

# Discrepancies between formal training provisions and workplace requirements

(ChemTube deliverable IO-1)  
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## ***Background and aims of IO1***

The ChemTube IO1 targeted the identification of possible discrepancies between formal training and workplace requirements in laboratory environments and process operation in European VET, primarily with EQF level 4 in focus. This analysis of the situation in the industry has been undertaken as a comparative study based on defined ECVET units of learning outcomes.

The analysis has been based on a previously developed qualification matrix elaborated as project result from the ChempharmVET Erasmus KA/2 strategic partnership (2015-1-NO01-KA202-013278). This matrix was based upon a review of the Pile Up matrix and the simultaneous development of additional units of learning outcomes for operators in the pharmaceutical industry. The Pile Up project was a transferred application of a proven method for developing units of learning outcomes from the European ECVET pilot project CREDCHEM. In this way the ChemTube has served as the fourth generation of ECVET developments since the first piloting phase of EQF/ECVET implementations.

IO1 of ChemTube has been directed towards workplace competence requirements taking into account dual learning (alternating school and work) and work-based learning. It has identified needs for learning outcomes to be added to the matrix, or to be reworked, after a comparison and review of the matrix of learning outcomes stemming from ChempharmVET developments. This has been done to facilitate work-based learning.

Selected VET providers and industry companies (associated partners) in the Czech Republic and Norway provided input as well as quality and relevance checks of competence definitions and learning outcomes.

The IO1 has addressed a mapping of existing VET provisions (EQF level 4) by expected learning outcomes in partner countries with a special attention to critical skills and tacit knowledge elements. with level of competences requested by the industry represented by selected companies linked to partners as external associate partners/stakeholders. This process resulted in an identification and specification of learning outcome gaps in VET (EQF level 4) for operators in the industries.

## **Stakeholder feedback**

Results from IO1 were presented to the partnership meeting of ChemTube in Dresden (2019-03-18) by Silvia Surová, director of the ZCHFP SR - The Association of Chemical and Pharmaceutical Industry of the Slovak Republic.

The qualification description from ChemPharmVET, in complete EQF/ECVET format, was used as a template for analysis and feedback when approaching the stakeholders in Norway and the Czech Republic.

### ***Norway***

Kristiansund videregående skole presented the Learning Outcome matrix from ChemPharmVET to GC-Rieber Oils, and Shell Norway where there has been a close cooperation between teachers and companies as part of dual training.

- GC-Rieber Oils, is a Norwegian and world-leading producer of marine derived Omega-3, high level concentrates. Located in Kristiansund, 60 employees.
- Shell, Norway is linked to the Ormen Lange gas facilities and process plant. An onshore process plant with 250 employees, located in Aukra.

The companies were selected based on experience from collaboration (School – Industry) with the local process industry. No pharmaceutical or food industry, because the local industry nearby Kristiansund is more traditional process industry, although GC-Rieber, are in the borderline against pharmaceutical.

The matrix was sent out in advance for review. Phone contact afterwards to uncover the biggest challenges with this complex qualification description. Meeting at the school (31-01-19) with all the people involved and where all the points in the matrix were discussed and evaluated.

### **CZECH REPUBLIC**

SPŠCB presented the matrix to Synthol Blansko (pharmaceutical company), Gumotex and Gumotex Coating (rubber, coating industry) and a VET school

- Synthol Blansko - is a pharmaceutical company generating effective substances of medicaments (research and production). It has subsidiary companies around the world. The role is cooperation with professional experience, coordination of the school curriculum and experience training.
- Gumotex Břeclav – rubber, coating industry - produces plastic components for car industry (e.g. seats, sun visors etc.) and supplies them to Audi, VW, Škoda etc. It also produces rubber boats - rafts, kayaks - which are supplied to the USA market.
- VET school – Střední škola informatiky, poštovnictví a finančnictví Brno, příspěvková organizace

## Extracts from the stakeholder feedback

Information about the testing company/training institution	
Company:	Shell, Norway GC -Rieber
Sector/Area of activity:	Oil and gas Marine oils
Contact person (name)	Oddvar Seljehaug Monica Strand
Contact person (position)	Training leaders. HR
Contact details ( e.g. email address)	Oddvar.Seljehaug@shell.com Monica.strand@gcrieber.com

  

UNIT 1 Perform operational logistics	
Learning outcome	Rating (1 to 7)
1. Preparation	1
1.1.1: Prerequisite : Foreign language	3 3
1.1.2: Prerequisite: Digital tools and software use	2 2
1.1.3: Production planning	2 2
	Dont want the operator to have contact with the customer . Do not take part in the planning of new products .
1.1.4: Logistics	2 4 This is a separate subject area, does not want interference from the operator .
1.2: Execution	
1.2.1: Health and safety	7 7
1.2.2: Process control	7 7
1.2.3: Products and packaging	2 4
1.3: Monitoring	
1.3.1: Quality standards and assessment	7 7

  

UNIT 2 Conduct Processes	
Learning outcome	Rating (1 to 7)
2.1 Process preparation	7 7
	Use of GMP
2.1.1 Basic process understanding	7 7
	USE OF P&ID
2.1.1.1 Production process	7 7
2.1.1.2 Equipment	6 7
	Put these two together to a point
2.1.1.3 Equipment setup	7 7
	Put these two together to a point
2.1.2 Instrumentation and control	7 7
2.1.2.1 Calculation	7 7
2.1.2.2 Instrumentation diagrams	3 3
2.1.2.3 Mode of operation	7 7
2.1.3 Equipment operation	7 7
1.3.1: Quality standards and assessment	7 7
2.1.4 Software	2 2 REMOVE from list, not relevant. Not relevant.
2.1.5 Procedures	7 7
2.1.6 Contamination	7 7
2.1.7 Handling of raw material	7 7
2.2 Handling of machinery in process	7 7
2.2.1 Production process	7 7
2.2.1.1 Preparing production	7 7
2.2.1.2 Starting production	7 7
2.2.1.3 Closing down	7 7
2.2.2 Production quality standards	7 7
2.2.2.1 Purification and contamination	7 7
2.2.2.2 Product characteristics and	7 7

UNIT 3 Participate in quality control	
Learning outcome	Rating (1 to 7)
3.1: Taking samples	2 6
3.1.1 Safety	7 7
3.1.2: Methods of sampling	2 6
3.1.3: Implementation of sampling	2 6
3.1.2.1: Sampling and offloading of samples from equipment	2 6 The production of gas makes this superfluous
3.1.2.2: Packaging, storing and transfer of samples	2 6 The production of gas makes this superfluous
3.1.2.3: Documentation of samples	2 6
3.2: Sample analysis	2 6
3.2.1: Procedure and process	2 6
3.2.3: Result	2 6
3.3: Participating in quality control	2 6
3.3.1: Quality control	2 6
3.4: Feedback and fine-tuning	2 6

UNIT 4 Participate in maintenance and repairs	
Learning outcome	Rating (1 to 7)
4.1. Operating permit (required to start working on the site)	7 7
4.1.1: Safety precautions in maintenance	7 7
4.1.2: Maintenance preparation	7 7
4.2. Lock out and tag out of installation	7 7
4.3. Maintenance and repair	7 7
4.3.1: Specific conditions	7 7
4.3.2 Feedback and improvements	7 7

Information about the testing company/training institution	
Company:	Synthon Blansko
Sector/Area of activity:	Pharmaceutical company
Contact person (name)	Renata Šebelová
Contact person (position)	HR Generalist
Contact details (e.g. email address)	Renata.Sebelova@synthon.com

**ChempharmVET-U1**

**Perform operational logistics**

- Student can follow the safety and environmental requirements regarding the given task.
- Student copes with the danger when loading and removing materials according to the safety and environmental rules.
- Student follows the regulations regarding dangerous situations, working with dangerous materials, first aid and evacuation plan.
- Student can correctly inform the department, colleagues or customers about some deviations.
- Student can test, assess, document and create the obligatory labelling.

**ChempharmVET-U2**

**Conduct processes**

- Student can choose proper tools according to the process.
- Student manages to install the apparatuses.
- Student manages to handle with the tools.
- Student works precisely.
- Student follows the safety rules and uses the protective aids.
- Student can clean the apparatus according to the safety and company regulations.
- Student can clean / finish the product well.
- Student realizes dangerous situations and malfunction in the production process (due to automatically generated details as well) and deals with it in an appropriate way.
- Student takes samples by certain tools.
- Student can define the main problems and suggest some solution.



### **ChempharmVET-U3**

- Student can apply methods and regulations regarding the sampling according to quality and safety rules.
- Student prepares the samples and apparatuses for sampling while being aware of the specific equipment and safety rules.
- Student samples well.
- Student can wrap and store the samples.

### **ChempharmVET-U4**

- Student can coordinate his / her and team work schedule when there are some repairs and maintenance.
- Student can organize and use tools, equipment, chemical matters and energy so that the maintenance can be done properly and in a safe way.

### Information about the testing company/training institution

Company:	Gumotex coating, s.r.o.
Sector/Area of activity:	Company
Contact person (name)	Jolana Strakušová
Contact person (position)	Business Partner
Contact details (e.g. email address)	jolana.strakusova@gumotex.cz

1. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in

**ChempharmVET-U1** Perform operational logistics

- Following the (safety) rules regarding transportation and material preparation
- Following the safety and environmental rules of the given task
- 

2. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in

**ChempharmVET-U2** Conduct processes

- Lack of loyalty to the company
- Lack of willingness to learn the production process thoroughly; take part in the production processes
- Lack of practical experience

3. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in **ChempharmVET-U3**

Participate in quality control

- Lack of knowledge of rubber production
- Lack of willingness to take part in the production processes and learn the production process thoroughly

4. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in **ChempharmVET-U4**

Participate in maintenance and repairs

- Lack of candidates educated in the field of machine maintenance, machinery, electro-technics and electronics
- School branches are focused on general knowledge in all fields of electro-technics and machinery instead of being targeted on specific knowledge
- Lack of knowledge of technical drawings
- Lack of practical experience during the studies

#### Information about the testing company/training institution

Company:	<a href="#">Střední škola informatiky, poštovníctví a finančnictví, příspěvková organizace, Čichnova 23, 624 00 Brno</a>
Sector/Area of activity:	Education
Contact person (name)	<a href="#">Mgr. Kateřina Kuchyňková</a>
Contact person (position)	Teacher – <a href="#">Scientific subjects</a>
Contact details (e.g. email address)	<a href="mailto:katerina.kuchynkova@cichnovabmo.cz">katerina.kuchynkova@cichnovabmo.cz</a>

1. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in  
**ChempharmVET-U1** Perform operational logistics

- Following the safety rules of transport and material preparation.
- Fulfilment of safety and environmental demands regarding the given task.
- Coping with the danger when working with materials and when removing materials according to the rules of environmental protection.

2. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in  
**ChempharmVET-U2** Conduct processes

- Explanation of rules and laws concerning the environment.
- Fulfilment of safety and environmental demands regarding the given task.
- Coping with the danger when working with materials and when removing materials according to the rules of environmental protection.
- Knowledge of legislature and laws regarding the health and safety.
- Implementation of work procedures so that the risks are limited.
- Solving the critical situation via work and emergency procedures until being helped by other employees.
- Staff training about the critical situations and responsibility for the solution;

monitoring of controlling all the critical activities which include company safety, staff safety or the environmental protection; responsibility for their ongoing process.

3. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in  
**ChempharmVET-U3** Participate in quality control

- Organization of quality assessment according to defined standards.
- Supervising the team when working to use the proper material of a good quality.
- Providing the quality check-up before transfer.
- Defining the chemical and pharmaceutical material specifications.

4. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in **ChempharmVET-U4**

Participate in maintenance and repairs

- Implementation of safety rules when maintaining.
- Realizing dangerous or critical situations and setting appropriate measures.
- Using the work, safety and crisis procedures.
- Identification of employee suitable safety material and convenient equipment.
- Explanation of optimal usage of personal protective equipment.
- Explanation of the relation between tools usage and safety material and staff equipment.
- Supervision of using the reliable equipment and working methods when maintaining.
- Explanation of principles when working with some tools (e.g. pumps, valves, measuring and controlling tools, washers or pipes).
- Organizing and using tools, equipment, chemical substances and energies in a way to proper and safe maintenance.

***Partners' synthesis of possible themes for video production to cover discrepancy gaps between school education and workplace requirements***

**Czech Republic - SPŠCH Brno**

***Critical Laboratory Operations –***

1. weighing (weighing vs. analytical weighing)
2. preparation of solutions in a volumetric flask
3. heating in water / oil bath
4. checking the bath temperature
5. heating while using a magnetic stirrer
6. stirring while using a magnetic stirrer
7. setting up a reaction apparatus with a paddle-wheel stirrer
8. drying in a desiccator
9. drying liquid products of organic synthesis
10. drying gases
11. working with a pressure bottle (gas withdrawal)
12. working with cryogenic liquids and solid matters (dry ice, liquid nitrogen)
13. simple filtration
14. low-pressure filtration (glass filter / Büchner funnel)
15. decantation
16. recrystallization (complex)
17. working with a rotary evaporator
18. simple distillation (complex)
19. low pressure distillation (complex)
20. liquid-liquid phase extraction
21. setting up an apparatus for a Soxhlet extraction (percolation)
22. determination of the melting point
23. determination of the boiling point
24. measurement of the refraction index
25. thin layer chromatography
26. preparation of a sample for GC/LC
27. mineralization of a sample (complex)

## Italy- Istituto Tecnico Superiore per le nuove tecnologie della vita:

### Critical Production Operations

#### CANDLES IN A CONTAINER

- 1) How to make the proper choice for a suitable wick
- 2) How to prepare a wick for a candle
- 3) How to place a wick in a candle
- 4) How to straighten a wick in a candle

#### LABORATORY TESTING OF LEATHER CHEMICALS

##### Fat Liquering Agents

- 5) How to prepare samples of skins
- 6) How to set up the necessary equipment ( barrel )
- 8) how to prepare the test solution
- 9) how to carry out the test on samples
- 10) how to evaluate the results

## **Slovakia - ZCHFP SR - The Association of Chemical and Pharmaceutical Industry of the Slovak Republic:**

### 1. Mechanické separačné metódy

#### **MECHANICAL SEPARATION METHODS**

##### **FILTRATION**

##### **FILTRATION AT ATMOSPHERIC PRESSURE 3.1A**

##### **FILTRATION AT REDUCED PRESSURE 3.1B**

##### **CENTRIFUGATION**

##### **Proper handling of the centrifuge**

### 2. Meranie fyzikálnych konštánt

#### **MEASUREMENT OF PHYSICAL CONSTANTS:**

##### **BOILING POINT 2.1A**

##### **Determination of boiling point by capillary method**

##### **DENSITY**

**Determination of density using pycnometer**  
**DETERMINATION OF DENSITY BY PYCNOMETER 2.2**  
**REFRACTIVE INDEX DETERMINATION 2.3**  
**REFRACTIVE INDEX**  
**Determination of refractive index using refractometer**

3. Odmerná analýza

**VOLUMETRIC ANALYSIS**

**VOLUMETRIC ANALYSIS - GENERAL 5.1**

**VOLUMETRIC ANALYSIS - SOME EXAMPLES OF VOLUMETRIC ASSAYS 5.2**

**5.1 TITRATIONS GENERAL**

**5.2 SOME EXAMPLES OF VOLUMETRIC MEASUREMENTS**

**5.2.A ACIDIMETRY**

**5.2.B IODOMETRY (IODOMETRIC TITRATION)**

4. Příprava roztoků

**PREPARATION OF SOLUTIONS:**

**Solution of solid in liquid with approximate composition**

**Solution of two liquid substances with approximate composition**

**Solution of solid in liquid with approximate composition**

**Solution of two liquid substances with approximate composition**

Syntéza

**SYNTHESIS**

**SIMPLE SYNTHESIS WITH FAST RUN IN A BEAKER - PRECIPITATION**

**ORGANIC SINGLE-DOSE REACTANT SYNTHESIS**

**ORGANIC SINGLE-DOSE REACTANT SYNTHESIS**

Vákuová odparka

**Rotary vacuum evaporator**

**Germany - SBG Dresden:**

***List of Tacit Knowledge and Critical Skills***

**Tacit Knowledge:**

**Common competences:**

- Determining densities via areometers in various solutions
- Determining densities of solids via pycnometer
- Bacteriological examination of water in the technical center
- Changing a flanged valve



### Specific competences:

- Taking samples from vessels with Bürkle MiniSampler
- Commissioning practice of the Ultra Centrifugal Mill ZM200

### Critical Skills

- Commissioning of the twin-screw extruder Brabender TSE20 x 40D
- Starting process of the semi-technical distillation DN 80

## Norway - Kristiansund videregående skole:

Proposed list based on the Matrix from the ChemPharmVet project:

<b>Aggregated Units of Learning Outcomes.</b>	<b>ChempharmVET-U1</b>	Perform operational logistics
	<b>ChempharmVET-U2</b>	Conduct processes
	<b>ChempharmVET-U3</b>	Participate in quality control
	<b>ChempharmVET-U4</b>	Participate in maintenance and repairs

1. Perform operational logistics -> **Specific competence**  
The work tasks in this unit are to prepare, execute and monitor a logistic plan.
2. Conduct processes -> **Specific competence**  
The work tasks in this unit are to conduct psysical processes (thermal, mechanical, EI&C), chemical processes, biological processes and pharmaceutical processes.  
The technological context consists of:
  1. Preparation of the process
  2. Handling of machinery
  3. Control of working processes.
3. Participate in quality control -> **Common competence**  
The work tasks in this unit are
  1. Taking samples
  2. Sample analysis
  3. Participating in quality control

The technological context consists of taking samples, methods of analysis and quality management.

4. Participate in maintenance and repairs -> **Common competence**

The work tasks in this unit are

1. Working permits
2. Lock out and tag out of installation
3. Maintenance or repair

Mapping of Tacid knowledge, Classroom Kristiansund Videregående Skole.

2.1.1.2 Equipment		Take responsibility for the correct installation of the equipment used by the team	
		Name equipment that is needed to conduct the process	Clarify equipment parts and describe their function correctly

- **Low pressure in the DP-cell**
- **Air trapped in centrifugal pump**

2.1.2 Instrumentation and control		Assume responsibility for fellow workers and their safety during the processing	
		Describe fundamentals of process control and instrumentation technologies	Recognize the hazard potential of the process
		Explain the operation mode of scales	

- **Pressure release for maintenance.**
- **Pressure release for start-up and shutdown of the plant.**
- **DB&B of valves and pumps**

2.1.2.2 Instrumentation diagrams		Take responsibility for the proper presentation and documentation of piping and instrumentation diagrams	
		Identify symbols and	Read the piping and

		their meaning in a piping and instrumentation diagram	instrumentation diagram
		Name rules concerning the compilation of a piping and instrumentation diagram	Compile an instrumentation and piping diagram abiding by the used standards into a given matrix
		Identify points of measurement in a given piping and instrumentation diagram	Marks points of measurement in a piping and instrumentation diagram abiding the used standards
		Name regulations on marking E/I & C technology in a piping and instrumentation diagram.	Enter standardized points of measurement into a piping and instrumentation diagram correctly

- **Use and understand of P&ID.**
- **Use and understand of P&ID legend.**
- **Use and understand of PFD.**
- **Use and understand of block form.**

2.1.4 Software		Take responsibility for the processes and the operating software systems	
		Describe processes and explain operating software systems	Describe and explain processes and their visualization on the screen

- **How to communicate with other operators**
- **How to orientate on the screen**
- **Understand the process medium**
- **Understand what comes in and out of the plant**
- **Understand the main components of the plant**
- **Understand chemical and physical changes**
- **Understand regulation and regulatory principles**

- Understand alarms levels, security systems and interlocking system
- Understand C&E.

2.2.1.2 Starting production		Autonomously decide on ramifications to start and stop the process safely	
		Identify basic operations and basic functions of the software	Instruct fellow workers on the ramifications
			Use correct materials and hardware according to situation
			Assume responsibility for his and his colleagues' safety
		Identify specific conditions of the start process according to current situation	Handle machinery manually (and via screen) according to process specifications
Operate it-equipment like pcs, touch screens, joy sticks, printers			

- **How to communicate with other operators**

2.2.1.3 Closing down		Take responsibility for the closing and the required documentation	
		Explain the operation mode of the equipment and know how to shut it down appropriately	Write an appropriate protocol containing all results

- **How to communicate with other operators**

## Attachment – Survey questionnaire from ZCHFP SR (2018-12-10)

### From ChemPharm to ChemTUBE

# QUALIFICATION PROFILE TESTING

**Process operator** in the European Chemical and Pharmaceutical Industry

**European Qualification Framework Level: 4**

The ChemTube Project aims to identify possible discrepancies between formal training and workplace requirements in laboratory environments and process operation in European VET, EQF level 4.

We would like to ask your professional opinion, to improve:

*In this phase we would like to test if the qualification profile is comprehensive and suited for the chemical/pharmaceutical industry's needs, by involving stakeholders.*

*In the testing we involve*

- 1. Companies from the chemical/pharmaceutical industry*
- 2. Vocational training providers.*

*Please take a look at the profile and help us to identify the competence gaps, the necessary adjustments and possible discrepancies between formal training and workplace requirements in laboratory and process operation with a special attention to critical skills and tacit knowledge elements.*

### QUALIFICATION PROFILE TEST QUESTIONNAIRE

Information about the testing company/training institution	
Company:	
Sector/Area of activity:	
Contact person (name)	
Contact person (position)	
Contact details (e.g. email address)	

Identification of possible gaps

Feedbacks about the professional profile

1. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in

**ChempharmVET-U1** Perform operational logistics

2. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in

**ChempharmVET-U2** Conduct processes

3. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in

**ChempharmVET-U3** Participate in quality control

4. Please identify possible gaps and missing workplace requirements, critical skills and tacit knowledge elements in

**ChempharmVET-U4** Participate in maintenance and repairs