

## Introduction

The automotive industry is undergoing rapid transformation driven by advances in vehicle technology, transport systems, and changing mobility preferences. These developments are reshaping the knowledge and skills required for vehicle maintenance, repair, and sales, with significant implications for vocational education. The transition from petrol and diesel vehicles to electric powertrains demands substantial changes in energy infrastructure, while increasing vehicle automation alters driver roles and introduces new requirements for automotive services.

Within the AutoCove 2.0 project, key trends in the automotive sector, including powertrain diversification, advanced driver assistance systems, and automation, were analysed alongside differences in national vehicle fleets. A Europe-wide survey of automotive educators and industry representatives revealed the most pronounced knowledge gaps in emerging technologies such as hydrogen systems and vehicle automation, as well as in generic IT, language, and information-seeking skills.

To address these gaps, industry, educational institutions, and research organisations are collaboratively developing future-oriented training courses delivered via an online learning platform. The courses are aligned with Euro-pean Qualifications Framework levels and will be freely available for five years.

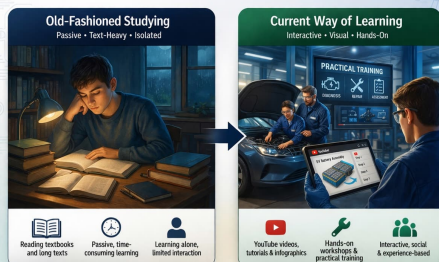
## Skills-gaps in the sector



## Vocation education in 2026

### Changing the Way We Learn

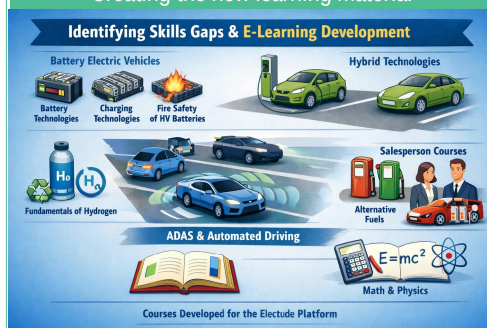
From Traditional Study to Interactive, Hands-On Learning



## Process in AutoCove 2.0



## Creating the new learning material



## Cooperation is the key to success



## Acknowledgements

This study is a part of the project AutoCove 2.0, co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

## References

- Hötte, K., et al., 2023. Technology and jobs: A systematic literature review. Technological Forecasting and Social Change
- Macher, G. et al. (2020). A Study of Electric Powertrain Engineering - Its Requirements and Stakeholders Perspectives. In: Yilmaz, M., Niemann, J., Clarke, P., Messnarz, R. (eds) Systems, Software and Services Process Improvement. EuroSPI 2020. Communications in Computer and Information Science, vol 1251. Springer, Cham.
- Zhao, X., et al., 2022. How will vehicle automation and electrification affect the automotive maintenance & repair (M&R) sector? Transportation Research Interdisciplinary Perspectives, 13, 100568.
- EU (2019). Regulation (EU) 2019/631 of the European Parliament and of the Council of 17 April 2019 setting CO2 emission performance standards for new passenger cars and for new light commercial vehicles, and repealing Regulations (EC) No 443/2009 and (EU) No 510/2011
- EU (2023). Regulation (EU) 2023/851 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2019/631 as regards strengthening the CO2 emission performance standards for new passenger cars and new light commercial vehicles in line with the Union's increased climate ambition (Text with EEA relevance) [Internet]. OJ L Apr 19, 2023.
- Ajanovic A, Haas R. Prospects and impediments for hydrogen and fuel cell vehicles in the transport sector. Int J Hydrog Energy. 2021 Mar 3;46(16):10049–58.
- Grosso M, Cristinel Raileanu I, Krause J, Alonso Raposo M, Duboz A, Garus A, Mourzouchou A, Ciffo B. How will vehicle automation and electrification affect the automotive maintenance, repair sector? Transp Res Interdiscip Perspect. 2021 Dec;12:
- SAE (2021). J3016\_202104: Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles - SAE International
- ERTRAC (2022). Connected, Cooperative and Automated Mobility Roadmap. ERTRAC; 2022.
- Boelhauwer A, van den Beukel AP, van der Voort MC, Hottentot C, de Wit RQ, Martens MH. How are car buyers and car sellers currently informed about ADAS? An investigation among drivers and car sellers in the Netherlands. Transp Res Interdiscip Perspect. 2020 Mar 1;4:100103.
- Geels, F. W. (2005). The dynamics of transitions in socio-technical systems: a multi-level perspective. In Transitions: Pathways toward sustainable societies (pp. 9-35).
- Nakicenovic, N. (1986). The automobile road to technological change: diffusion of the automobile as a technological substitution process. Technological Forecasting & Social Change, 29(3), 249-263.
- Lilja J., Seefried, M., Öörni, R. (2024). D2.1 Development trends in vehicle fleet, vehicle sales and maintenance services.
- Smit G, Flickenschild M, Verkennis N, Martino A, De Stasio C, Fiorello D, et al. Study on exploring the possible employment implications of connected and automated driving - Final Report. Rotterdam: ECORYS; 2021 Jan
- Hagman J, Stier JJ. Selling electric vehicles: Experiences from vehicle salespeople in Sweden. Res Transp Bus Manag. 2022 Dec 1;45:100882.
- Moldovan, L. (2019). State-of-the-art Analysis on the Knowledge and Skills Gaps on the Topic of Industry 4.0 and the Requirements for Work-based Learning, Procedia Manufacturing, Volume 32, 2019, Pages 294-301
- Pauliina Rikala, Greta Braun, Miitta Järvinen, Johan Stahre, Raija Hämäläinen. Understanding and measuring skill gaps in Industry 4.0 — A review, Technological Forecasting and Social Change, Volume 201, 2024.
- Partnership for 21st century learning, 2007. Framework for 21st Century Learning (2007)
- Seefried, M., Ziegler, A., Ponomarev, P., Hein, T., Oeser, D., Bohn G., Tuominen, A., Penttinen, M., Öörni, R. (2024). D2.2 Skills-gaps analysis.

## Contact Information

### Merja Penttinen

Address

Tel: +358 40 554 6826

Email: Merja.Penttinen@vtt.fi

Web: [www.vttresearch.com](http://www.vttresearch.com)