

## **Tag der Lehre / Conference Inverted Classroom and Beyond 2024**

### **Blog post - Lohbeck / Strauch / Oeser**

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**Title:** Requirements for study programmes of the future in the STEM field - analysis of surveys among pupils, students and employers in the public sector

**Lead/Teaser:** A newly established coordination centre within the Ministry of Digital and Transport aims to counter the shortage of skilled workers in engineering. Results and analyses of a nationwide survey among pupils, students and public authorities will be presented, as well as plans to reduce the gap between higher education and the workplace.

**Image:** [Vortrag\_13.2.\_10h\_Lohbeck.Strauch.Oeser] will be sent separately



**TEXT** for the blog post, engl.:

The shortage of skilled workers in the engineering sector threatens the development and sustainable transformation of the economy and mobility in Germany.

There are 151,300 vacancies in the engineering sector [VDI, 2022a, p.3, p.6] and 7,400 positions per year are forecast as demographic replacement requirements in the construction and energy sector [VDI, 2022b]. In contrast, the number of first-year students in engineering and computer science has fallen by 15% in the last 5 years [VDI, 2022a, p.3] and 53% of all students change or drop out of a STEM degree

programme. [acatech, Joachim Hertz Stiftung, 2022, p.24] The problem is further intensified by the demographic development, according to which the group of 15-24-year olds has fallen below 10% for the first time. [Federal Statistical Office, 2022] In addition, the current teaching content of degree programmes cannot keep up with the exponential growth of technological development and the associated demands from business and administration.

The staff unit "Academy for Sustainable Road and Transport", or "Academy" for short, founded in March 2022 as part of a departmental research institution of the Federal Ministry of Digital and Transport, has the central task of developing a scientific foundation for research, evaluation and quality assurance of sustainable, innovative and realisable concepts for recruiting, securing and qualifying skilled workers for the road and transport sector.

Against this background, this contribution deals with the central question of how a sustainable supply of skilled workers in the road and transport sector can be achieved.

In order to build up a comprehensive database, surveys were conducted among three stakeholder groups (pupils, students, representatives of authorities) under the overarching aspect of consistency in order to find out, among other things, to what extent sufficient preparation is provided in the educational environment and which requirements are really considered necessary (also in the future) in the respective activities.

Well over 3,000 people were addressed nationwide and the responses of over 1,000 participants were analysed. The results of the surveys have shown that approaches used to date to increase the attractiveness of degree programmes and reduce drop-out rates have not been sufficiently successful: Pupils feel hindered rather than supported by the (too) large offer - in engineering alone there are currently almost 7,500 degree programmes in Germany [www.think-ing.de] - and often fundamentally question their suitability for a degree course. [Lohbeck, Strauch, Oeser, 2022b]

Students [Lohbeck et al., 2022c] are quite realistic in their assessment of their lack of professional expertise - set against the expectations of future employers: up-to-date knowledge that is constantly being adapted is no longer relevant as expert knowledge for a few, but for all graduates. However, the extended range of courses on offer - generally mainly undergraduate programmes - has not yet led to sufficient connectivity for graduates, partly because the current form of higher education cannot provide the full range of specialist skills required by employers. Universities (of applied sciences) have begun to utilise their potential to teach specialist topics of the future, e.g. BIM or digital twins<sup>1</sup>. Interdisciplinary orientations that can support more precise connectivity are only just being established in some cases.<sup>2</sup>

The public authority representatives surveyed [Lohbeck et al., 2022a] report a low

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<sup>1</sup> Evaluation of various module manuals from universities as part of the Academy's internal project "BIM Radar".

<sup>2</sup> Cf. TUM Schools at the University of Munich

level of satisfaction with regard to the connectivity of young professionals, with a lack of both specialist and general skills. The rapid development of technology has created completely new requirements on the labour market that none of the stakeholders<sup>3</sup> can currently meet with comprehensive solutions. The necessary changes cannot be sufficiently achieved with existing established methods.

Lifelong learning has been gaining in importance for years, but has yet to find a comprehensive equivalent in traditional education systems. At the same time, the gap between the skills taught on the one hand and the skills required on the other is widening. A coordinated exchange between the stakeholders of the topic has not yet taken place to a sufficient extent.

The Academy wants to act as a coordinator of a systemically acting structural network of all stakeholders, focussing specifically on the gap between undergraduate academic education and the requirements of the roads and transport sector.

To this end, both current and future requirements of employers in business and administration will be surveyed and compared with the educational programmes offered by universities. The resulting gap is to be comprehensively analysed on an ongoing basis and the corresponding learning content and adapted onboarding processes for employers defined. These are then to be taught in the third educational pathway - and in consultation with the employers on a part-time basis. The educational providers in this concept are, on the one hand, the universities themselves, which are currently evaluating their state-mandated continuing education programmes, and, on the other hand, private providers and other stakeholders in the network.

An initial analysis and evaluation of current courses and innovative concepts for future courses is to be carried out by a funding and research programme initiated by the federal government in cooperation with the universities.

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<sup>3</sup> Business, administration, universities, students, lateral entrants and internationals to counteract the declining demographic figures

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