PARP
PFR Group

Branżowy Bilans
Kapitału Ludzkiego II

Sectoral Human Capital Study II

Chemical Industry

Results from the 2nd edition of the study

European Funds
Knowledge Education Development

Republic of Poland

European Union
European Social Fund

PARP PFR Group

Branżowy Bilans Kapitału Ludzkiego II

Project information

Project name

Sectoral Human Capital Study II
Chemical industry – 2nd edition *

Study objective

To increase awareness of current and future demand for competencies in the chemical sector

Dates

2nd edition:
January 2022 to May 2023
Including quantitative research:
October to December 2022

* The first edition of the study was conducted August 2020 to August 2021.

Information on the sector

The chemical industry embraces

manufacture and processing of coke and refined petroleum products

manufacture of basic pharmaceutical substances and pharmaceutical preparations

manufacture of chemicals and chemical products

manufacture of rubber and plastic products

Chemical industry

The chemical industry in Poland covers more than **22,000 registered entities**. The largest share is held by companies producing rubber and plastic products (about 15,000) and companies producing chemicals and chemical products (nearly 6,000).

A total of **350,000 people were employed** in the various subsectors of the chemical industry in 2022, with the largest number employed in the manufacture of rubber and plastics (225,000) and the manufacture of chemicals and chemical products (83,000). The chemical industry ranks **third in terms of industrial employment** in Poland.

Key business processes and key positions

New product development

Key positions
Technologist
Laboratory manager
Chemical analyst

Customer acquiring

Key positions
Technologist
Laboratory manager
Chemical analyst

Production

Key positions
Chemical industry machine operator
Production worker
Production foreman

Team management

Key positions
Production manager
Production foreman
Laboratory manager

Quality control

Key positions
Quality controller
Production foreman
Laboratory manager

Storage/ transport/ logistics

Key positions
Chemical industry machine operator
Production worker
Production foreman
Quality controller

Trends in the chemical industry

- Green transformation of the chemical industry pursuant to the European Green Deal regulations (EGD)
- Development towards Industry 4.0
- Individualisation (customisation) of chemical production
- Increasing interconnection of the Polish chemical sector with the world's chemical industry, and increasing competition

Impact of developments on businesses – employers' opinions

Green transformation of the chemical industry pursuant to the European Green Deal regulations (EGD)

Individualisation (customisation) of chemical production

Development towards Industry 4.0:

automation and robotisation of chemical production

digitisation and computerisation of the industry

Increasing interconnection of the Polish chemical sector with the world's chemical industry, and increasing competition:

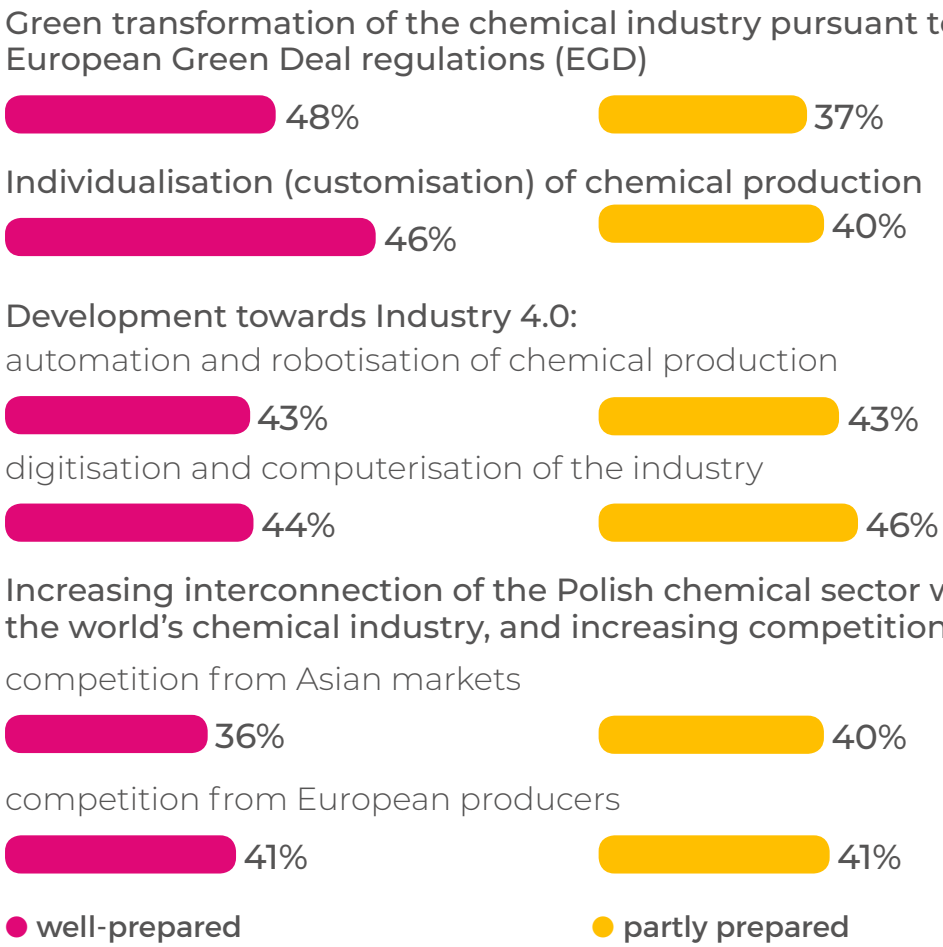
competition from Asian markets

competition from European producers

high impact · low impact · very low impact or no impact · hard to say

Source: SHCS II chemical industry (employers) – 2nd edition 2023 (N=809)

How well prepared businesses are for the changes taking place in the chemical industry



Source: SHCS II chemical industry (employers) – 2nd edition 2023 (N=809)

Percentage of employees with skills related to change:

- 52% – Individualisation (customisation) of chemical production
- 51% – Development towards Industry 4.0
- 48% – Green transformation of the chemical industry pursuant to the European Green Deal regulations (EGD)

Difficulties experienced by companies in 2022

- » **56%** high energy prices
- » **49%** increase in operating costs
- » **30%** decrease in the number of orders
- » **24%** drop in the number of customers
- » **19%** cash flow difficulties
- » **19%** high cost of adjustment to EU standards

Changes planned by companies for the months ahead

- » **51%** increase in average sales margin
- » **29%** finding new suppliers of raw materials
- » **22%** increased outlay on innovation in the company
- » **22%** creation of new services/ products
- » **22%** adjusting the company's activities to the requirements of sustainable production and development
- » **20%** investment or increased investment in new production technologies, modern machinery and software

Most common challenges in companies' daily operations		
	2023	2021
Increase in energy costs*	74%	
High innovation costs*	37%	60% ↑
High costs associated with adapting the company's activities to the new EGD regulations	37%	51% ↑
Increase in the cost of renewable energy sources*	34%	
Meeting employees' financial expectations	32%	63% ↑
Increase in costs of implementing Industry 4.0 technological solutions	31%	39% ↑
The need to keep the best employees in the company*	27%	
Facing high competition from Asian markets	27%	49% ↑
Facing high competition from western markets	25%	50% ↑
Shortages of key raw materials/ intermediates*	25%	
High costs of customised products*	22%	
The need to recruit staff with diverse skills who can work with specialists in different fields*	20%	
Difficulties in reaching customers*	3%	

* challenges only covered in the 2nd edition of the survey

Source: SHCS II chemical industry (employers) – 2nd edition 2023 (N=809), 1st edition 2021 (N=808)

45% of companies between January 2022 and January 2023 introduced a new or improved product/service (15%), a production method (14%), a method of promotion or customer outreach (14%), or method of work organisation (10%). 9% of companies introduced a new or improved technology enabling more eco-friendly production.

Future scenarios

Scenario I: Technological odyssey – the (non-)distant future of the sector

Dynamic development of the chemical industry based on the latest, most advanced technologies. Investments in artificial intelligence, automation of production processes and the Internet of Things (IoT).

More precise and efficient production, as well as better quality control and process safety.

Wide availability of highly specialised staff with interdisciplinary competences.

Scenario II: Machine city – the future begins now

Middle stage of technological development of the industry – between complete ecological and technological transformation and the traditional mode of production and use of finite natural resources.

Initiation and planning of measures for sustainable development through investment in environmental projects.

Limited availability of highly specialised staff with interdisciplinary competencies

Scenario III: Industrial metropolis – time standing still

A stop or significant slowdown in the development of the industry, e.g. due to the geopolitical situation or economic conditions.

Insufficient or no funds for continuing investment in modern technology for sustainable chemical production (such as investments in decarbonising technologies in the sector, or in renewable energy), including a lack of funds for innovation.

The industry fails to meet the goals of the EU's Long-Term Climate Strategy, by which the EU is supposed to achieve climate neutrality by 2050.

Balance of skills

Competency balance – a summary of assessments of key competencies for particular positions in the chemical industry from the perspective of employers and employees, in order to better balance the labour market in terms of the supply of workers with the right competencies and employers' demand for them.

Employers confirm that all the competencies identified for each of the key positions are relevant. The overall self-assessment of these competencies among employees in key positions is also high. **Employers often indicated social competencies as relatively more important**, and employees also rated themselves highly in this respect.

Among the competencies indicated by employers as not readily available on the market were above all digital competencies, but also knowledge of standards and regulations. These competencies, right after job-specific skills and industry knowledge, can also be counted among those valued highly by employers. Hot skills (skills already rapidly growing in importance, or which will soon become more important), irrespective of the position, most frequently included job-specific competencies, competencies in knowledge of standards, regulations, and legislation (e.g. knowledge of quality management systems, or standards in Good Manufacturing Practice), as well as social skills, including those related to work organisation (e.g. self-reliance, the ability to apply knowledge in practice, reliability, and punctuality). Employers also forecast a rapid increase in the importance of digital competencies (e.g. the ability to use specialised software), especially in relation to occupations such as chemical analyst, chemical industry machine operator, and production worker.

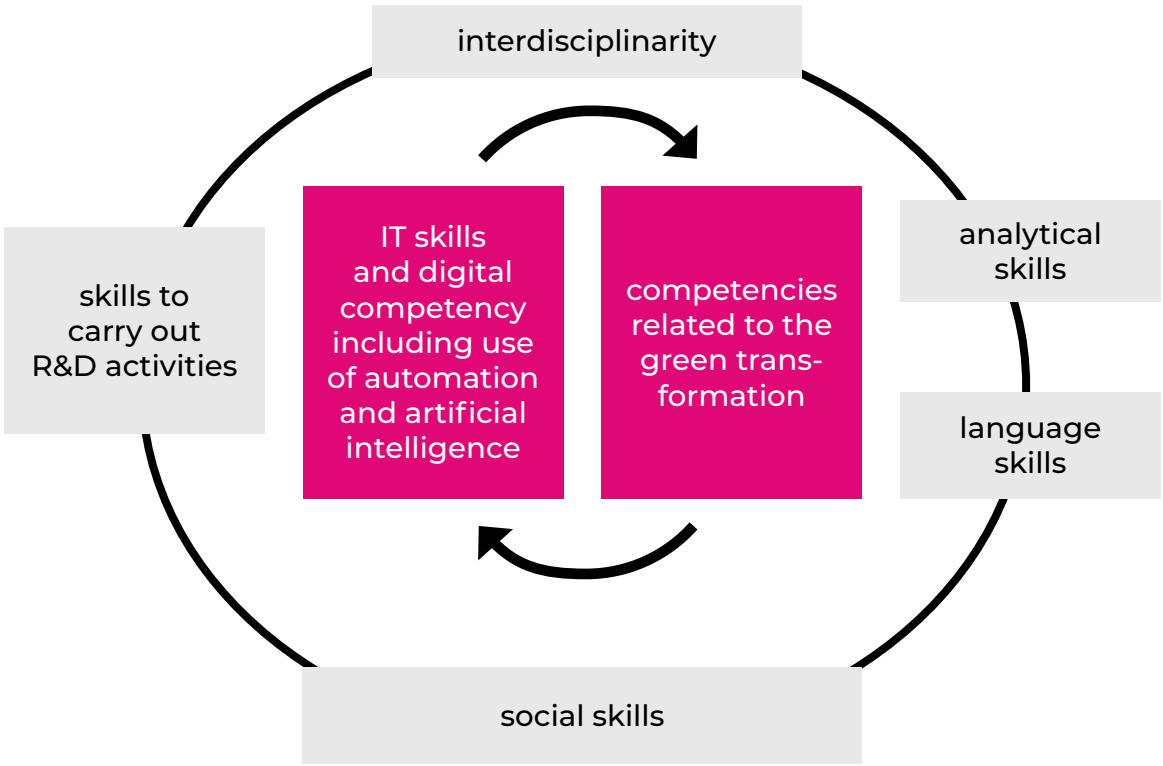
Employers are predicting an **increase in the importance of social and digital competencies and knowledge of law, regulations and standards over the next 5 years**. At the same time, these competencies are also already rapidly gaining in importance (hot skills). Employees often rated these competencies lower than other skills, while declared a willingness to improve in this area in the future.

The largest number of competencies that will gain in importance over the next 5 years and hot skills were noted for laboratory manager and chemical analyst.

Chemical analyst and quality controller were the positions for which employees declared their willingness to seek improvement in regard to the highest number of competencies.

Production foreman in turn was the position for which it proved difficult to acquire the largest number of competencies on the labour market.

Future skills



Future skills:

» **IT and technology competencies,** including the ability to apply artificial intelligence, e.g. the design of microparticles and nanoparticles, the ability to use artificial intelligence for optimising processes (compound design, synthesis, etc.), the ability to design and implement process robotisation and automation and its analytical handling using artificial intelligence and digital technology, prototyping, testing, and the launch and validation of new technologies;

» **interdisciplinarity** (competencies related to combining knowledge from different fields, e.g. chemical technology, energy, information technology, law), including skills in obtaining materials from the fields of chemistry and biology, the ability to analyse the possibilities of integrating sectors of industry, basic knowledge of other fields and the ability to use it, and cognitive flexibility;

» **competencies related to the design of a chemical process**, taking into account ecological production methods and industrial recycling, e.g. the ability to modify machinery (a different raw material = less of an environmental impact), knowledge of industrial recycling and its potential use, the ability to use green chemistry, the ability to adapt technology to the characteristics of the raw materials obtained, “green skills” (parameterised by the European Green Competence Framework – GreenComp), and knowledge of sustainable energy issues;

» **analytical and mathematical competencies**, including mathematical modelling, analysing data from R&D projects and putting them into practice, Big Data analysis, forecasting trends, market demand analysis, in-depth risk analysis, and the ability to discern local market demand;

» **competencies related to the development of technological innovations**, including the ability to use new technologies, and research competencies enabling the preparation of cross-sectoral innovations;

» **social competencies** such as lifelong learning, multitasking, virtual cooperation, design thinking, calculative thinking, the ability to adapt quickly to new conditions, and the ability to work in an intercultural and interdisciplinary team.

Future job positions:

» positions combining industry knowledge with IT and robotics

» positions related to the design of chemical processes taking ecological production methods into account

» analysis and research positions

» positions related to the individualisation and innovation of chemical production

Employment in the sector

Almost one in **four employers** (23%) were looking for employees in 2022.

40% **of companies that were looking for employees had difficulties with recruitment, particularly for the following positions:**

» production worker: **57%**

» chemical industry machine operator: **35%**

Reasons for recruitment difficulties:

» low interest in the job offer

» candidates meeting expectations were not happy with the terms of employment

» candidates who applied did not meet expectations

Employees sought most often between January 2022 and January 2023*

» production worker: **86%**

» chemical industry machine operator: **30%**

» production foreman: **13%**

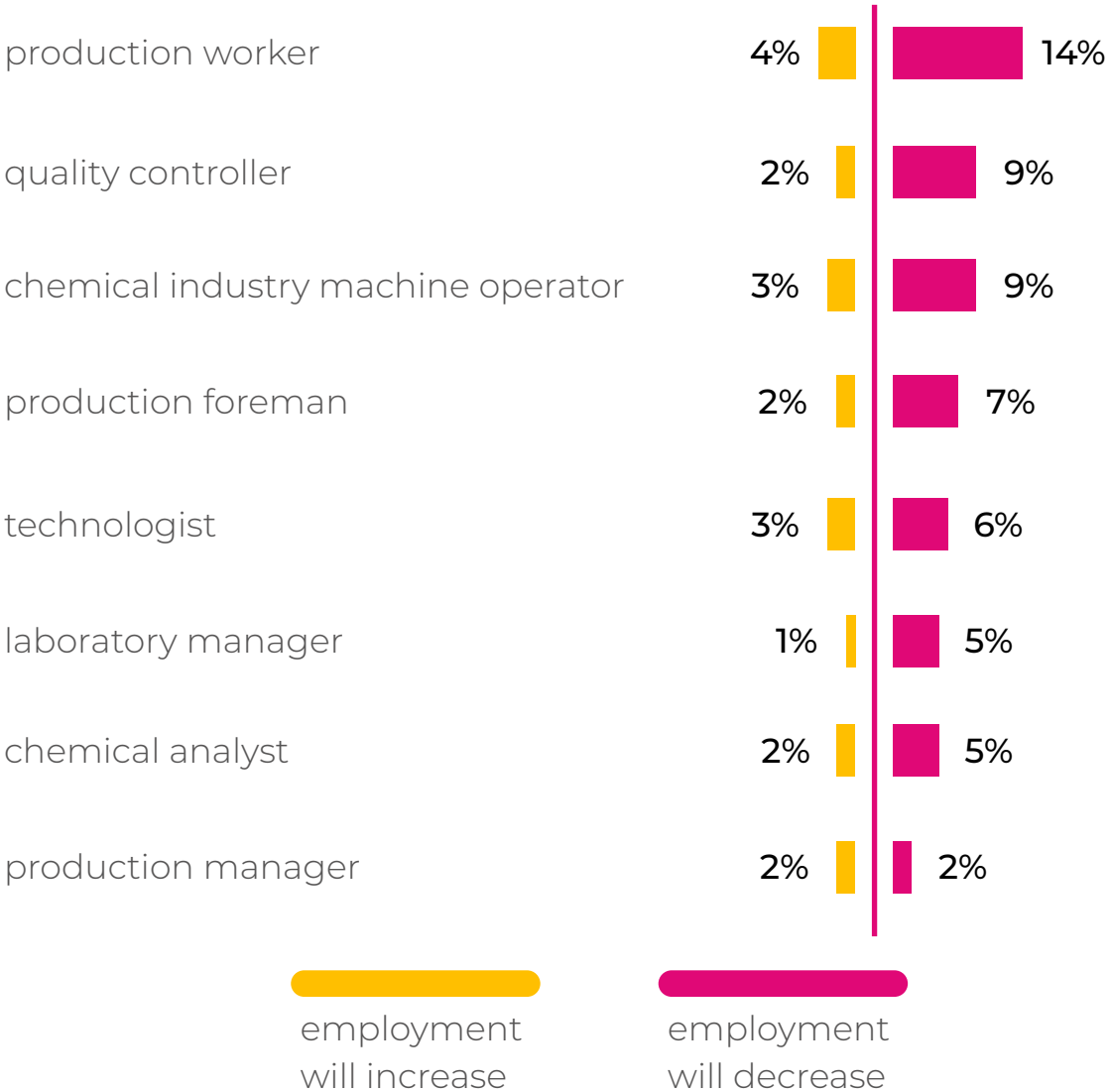
» quality controller: **10%**

* as indicated by employers who were looking for employees (n=214)

Expected changes in employment

Over the next 5 years, **3%** of employers expect an increase in employment in the industry.

Expected changes in employment in key positions over the next 5 years

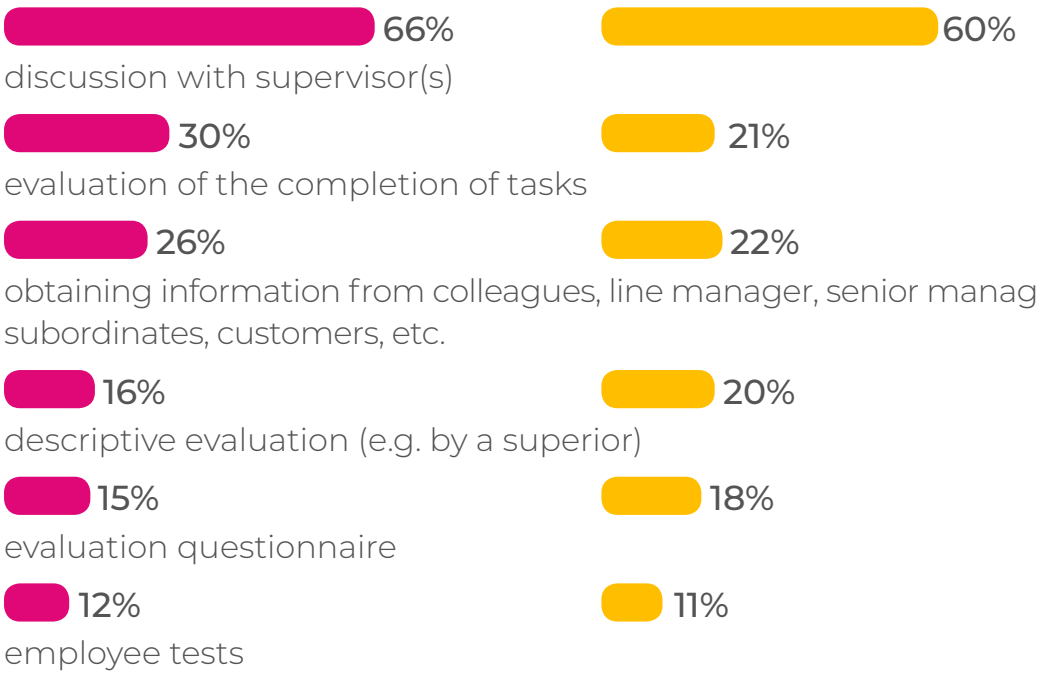


Source: SHCS II chemical industry (employers) – 2nd edition 2023 (N=809)

Assessment of employees' skills

55% of companies are assessing the necessary employees' skills. 42% of them evaluate employees' skills systematically (at least once a year)

Methods of assessing employees' skills in 2022



Source: SHCS II chemical industry – 2nd edition 2023 (employers N=437), employees (N=471); employers who assess the competencies of employees

Matching of employees' skills to the tasks

- 5% of employees most often perform tasks that are too simple for their skills
- 77% of employees most often perform tasks that match their skill level
- 13% of employees most often perform tasks that are too difficult for their skills

Source: SHCS II chemical industry (employees) – 2nd edition 2023 (N=825)

Forms of skill development for employees in the workplace

69% of employers offered at least one form of employee development at their company in the 12 months preceding the survey (in or outside the workplace).

Forms of professional skills development in the workplace

48% 30%
instruction on e.g. operating new equipment, machinery, software (e.g. training offered by machine manufacturers)

31% 16%
temporary observation of another employee's work

31% 13%
temporarily performing tasks in a different position for training purposes (rotation)

26% 14%
participation in internal courses and training delivered at the workplace by company employees (excluding health and safety and fire protection)

23% 14%
participation in courses and training provided by an external company at the workplace (excluding health and safety and fire protection)

21% 14%
performing tasks at work with the support of another person, e.g. a supervisor or colleague

17% 14%
e-learning courses (excluding health and safety and fire protection)

13% 11%
joint team meetings to share knowledge of other teams' work

- **offered by the employer**
- **participation by employees in key positions**

Source: SHCS II chemical industry (employers and employees) – 2nd edition 2023 (employers N=809, employees N=825)

Methods of motivation and their appeal

The methods of employee motivation applied most often by employers, and employees' assessment of their appeal

2	1	3
a well-organised workplace	bonuses	maintaining a good atmosphere among employees
employers: 62%	employers: 86%	employers: 59%
employers: 66%	employers: 92%	employers: 65%

Source: SHCS II chemical industry – 2nd edition 2023 (employers N=809), employees (N=825); employers who assess the competences of employees

88% the majority of employees working in key positions are generally satisfied with their jobs

Assessment of how well education meets employers' needs

» **68%** of employers believe that current school and university curricula meet the employee skills needed in their companies

» **69%** of the surveyed employees feel their school/ university has prepared them well for working in their current position

Skills that should be imparted in secondary and higher education, according to employers and employees

Source: SHCS II chemical industry – 2nd edition 2023 (employers N=809), employees (N=825); employers who assess the competences of employees

Collaboration between business and education

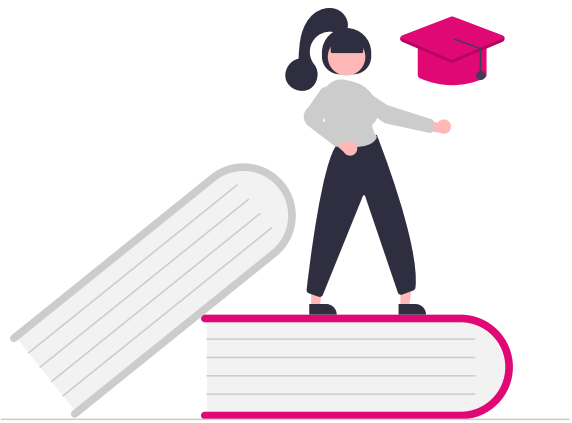
Altogether, one in five businesses collaborate in any way with educational institutions.

Forms of cooperation between business and education

- **13%** of employers collaborate with schools
- **6%** of employers collaborate with training companies
- **5%** of employers collaborate with universities

Forms of collaboration with educational institutions:

- staff training provided by representatives of schools and/ or universities
- business patronage for a school/ university
- participation in curriculum development
- collaboration with student on projects



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Kapitału Ludzkiego II

For a full overview of the findings, see the report:

Sectoral Human Capital Study II
Chemical Industry

Report on the 2nd edition of the research (in Polish):

https://www.parp.gov.pl/component/site/site/bilans-kapitaluludzkiego#wynikibadanbranzowych

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