Informationen über seine Eigenschaften und die seiner Verbindungen ableiten. Hierfür nutzen sie Kenntnisse über bzw. Kenntnis der: <ul style="list-style-type: none"> 1.1.2.1 Atombau: Protonen, Neutronen, Elektronen; Atommodelle; Quantenzahlen und Orbitale (räumliche und energetische Aspekte) 1.1.2.2 Elektronenbesetzung von Orbitalen: Pauli-Prinzip und Hund'sche Regel; Grundzustand und angeregte Zustände; Singulett- und Triplettzustände; Absorption und Emission von Strahlung 1.1.2.3 Radionuklide: Isotope, radioaktiver Zerfall und Strahlungsarten; Bedeutung für Radiotherapie, Radiodiagnostik und (Bio)analytik 1.1.2.4 Periodensystem: Aufbau des Periodensystems über die Elektronenbesetzung von Orbitalen; Elektronenkonfiguration, Valenzelektronen, Edelgaskonfiguration 1.1.2.5 Namen und Symbole der wichtigsten Elemente 1.1.2.6 Anordnung in Perioden und Gruppen sowie deren Bezeichnung 1.1.2.7 Periodische Eigenschaften: Atomradien, Ionenradien, Hydratationsradien, „Schrägbeziehung“, Elektronegativität (EN), Ionisierungsenergie, Elektronenaffinität, Oxidationszahlen, Standardpotentiale; Metalle, Halbmetalle, Nichtmetalle

Beispiel 3: wie 2, mit graphisch hervorgehobener Kompetenztiefe

1.1 Allgemeine Chemie		Kompetenz- tiefe
1.1.1 Grundbegriffe und -gesetze	Sie können chemische Grundbegriffe und Definitionen im Dialog mit Fachleuten nutzen und sind fähig, Fachliteratur zu lesen. Hierfür erinnern sie Grundlagen über: <ul style="list-style-type: none"> 1.1.1.1 Stoff, Stoffumwandlung (chem. Reaktion), Element, Verbindung 1.1.1.2 Atom- und Molekülhypothese nach Dalton bzw. Avogadro; Gesetze der Massenerhaltung, der konstanten und multiplen Proportionen 1.1.1.3 Definition und Beziehungen von Masse, Volumen, Stoffmenge, relative Atom-/Molekülmasse, Gehalts- und Konzentrationsgrößen inkl. Einheiten und Symbole 1.1.1.4 Bedeutung chem. Elementsymbole, Formeln und Gleichungen, stöchiometrische Berechnungen 	1
1.1.2 Atombau und Periodensystem der Elemente	Sie können den Aufbau von Atomen beschreiben und können aus der Stellung eines Elements im Periodensystem Informationen über seine Eigenschaften und die seiner Verbindungen ableiten. Hierfür nutzen sie Kenntnisse über bzw. Kenntnis der: <ul style="list-style-type: none"> 1.1.2.1 Atombau: Protonen, Neutronen, Elektronen; Atommodelle; Quantenzahlen und Orbitale (räumliche und energetische Aspekte) 1.1.2.2 Elektronenbesetzung von Orbitalen: Pauli-Prinzip und Hund'sche Regel; Grundzustand und angeregte Zustände; Singulett- und Triplettzustände; Absorption und Emission von Strahlung 1.1.2.3 Radionuklide: Isotope, radioaktiver Zerfall und Strahlungsarten; Bedeutung für Radiotherapie, Radiodiagnostik und (Bio)analytik 1.1.2.4 Periodensystem: Aufbau des Periodensystems über die Elektronenbesetzung von Orbitalen; Elektronenkonfiguration, Valenzelektronen, Edelgaskonfiguration 1.1.2.5 Namen und Symbole der wichtigsten Elemente 1.1.2.6 Anordnung in Perioden und Gruppen sowie deren Bezeichnung 1.1.2.7 Periodische Eigenschaften: Atomradien, Ionenradien, Hydratationsradien, „Schrägbeziehung“, Elektronegativität (EN), Ionisierungsenergie, Elektronenaffinität, Oxidationszahlen, Standardpotentiale; Metalle, Halbmetalle, Nichtmetalle 	2

Beispiel 4: wie 2, mit Anwendungsbeispielen**1.1 Allgemeine Chemie**

1.1.1 Grundbegriffe und -gesetze Sie können chemische Grundbegriffe und Definitionen im Dialog mit Fachleuten nutzen und sind fähig, Fachliteratur zu lesen. Hierfür erinnern sie Grundlagen über:

1.1.1.1 Stoff, Stoffumwandlung (chem. Reaktion), Element, Verbindung

1.1.1.2 Atom- und Molekülhypothese nach Dalton bzw. Avogadro; Gesetze der Massenerhaltung, der konstanten und multiplen Proportionen

1.1.1.3 Definition und Beziehungen von Masse, Volumen, Stoffmenge, relative Atom-/Molekülmasse, Gehalts- und Konzentrationsgrößen inkl. Einheiten und Symbole

1.1.1.4 Bedeutung chem. Elementsymbole, Formeln und Gleichungen, stöchiometrische Berechnungen

Anwendungsbeispiele:
Grundlagen
Teilchenmodell,
Reaktionsgleichungen,
chem. Rechnen;
Fachliteratur verstehen

1.1.2 Atombau und Periodensystem der Elemente Sie können den Aufbau von Atomen beschreiben und können aus der Stellung eines Elements im Periodensystem Informationen über seine Eigenschaften und die seiner Verbindungen ableiten. Hierfür nutzen sie Kenntnisse über bzw. Kenntnis der:

1.1.2.1 Atombau Protonen, Neutronen, Elektronen; Atommodelle; Quantenzahlen und Orbitale (räumliche und energetische Aspekte)

1.1.2.2 Elektronenbesetzung von Orbitalen Pauli-Prinzip und Hund'sche Regel; Grundzustand und angeregte Zustände; Singulett- und Triplettzustände; Absorption und Emission von Strahlung

1.1.2.3 Radionuklide Isotope, radioaktiver Zerfall und Strahlungsarten; Bedeutung für Radiotherapie, Radiodiagnostik und (Bio)analytik

1.1.2.4 Periodensystem Aufbau des Periodensystems über die Elektronenbesetzung von Orbitalen; Elektronenkonfiguration, Valenzelektronen, Edelgaskonfiguration

1.1.2.5 Namen und Symbole der wichtigsten Elemente

1.1.2.6 Anordnung in Perioden und Gruppen sowie deren Bezeichnung

1.1.2.7 Periodische Eigenschaften Atomradien, Ionenradien, Hydratationsradien, „Schragbeziehung“, Elektronegativität (EN), Ionisierungsenergie, Elektronenaffinität, Oxidationszahlen, Standardpotentiale; Metalle, Halbmetalle, Nichtmetalle

Anwendungsbeispiele:
Spektroskopische Verfahren (insbes. UV-Vis-Spektroskopie, Fluorimetrie etc.); Radiochemie und -therapie; Reaktivität und Stabilität von Stoffen; Analytik anorganischer Stoffe

Online version of the catalogue

27. With the online version of the subject catalogue, it is particularly important to me that it...

27a. ...allows one-click navigation through the hierarchy levels. (select one category)

- agree
- partially agree
- partially disagree
- disagree

27b. ...provides the possibility to choose between different representations (e. g. as in examples 1 to 4). (select one category)

- agree
- partially agree
- partially disagree
- disagree

27c. ...connects related learning objectives via links. (select one category)

- agree
- partially agree
- partially disagree
- disagree

27d. ...provides a printable version (PDF) in the style of previous bound editions of the SC alongside the digital version. (select one category)

- agree
- partially agree
- partially disagree
- disagree

Criticism and suggestions

28. Do you see any disadvantages for you as a student or for teachers in a competency-based design of the subject catalogue? (single choice)

- yes
- no

28a. If you selected "yes", please specify (free text)

29. What other aspects, not mentioned in this survey, would you consider important for the benefit of a competency-based subject catalogue? (free text)

30. What other aspects, not mentioned in this survey, would you consider important for the design of the subject catalogue? (free text)

31. Should students be involved in the continuous development of the subject catalogue? (single choice)

- yes
- no

Self-assessment

32. General, Inorganic and Organic Chemistry

32a. I can estimate the pKa value of a compound (select one category)

- agree
- partially agree
- partially disagree
- disagree

32b. I can determine oxidation numbers in an inorganic molecule (select one category)

- agree
- partially agree
- partially disagree
- disagree

32c. I can name a compound according to IUPAC (select one category)

- agree
- partially agree
- partially disagree
- disagree

32d. I can plan and perform a one-step synthesis (select one category)

- agree
- partially agree
- partially disagree
- disagree

33. Pharmaceutical Biology and Human Biology

33a. I can determine a minimal inhibitor concentration (select one category)

- agree
- partially agree
- partially disagree
- disagree

33b. I can identify a seed plant with the help of specialised literature (select one category)

- agree

- partially agree
- partially disagree
- disagree

33c. I can perform a microscopic identity test of a medicinal drug according to Ph. Eur. (select one category)

- agree
- partially agree
- partially disagree
- disagree

33d. I can perform a blood pressure measurement (select one category)

- agree
- partially agree
- partially disagree
- disagree

34. Physics, Physical Chemistry and Pharmaceutics

34a. I can visualise measurement results graphically and calculate MW and standard deviation (select one category)

- agree
- partially agree
- partially disagree
- disagree

34b. I can calculate the decay of a radioactive drug with the help of decay laws (select one category)

- agree
- partially agree
- partially disagree
- disagree

34c. I can explain how a light microscope works (select one category)

- agree
- partially agree
- partially disagree
- disagree

34d. I can prepare a formulation (cream, capsules, etc.) according to instructions (select one category)

- agree
- partially agree
- partially disagree
- disagree

35. Pharmaceutical Analysis

35a. I can carry out an acid-base titration independently (select one category)

- agree
- partially agree
- partially disagree
- disagree

35b. I can carry out a wet chemical identity reaction according to Ph. Eur. (select one category)

- agree
- partially agree
- partially disagree
- disagree

35c. I can carry out thin-layer chromatography independently (select one category)

- agree
- partially agree
- partially disagree
- disagree

35d. I can interpret a $^1\text{H-NMR}$ spectrum of an organic compound (select one category)

- agree
- partially agree
- partially disagree
- disagree

36. Interdisciplinary competencies

36a. I can provide information and advice on the use of typical medicinal teas (select one category)

- agree
- partially agree
- partially disagree
- disagree

36b. I can take scientific criteria into account in decision-making processes (select one category)

- agree
- partially agree
- partially disagree
- disagree

36c. I can communicate scientific findings and enter into dialogue with experts (select one category)

- agree
- partially agree
- partially disagree
- disagree

36d. I can consider the ethical principles of pharmacists' behaviour and actions in healthcare (select one category)

- agree
- partially agree
- partially disagree
- disagree

36e. I can organise and optimise work processes in terms of safety, effectiveness and efficiency. (select one category)

- agree
- partially agree
- partially disagree
- disagree

Thank you for completing the questionnaire.