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Skill Gaps of Teachers in Air Transport Professions

Research Summary Report

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Introduction

The research described in this report was conducted, as a results of project “Leveling the Competence Gaps of Teachers in Professions Related to Air Transport” from the Erasmus+ programme, action type KA210-VET - Small-scale partnerships in vocational education and training that is co-funded by the European Union. It is important to be mentioned that research was conducted on the teachers and instructors that participated in the project. Main purpose of the project and presented research is to analyze the skills and competencies required by high-school teachers preparing students for careers in the General Aviation and air transportation market. With the industry facing rapid advancements, there is an increasing demand for a skilled workforce capable of meeting complex operational and technological standards. High-school educators play a crucial role in shaping students' foundational knowledge and attitudes toward this field. However, there is often a gap between industry requirements and the skills imparted at the high-school level.

The primary aim of this study is to identify specific skill gaps among high-school teachers, trainers and instructors in aviation-focused programs. This research addresses areas such as technical knowledge, familiarity with industry regulations, safety and compliance training, and proficiency in using industry-standard technologies. The findings from this survey are intended to highlight areas in which professional development could benefit teachers, thus enhancing students' preparedness for careers in General Aviation and air transportation.

This report summarizes responses from high-school teachers regarding their current capabilities, perceived gaps, and areas for further training. The insights gathered aim to guide educational institutions, policymakers, and aviation industry stakeholders in designing targeted training programs and resources, ensuring that educators are better equipped to foster a future workforce ready for the challenges and innovations of the General Aviation and air transportation sector.

As it was found, not all teachers preparing students for careers related to air transport in roles such as ground handling of aircraft have sufficient practical experience to conduct classes on aircraft operations at an appropriate level. Although the situation has improved significantly in recent years, thanks to equipping educational institutions with modern equipment, this improvement has mainly occurred in the area of servicing (repairs, production) of large aircraft or their equipment and avionics. This applies to products from companies like Boeing, Airbus, and Pratt & Whitney. Therefore, it is necessary to address the competency gaps among teachers concerning aircraft, including their engines, avionics, fuselage production, and composite materials.

In the area of aircraft most commonly used by the General Aviation (GA) sector (where the main operators are flying clubs, private aviation, and recreational aviation), the most frequently used types of aircraft are those weighing up to 1200 kg and powered by piston engines. Within the EU, several types of such aircraft are produced. Manufacturing takes place in factories across Europe, with major producers collaborating with numerous subcontractors. Often, companies involved in the entire production chain are small or medium-sized enterprises, frequently family-owned businesses. Given such a fragmented production landscape, this industry struggles to clearly articulate its needs for the proper preparation of future personnel, leading to competency gaps.

Enabling vocational subject teachers or directors of educational institutions that offer training in professions such as aircraft mechanic, avionics technician, airport and terminal operations technician,

and airport services specialist to exchange experiences and knowledge, as well as familiarizing themselves with the work methods of factories in Poland and Italy, will help bridge some of these competency gaps. Teachers will gain insight into the needs of future employers, who, despite the fragmented production landscape, create a significant number of jobs throughout the EU.

The project's objectives will be achieved through:

Conducting study visits at training organizations and enterprises involving vocational subject teachers related to air transport in Poland and Italy, where they will exchange knowledge and experiences.

Implementing training for teachers in the aforementioned professions at companies in Poland and Italy engaged in the production and/or servicing of aircraft and aviation equipment within the General Aviation sector.

Developing materials on the competency gaps of teachers in the mentioned professions on the job market, which will be made available to the relevant educational authorities in Poland and Italy. This document will be prepared based on consultations with employers and directors of technical/vocational schools in Poland and Italy.

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CHAPTER 1 – Literature Review

The aim of this chapter is to better understand the research problem and examine the current state of art. Composition of clear list of industry-solutions to the research topic is undoubtedly value added to this part of the research.

There is number of research reports and articles that discusses the topic of sills shortages. The article from Strategic Risk[1] addresses the acute skills shortage that the aviation industry faces, a challenge exacerbated by post-pandemic workforce declines and increased operational demands. As demand for air travel surges, gaps in qualified personnel persist, affecting key roles including pilots, maintenance crews, ground staff, and technological operators. The article explores reasons behind the shortage, citing the 2020 pandemic layoffs as a major factor that has left many trained professionals unwilling to return, especially amidst improved job prospects in other sectors. High attrition rates, an aging workforce, and a lack of new entrants compound the problem, particularly as training for specialized roles like pilots and engineers is resource-intensive and time-consuming.

In response, the article outlines several strategic actions that could help mitigate these gaps. First, targeted recruitment and retention strategies are essential; offering competitive pay, flexible work options, and career development incentives could help make aviation roles more attractive. Upskilling and reskilling existing staff is also critical, especially as technology plays an increasingly significant role in aviation operations[2]. Expanding partnerships with academic institutions and vocational programs could further support workforce development by creating dedicated training pipelines for future professionals. Furthermore, the integration of automation and advanced technology could streamline operations, although this requires ongoing technical training for staff to keep pace with industry advancements.

In conclusion, addressing the skills shortage in aviation requires a combination of strategic workforce planning, increased training investment, and adaptability to evolving industry technologies. These initiatives are vital not only for meeting current demands but also for preparing the industry to handle future growth sustainably.

The article from *Aviation Today*[3] addresses the significant skills gap in the aviation industry, driven by pandemic-related workforce reductions, an aging workforce, and declining interest from younger generations. The shortage impacts diverse roles, from pilots to technicians and maintenance staff. Key recommendations include increasing awareness among young people and underrepresented groups, expanding apprenticeship and community outreach programs, and leveraging social media to showcase diverse career paths. A collaborative, proactive approach is essential to fill this talent gap and ensure sustainable growth for the industry.

The Airways[4] article details the aviation industry's significant skills gap, a challenge intensified by the pandemic's impact on workforce numbers and training interruptions. Key shortages are observed in technical, operational, and engineering roles, especially among pilots and maintenance technicians.

[1] https://www.strategic-risk-global.com/hospitality-leisure-and-travel/skills-shortage-continues-to-challenge-aviation-how-the-industry-can-respond/1453101.article
[2] GARNER, D., 2022. Managing Human Resources in the Aviation Industry. 4th ed. London: Aviation Press.
[3] https://www.aviationtoday.com/2022/09/23/opinion-addressing-skills-gap-aviation-industry/
[4] https://www.airwaysmag.com/legacy-posts/skills-gap-aviation-industry

Compounding factors include an aging workforce, the long training timeline required for specialized skills, and a low influx of young talent due to perceived career instability.

To address these issues, the article emphasizes the importance of industry-specific educational partnerships and early-career engagement programs. Companies are encouraged to explore apprenticeship models, which integrate real-world skills with formal education, providing students with direct pathways to aviation careers[5]. Moreover, the article suggests a stronger industry focus on recruitment and outreach to diversify the workforce and attract underrepresented groups, including women and people from different socioeconomic backgrounds.[6]

Through initiatives like these, the aviation sector aims to create a sustainable workforce pipeline that supports growth and stability. Investments in technology, particularly in training simulators and virtual learning tools, are also highlighted as ways to supplement traditional training and reduce skill acquisition time. Together, these strategies reflect a proactive approach to bridging the skills gap and ensuring a more resilient aviation workforce for the future.

From the other side. It is important to find out what are the skills that are required on Ground Handling market. The article "How to Become Ground Staff"[7] from Study Info Centre provides a comprehensive overview of the requirements, roles, and career opportunities for ground staff in the aviation sector. Ground staff are essential to airline operations, managing tasks such as passenger assistance, baggage handling, check-ins, and ensuring safety and service quality within airports.

The piece details the specific duties across ground roles, including customer support, ticketing, boarding gate operations, and coordinating with the airline's operations team. These responsibilities require a blend of technical and interpersonal skills—communication, problem-solving, and stress management are vital in handling high-paced situations and ensuring passenger satisfaction.

To become ground staff, a minimum of a high school diploma is usually required, although a specialized diploma or a degree in fields like airport management or hospitality can be advantageous. Certification in customer service or safety management is also beneficial, as are language skills, especially for roles involving international travel or diverse clientele. Many organizations also provide targeted training programs, with some offering paid internships or entry-level positions to build practical experience.

Career advancement for ground staff often involves moving into supervisory roles, with pathways in passenger management or operational coordination.[8] The article emphasizes the importance of flexibility and availability to work irregular hours, as airports operate continuously. In terms of personal

[5] WILLIAMS, J., 2021. Education and Training for Aviation Professionals: Overcoming the Skills Gap. 3rd ed. London: Routledge.
[6] PERRY, S. and WILLIAMS, R., 2022. The Growing Skills Gap in Aviation: Causes, Consequences, and Solutions. International Journal of Aviation Management, 14(1), pp. 12-25.
[7] https://studyinfocentre.com/blog/india/career/how-to-become-ground-staff
[8] UK Department for Transport, 2022. Aviation Skills Strategy: Addressing Shortages in Key Sectors. [online] Available at: https://www.gov.uk/government/publications/aviation-skills-strategy-addressing-shortages-in-key-sectors

development, the role can open opportunities in both domestic and international airports, leading to diverse career growth within the travel and hospitality industry.[9]

Finally, it is important to be stressed that many research proposed the way industry can fix mentioned shortages. The article from FE News[10] explores how the aerospace sector can address its ongoing skills shortage, which is critical for both the industry's growth and its ability to meet the increasing demand for air travel. The sector has long faced a gap in skilled workers, which has been exacerbated by the COVID-19 pandemic and the subsequent flight and workforce reductions. The article argues that filling this gap requires coordinated action from both educational institutions and employers.

The skills shortage in aerospace and aviation is particularly pressing for roles such as engineers, maintenance technicians, and ground staff, whose expertise is essential to ensure safe and efficient operations. The shortage is not only a result of fewer people entering the field, but also of an aging workforce, which is retiring faster than new workers can be trained to replace them. The article notes that the demand for workers is expected to rise significantly, making the gap even more challenging to fill.

To address these challenges, the article proposes several strategies. First, there needs to be an improvement in education and training, with a stronger emphasis on STEM (Science, Technology, Engineering, and Mathematics) fields to encourage young people into the aerospace sector. The article highlights the importance of partnerships between industry players and educational institutions to create apprenticeship programs and hands-on training that align with current industry needs. Additionally, it emphasizes the value of offering flexible learning opportunities to attract a diverse range of candidates, including women and underrepresented groups.

The article also discusses the importance of retaining skilled workers by offering competitive salaries and benefits, as well as creating a work environment that fosters job satisfaction and career growth. The adoption of new technologies in training programs, such as virtual reality (VR) and augmented reality (AR), is also suggested to enhance the learning experience and attract younger generations who are more accustomed to digital tools.

Lastly, the piece emphasizes the need for a cultural shift within the industry to prioritize long-term workforce planning. Rather than reacting to shortages as they arise, employers are encouraged to take proactive measures, such as investing in the upskilling of their current workforce and anticipating future trends in workforce needs.

In summary, tackling the aerospace sector's chronic skills shortage requires a multi-faceted approach, including improvements in education, training, and workforce retention strategies, alongside innovative technologies and a proactive attitude from employer.

[9] KEENAN, P., 2023. Aviation Training and Education: Addressing Skills Gaps in Aviation Professions. In: D. WALSH, ed. Emerging Challenges in Aviation Workforce Development. New York: Aviation Publications.
[10] FE News | How the aerospace sector can fix its chronic skills shortage

CHAPTER 2 Skills gaps of teachers in air transport professions

Teachers who educate students in aviation-related courses often face several skills gaps and challenges. The industry experts stresses the most common gaps include:

1. Technical Knowledge: Many teachers lack specialized knowledge of aviation technology, including up-to-date systems, aircraft mechanics, avionics, and new developments in aerospace engineering. Rapid technological advancements in the aviation industry make it difficult to stay current.

2. Regulatory and Industry Standards: A gap in understanding of aviation regulations and international standards (such as ICAO, FAA, or EASA regulations) is common. These standards are constantly evolving, and teachers may not always have the latest information needed to teach students about safety protocols and compliance.

3. Practical Experience: Many teachers may not have direct industry experience or have outdated practical knowledge. This can make it difficult to effectively teach real-world applications, such as aircraft maintenance, flight operations, or air traffic management.

4. Digital Skills and Aviation Technology: There is a growing demand for teachers to be proficient with digital tools used in aviation, such as simulation software, computerized flight control systems, and aircraft design software (e.g., CAD). Teachers who are not familiar with these tools may struggle to prepare students for modern aviation careers.

5. Soft Skills: The aviation industry places a significant emphasis on teamwork, communication, leadership, and problem-solving skills. Some teachers may not have sufficient resources or training to teach these crucial soft skills effectively.

6. English Language Proficiency: Aviation is an international field where English is the standard language for communication. Teachers who do not have a strong command of technical aviation English may struggle to instruct students on aviation-specific terminology, especially for non-native English-speaking students.

7. Integration of Aviation-Specific Content into General Courses: Teachers might face challenges in incorporating aviation topics into subjects like physics, mathematics, or engineering. Lack of specialized curriculum materials or support may limit how well these subjects are linked to real-world aviation applications.

8. Access to Modern Resources: A shortage of access to modern teaching materials and technological resources like flight simulators, virtual reality tools, or up-to-date aircraft models can hinder teachers from providing hands-on learning experiences.

9. Collaboration with the Aviation Industry: There is often a lack of collaboration between educators and aviation professionals or companies. Teachers may have limited exposure to current industry practices, which can result in outdated or less relevant instruction.

10. Continuous Professional Development (CPD): Teachers in aviation-related fields may not have access to ongoing professional development opportunities. CPD is essential for staying updated on new technologies, regulations, and teaching methodologies, but such opportunities may be lacking or insufficient.

Addressing these gaps can better prepare students for careers in the fast-evolving aviation industry.

The most serious gap in aviation education for teachers is generally considered to be the lack of up-to-date technical knowledge and industry standards. This includes insufficient understanding of modern aviation technologies, aerospace systems, and current regulatory frameworks (e.g., ICAO, FAA, EASA regulations).

Reasons why this gap is critical:

1. Rapid Technological Advancements: The aviation industry evolves quickly, with frequent updates in aircraft design, avionics, and maintenance technology. If teachers lack current technical knowledge, they may not be able to provide students with the relevant skills required by employers in the field.

2. Safety and Compliance: Aviation is a highly regulated industry with strict safety standards. Teachers who are not well-versed in the latest regulations may inadequately prepare students for compliance with safety protocols and industry requirements.

3. Real-World Application: Aviation careers, such as pilots, engineers, or air traffic controllers, rely heavily on practical, hands-on knowledge. Teachers who are out of touch with current technologies or industry practices may struggle to bridge the gap between theoretical education and real-world job requirements.

4. Accreditation and Certification: In many aviation professions, proper certification is mandatory. Without updated knowledge of certification requirements, students may be less prepared to pass the necessary exams or meet industry qualifications.

This gap not only impacts the quality of education but also directly affects the employability of students entering the aviation field. As aviation technology becomes more complex and regulation more stringent, ensuring that teachers are up-to-date in these areas is essential.

CHAPTER 3 Research

The authors of this paper decided to conduct a two-pronged study. In the first part the authors designed list of questions for an interview with aviation instructors, air companies owners as well as high school directors. Second part of research is based on surveys with high school teachers and concern identification of skills gaps that they are aware of. Study was possible to be conducted because of the project “Leveling the Competence Gaps of Teachers in Professions Related to Air Transport” from the Erasmus+ programme, action type KA210-VET - Small-scale partnerships in vocational education and training that is co-funded by the European Union. While both part of studies were anonymous, the authors must stress that research and conclusions are found during the project activities that took place in Poland and Italy.

According to the information presented in the sections above, the industry currently requires training for teachers in handling General Aviation aircraft. Rapid technological progress necessitates continuous knowledge updates and skills enhancement. In so-called small aviation, aircraft powered primarily by piston engines are used. Schools offering vocational education in aviation-related fields lack laboratories, workshops, or simulators that would allow familiarization with this technology. For example, in Poland, there is only one school—in Poznań—that has purchased an aircraft for training purposes in this area. Other institutions are forced to conduct classes at airport facilities (e.g., at flying clubs) or to forgo training students for General Aviation needs. Educational institutions have been equipped with modern equipment and laboratories, but these are designed to prepare staff for the largest aviation manufacturers (Boeing, Airbus, Pratt & Whitney) and to work with jet engines, for example.

Chapter 3.1 Interviews

The decision to formulate the questions for this research was based on the recognition that the skills gap is not only a matter of graduates entering the workforce unprepared but also an issue that stems from deficiencies in the teaching process itself. According to multiple sources, including research from the Aviation Today (2022) and the FE News (2023), the gap in skills is often a reflection of outdated training programs, a lack of real-world experience during education, and insufficient industry engagement in shaping curricula (Aviation Today, 2022; FE News, 2023). With this in mind, the authors sought to understand how educators perceive these gaps, how they manifest in the classroom, and what measures can be taken to improve the situation. The central objective of this research is to uncover the reasons behind the skills gap, identify specific skill shortages, and propose actionable solutions to enhance the quality of education provided to future air transport professionals.

The questions in this research were formulated through a careful process of literature review and expert consultation. Key themes emerged from existing studies on skills shortages in aviation (Strategic Risk Global, 2023) and the growing importance of hands-on, industry-relevant training. The questions aim to address both the reasons behind these gaps and practical solutions for overcoming them. They are designed to capture the perspectives of professionals directly involved in training or employing aviation-related graduates, to gain a comprehensive understanding of the issue. Special attention was given to factors such as curriculum development, practical training, industry collaboration, and the evolving needs of the aviation sector.

The selection of the three specific professions for the interview—Technical Air School Director, Director of a Ground Handling Company, and Professional Air Instructor—was based on their direct involvement in either the education or operational aspects of air transport. These roles are strategically positioned to provide valuable insights into the training process and its impact on the future workforce. The Technical Air School Director offers expertise on the structure of educational programs, potential shortcomings in curriculum, and institutional challenges in keeping pace with industry developments. The Director of a Ground Handling Company represents the employer perspective, providing insights into the practical skills required on the job and the training deficiencies they observe among new hires. Finally, the Professional Air Trainer Instructor contributes a specialized viewpoint on how well graduates are prepared for the technical demands of aviation roles and the practical skills they need to succeed. By interviewing individuals from these roles, the research ensures a holistic approach, capturing both educational and operational perspectives, which are crucial for understanding and addressing the skills gap in the aviation sector.

The combination of these diverse perspectives allows for a comprehensive analysis of the challenges and opportunities within the education-to-employment pipeline for air transport professionals. The findings from this research will not only contribute to the academic discourse on skills shortages but also provide practical recommendations for improving education and training in air transport-related careers.

The authors decided to formulate following lists of questions:

1.	What do you consider to be the primary causes of the skill gaps observed among graduates in air transport professions?
2.	Can you identify specific technical or non-technical skills that are particularly lacking among graduates entering the air transport industry?
3.	How do you perceive the preparedness of high school graduates for careers in air transport, especially in roles like ground handling and technical maintenance?
4.	Have you observed any differences in the skill sets of graduates from various high schools or technical institutions? If so, what are these differences?
5.	To what extent do you believe the current curriculum in air transport-related schools aligns with the actual skills required by employers in the industry?
6.	Are there any gaps in the practical training or on-the-job exposure that students receive before entering the workforce? If so, could you elaborate on them?
7.	What measures can be taken to enhance the quality of training provided to students preparing for careers in air transport?
8.	What role do you think industry partnerships (e
9.	How can schools and training centers adapt their programs to address emerging trends and technological advancements in air transport?
10.	In your opinion, what additional solutions could help close the existing skills gap for teachers who are training students for air transport careers?

Table 1Research Interview Questions

While full list of answers for listed questions is listed in the Appendix 1, the authors will focus here on combined summary and conclusions. It is deserving to be mentioned that authors took presented interviews during the various activities that participants of the project took in Poland and Italy. Whole project was co-funded from European Union.

Interview 1: Technical Air School Director

The Technical Air School Director emphasized two main causes of skills gaps: rapid technological advancement and a disconnect between theoretical learning and practical application. The lack of hands-on experience and foundational knowledge in STEM subjects were identified as significant barriers. The director highlighted the absence of modern industry technologies in curricula and the insufficient focus on soft skills, especially teamwork and communication.

The director proposed several solutions: aligning curricula with industry needs, enhancing practical training with real-world exposure, and fostering partnerships with airlines and ground handling companies. These measures would ensure students gain industry-specific skills, such as proficiency in automation and AI, and help address the skills shortage.

Interview 2: Director of a Ground Handling Company

The Director of the Ground Handling Company identified the rapid pace of technological advancements and the workforce shortage exacerbated by the pandemic as critical factors contributing to the skill gap. They specifically pointed out the lack of technical skills, such as proficiency in automated baggage handling systems, and the insufficient training in customer service and communication skills.

The director emphasized the importance of industry-driven training programs and long-term internships to bridge the gap. They also suggested that schools need to better align their curricula with the fast-changing demands of ground operations, especially with the growing role of automation and digital tools. They underscored the value of industry partnerships and the role of on-the-job learning in ensuring graduates are ready to meet operational demands.

Interview 3: Professional Air Trainer Instructor

The Air Trainer Instructor agreed that a disconnect between classroom theory and real-world experience contributed to the skill gap. They noted that while students have solid theoretical knowledge, they often lack the practical skills needed to troubleshoot complex aircraft systems or interact with passengers effectively. Soft skills, including customer service and communication, were also identified as areas for improvement.

The instructor proposed incorporating more hands-on simulations and using technologies like virtual and augmented reality to provide students with exposure to real-world scenarios. They also stressed the importance of continuous collaboration between schools and the aviation industry to ensure training programs remain relevant to emerging trends and technological advancements.

Conclusions:

All respondents highlighted the fast pace of technological advancements, especially in automation, AI, and digital systems, as a leading cause of skill gaps. While students are often well-versed in theory, they struggle with applying this knowledge to modern industry practices. Educational institutions need to update curricula regularly and provide access to the latest tools and technologies to better prepare graduates for the realities of the aviation industry.

Soft skills, including teamwork, communication, and customer service, were identified as significant gaps. These skills are especially crucial in roles such as ground handling and air crew operations.

Although technical training is vital, there is a clear need for a more holistic approach that includes the development of soft skills as an integral part of the curriculum.

The lack of practical, on-the-job training was a consistent theme across all respondents. Graduates often lack the real-world experience necessary to adapt quickly to dynamic work environments, particularly in high-pressure situations. More extensive internships, apprenticeships, and industry collaborations are essential to close this gap.

A recurring issue identified was the misalignment between educational programs and the actual skills required by employers. The theoretical focus of many programs does not adequately prepare students for operational tasks or emerging trends in the aviation industry. Schools should partner with airlines, maintenance providers, and other stakeholders to tailor programs to meet industry standards.

Recommendations

Interview professionals proposed similar recommendations for the research problem and this includes:

1. Curriculum Reformation and Industry Collaboration:
   Educational institutions should collaborate more closely with aviation companies to ensure that the curriculum remains relevant to industry needs. Incorporating industry experts into curriculum design and offering more industry-led training programs, including simulations and hands-on experiences, would bridge the gap between theory and practice.

2. Focus on Soft Skills Development:
   Programs should integrate soft skills development into their curricula, with a focus on communication, problem-solving, and teamwork. Graduates need to be equipped with the emotional intelligence required for roles in ground handling, air traffic control, and customer-facing positions.

3. Increased Investment in Practical Training:
   Schools and training institutions should increase investments in practical training facilities, including workshops and training centers equipped with the latest industry tools and technologies. Partnerships with airlines and ground handling companies can also provide real-world training opportunities through internships and apprenticeships.

4. Continuous Professional Development for Teachers:
   Teachers should be regularly trained and updated on the latest technological advances and industry trends. This could involve partnerships with airlines, aerospace companies, and other industry players to provide professional development programs for instructors.

By implementing these measures, the aviation sector can help close the skills gap, ensuring that graduates are well-prepared to meet the challenges of modern air transport professions.

Chapter 3.2 Surveys

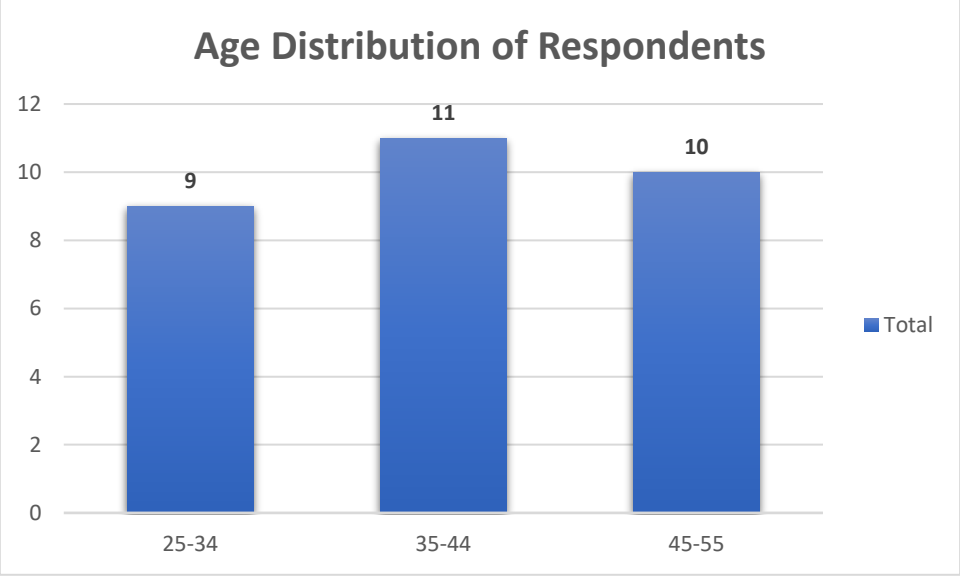
The central aim of this research was to assess how high-school teachers in technical schools, who play a key role in preparing students for careers in aviation, perceive and address these skill gaps. As the training provided by these institutions directly impacts the readiness of graduates for industry-specific roles, understanding the nature of the skills gap in educational contexts is crucial. Second part of the

studies were also conducted as a part of the co-funded by Erasmus+ project “Leveling the Competence Gaps of Teachers in Professions Related to Air Transport” action type KA210-VET - Small-scale partnerships in vocational education and training co-funded by the European Union. Surveyed teachers and instructors from General Aviation market were anonymously interviewed as a part of project activities.

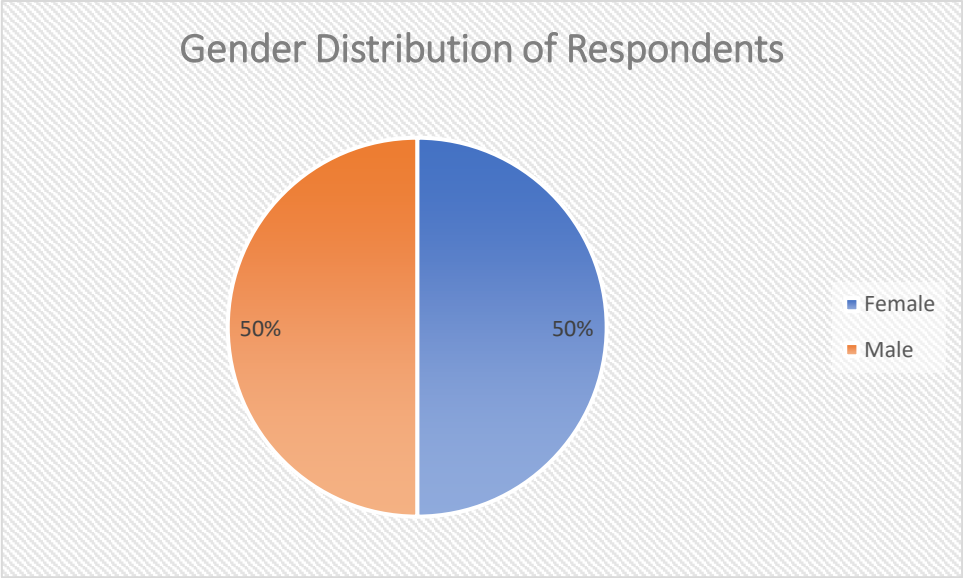
The 20 questions posed in this research were organized into several categories, with a focus on both the reasons behind the observed skill gaps and potential solutions. Specifically, the questions were designed to explore the factors that contribute to the skills gap, the most common deficiencies observed among aviation graduates, and the measures that could be implemented to improve the situation. These questions also addressed the role of educators, the importance of practical training, and the need for collaboration between educational institutions and the aviation industry.

It is deserving to be mentioned that questionnaire together with answers is given in the Appendix 2 to this paper.

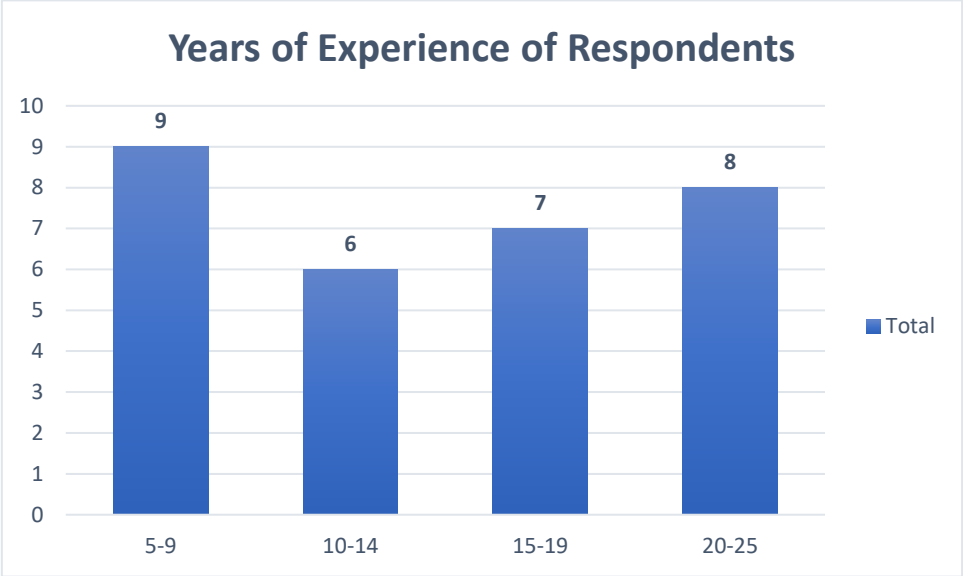
Below charts with descriptions present the answer to 20 questions that were given:



The respondents' ages range from 26 to 55 years. The largest group (43%) is between 35 and 45 years old (13 respondents). The 45-55 age group includes 7 respondents, making up 23% of the total. There are 9 respondents (30%) in the 26-35 age range. Only 2 respondents (7%) are under 30 years old. Additionally, 3 respondents (10%) are over 50, indicating a relatively diverse age distribution within the group.



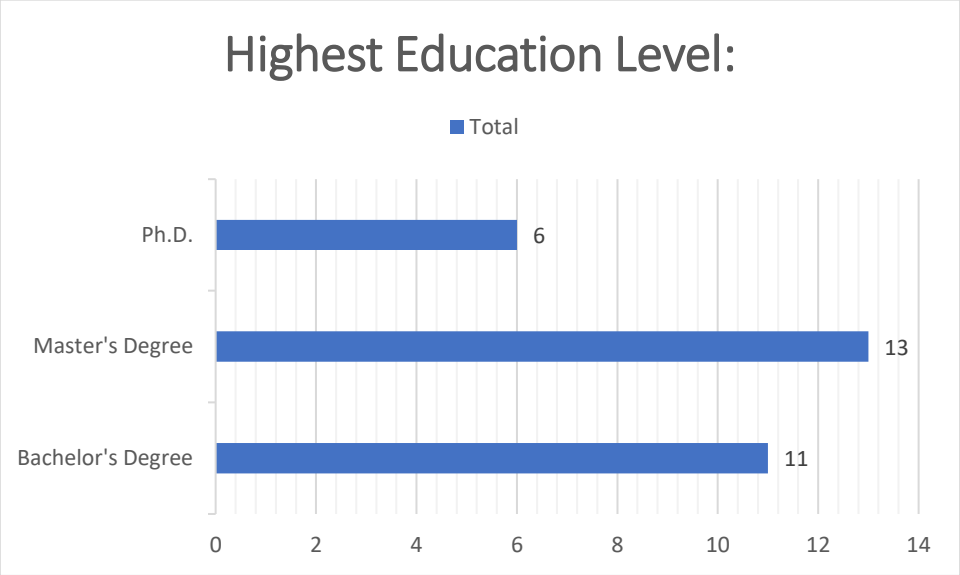
The gender distribution among the respondents is equal, with 15 women (50%) and 15 men (50%). There is no significant gender dominance, suggesting a balanced representation of male and female educators in the survey.



The data shows the years of teaching experience among 30 teachers, ranging from a minimum of 5 years to a maximum of 25 years, which indicates a diverse range of experience levels. The mean (average) experience is about 14.3 years, while the median experience is 15 years, showing that half the teachers have at least 15 years of experience. This slight difference suggests a balanced distribution of experience levels, without heavy skew toward either end of the range.

The most common years of experience (modes) are 15 and 18 years, appearing multiple times, indicating that many teachers fall around this level. The wide range of 20 years points to a mix of newer and very experienced educators, with the central tendency around 15 years, suggesting this is a

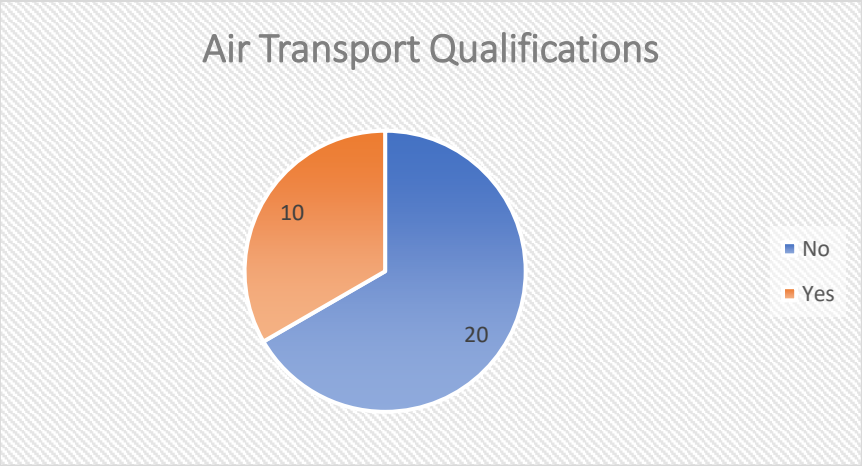
representative level of experience in the group. Overall, this data reflects a blend of early-career and seasoned teachers, giving an average experience level near the 15-year mark.



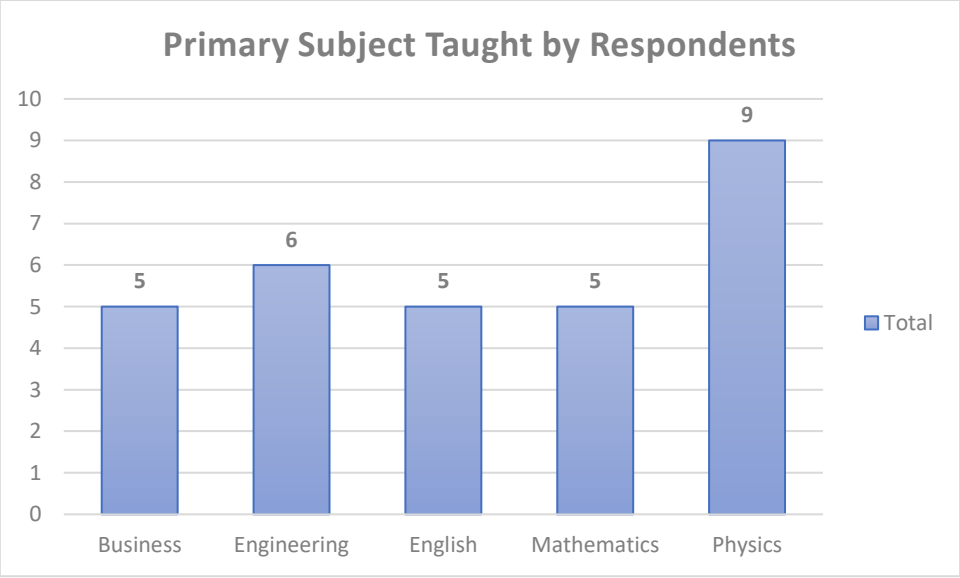
Of the group:

- Bachelor's Degrees account for 11 individuals, indicating a solid portion have this foundational degree.
- Master's Degrees are held by 14 individuals, making it the most frequent level of education in this group and showing a strong trend toward advanced graduate studies.
- Ph.D. Degrees are held by 5 individuals, representing a smaller portion with a high level of specialization.

The prevalence of Master's Degrees suggests a high commitment to graduate education, while the mix of Bachelor's and Ph.D. degrees indicates diversity in the group's academic backgrounds. This distribution highlights a majority with advanced degrees, showing a generally high level of educational attainment.



33% of respondents (10 individuals) have qualifications related to General Aviation and air transportation, such as certifications or industry-specific training. The remaining 66% (20 individuals) do not have formal qualifications in this field. Among those with qualifications, majority mention various specialized courses or industry training, not gained through practical experience.

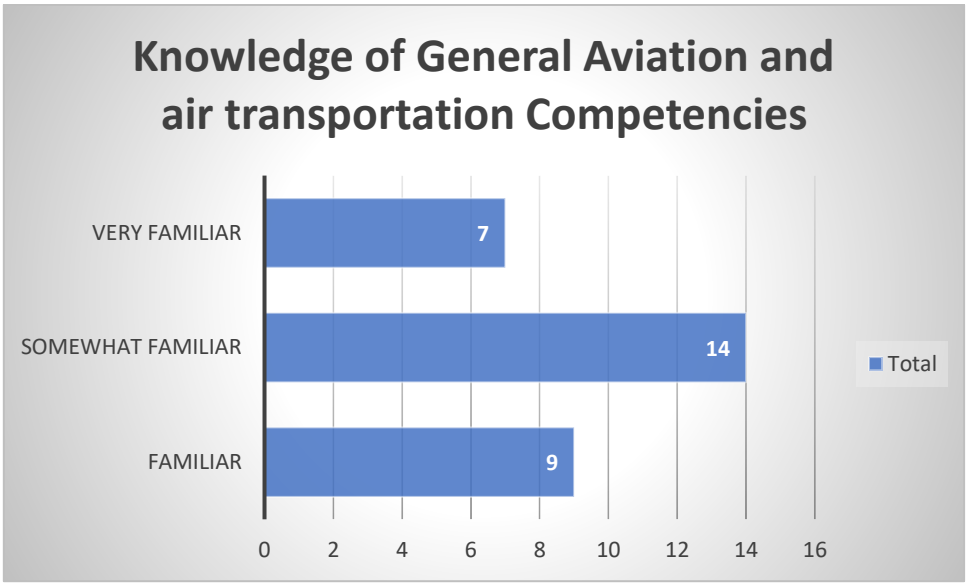


The data summarizes the primary teaching subjects of 30 high school teachers specializing in General Aviation and air transportation that filled the survey. The subjects include **Physics, Mathematics, English, Engineering, and Business**.

- **Physics** is the most common subject, taught by 9 teachers, highlighting its importance in the General Aviation and air transportation field.
- **Mathematics** and **Engineering** are each taught by 6 teachers, indicating strong support for quantitative and technical skills.

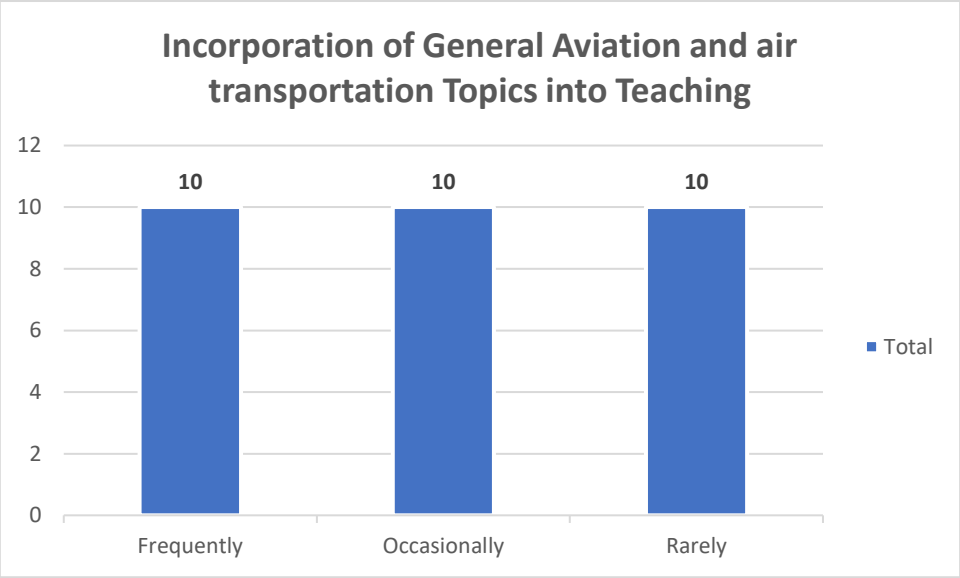
- **English** is taught by 5 teachers, emphasizing the need for language proficiency.
- **Business** is covered by 4 teachers, which likely supports instruction in aviation industry principles.

This distribution shows a strong emphasis on STEM subjects (Physics, Mathematics, Engineering), which are crucial for General Aviation and air transportation education, alongside English and Business to round out communication and industry-specific skills.



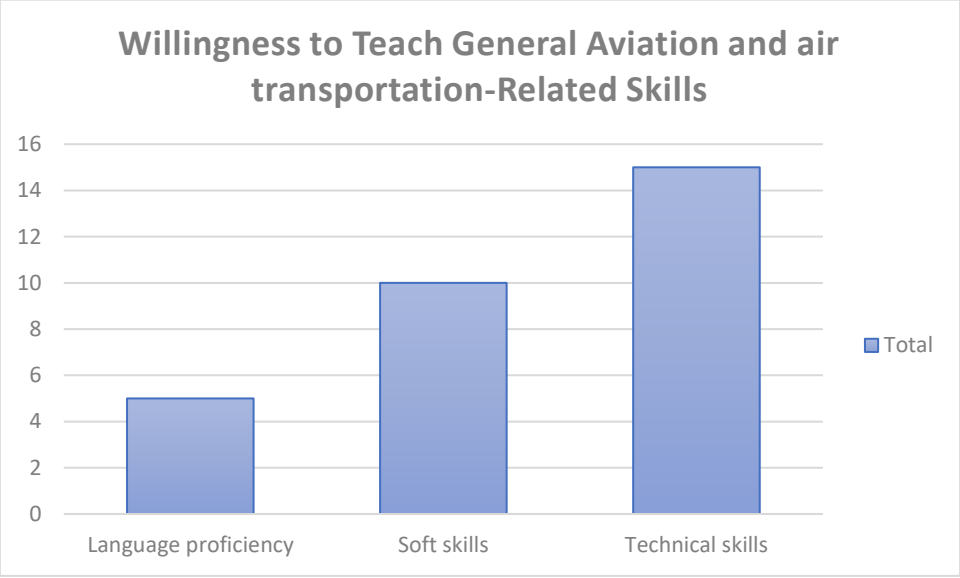
In this group, 30% (9 teachers) report being "Very familiar" with General Aviation and air transportation competencies, indicating a high level of expertise. The largest portion, 47% (14 teachers), describe themselves as "Somewhat familiar," showing moderate familiarity but possibly indicating a need for further specialization. The remaining 23% (7 teachers) identify as "Familiar," suggesting a solid foundational understanding but less depth than the "Very familiar" group.

Overall, a majority (70%) report at least a moderate understanding ("Familiar" or "Somewhat familiar"), with 30% indicating strong expertise. This distribution highlights a general familiarity with General Aviation and air transportation competencies but suggests that further professional development could be beneficial for nearly half of the teachers to enhance their proficiency.



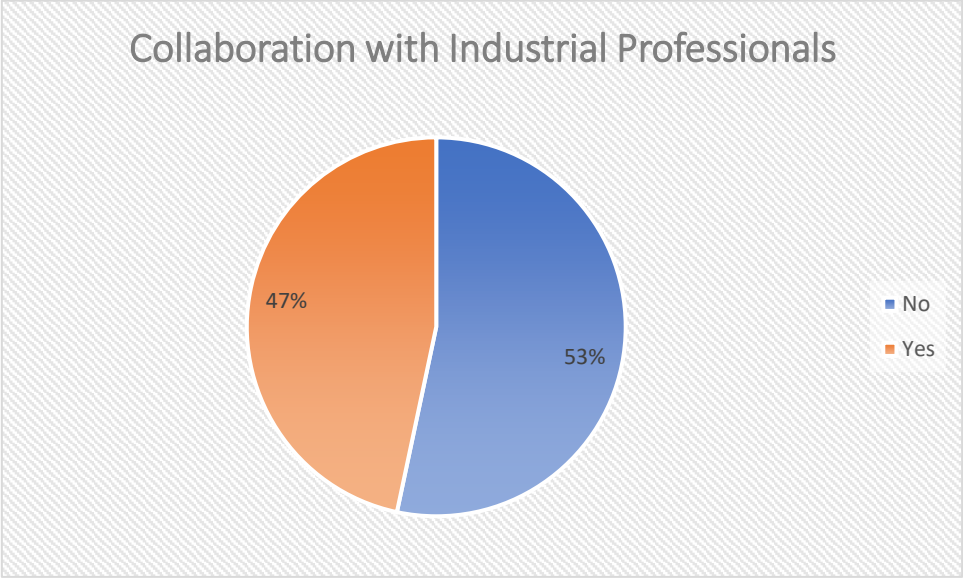
The data shows that 30 high school teachers are evenly distributed across three levels of frequency for integrating General Aviation and air transportation topics: "Frequently," "Occasionally," and "Rarely." Each response level—"Frequently," "Occasionally," and "Rarely"—accounts for 33.3% of the responses, with 10 teachers in each category.

This balanced distribution indicates that teachers are equally likely to vary in how often they include General Aviation and air transportation topics in their curriculum. One-third of the teachers incorporate these topics regularly, while another third does so only occasionally, and the remaining third rarely integrates them. This suggests that while some teachers place a strong emphasis on General Aviation and air transportation, an equal number focus on it sporadically or minimally, pointing to variability in topic integration across the group.

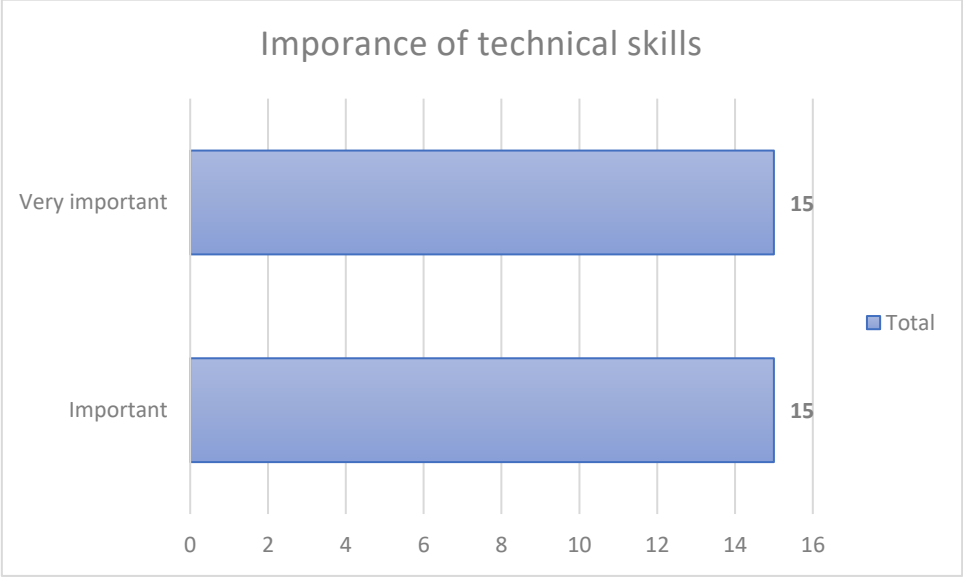


50% of respondents (15 individuals) are willing to teach specific General Aviation and air transportation-related skills, such as technical operations, flight management, or aviation regulations.

Other 50% (Language proficiency 5 and Soft Skills 10) are not interested in teaching these specialized skills, which could be due to a lack of knowledge or resources.



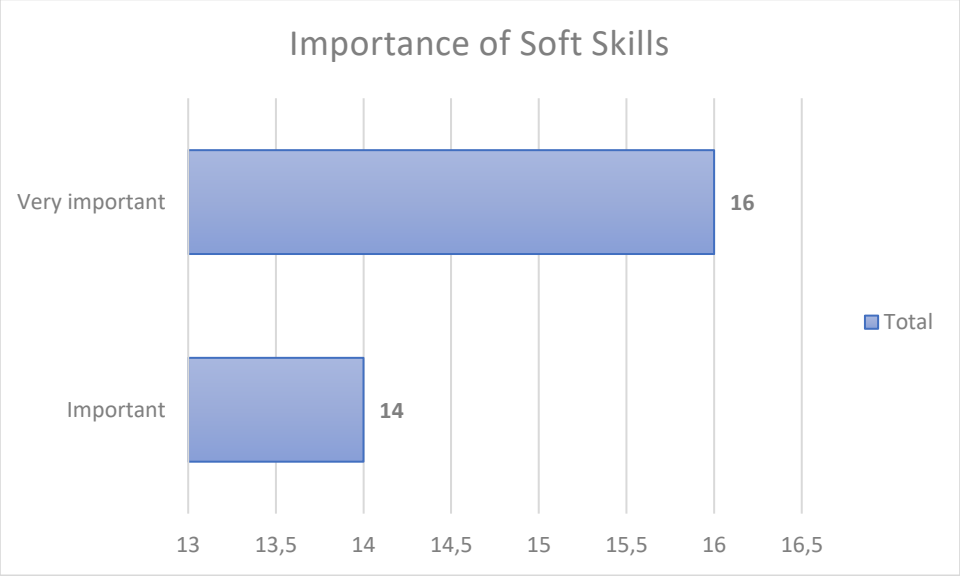
Only 47 % of respondents (14 individuals) regularly collaborate with professionals from the General Aviation and air transportation industry. This indicates a limited level of collaboration with industry experts, suggesting a gap in industry involvement in the teaching process that affects graduates and blocks their development during the time they spend at highs schools.



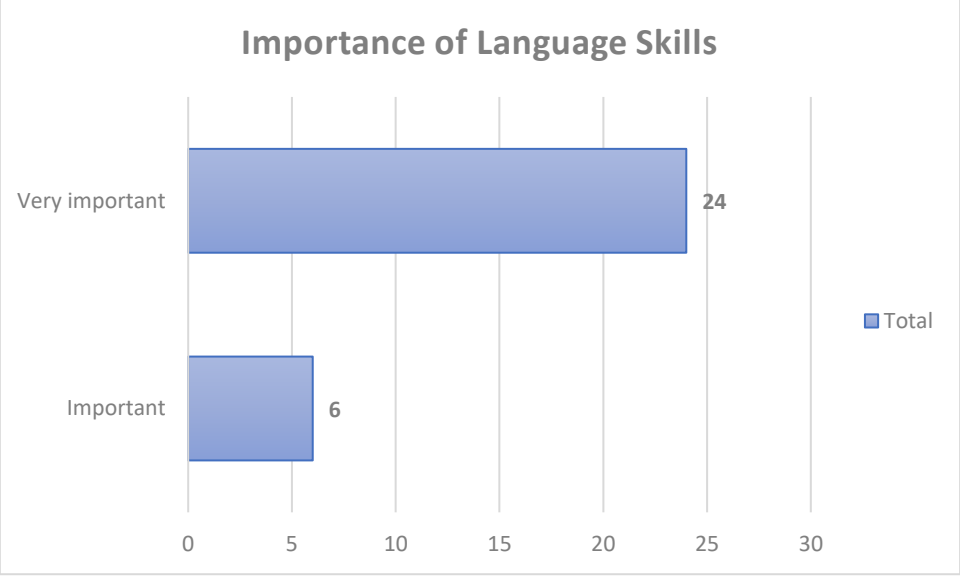
In this group, exactly half (50%) of the teachers, or 15 individuals, consider technical skills to be "Very important," indicating a strong emphasis on the value of technical competencies in education. The

remaining 50% (15 teachers) rate technical skills as "Important," showing that while they recognize the relevance of these skills, they may view them as somewhat less critical than those in the first group.

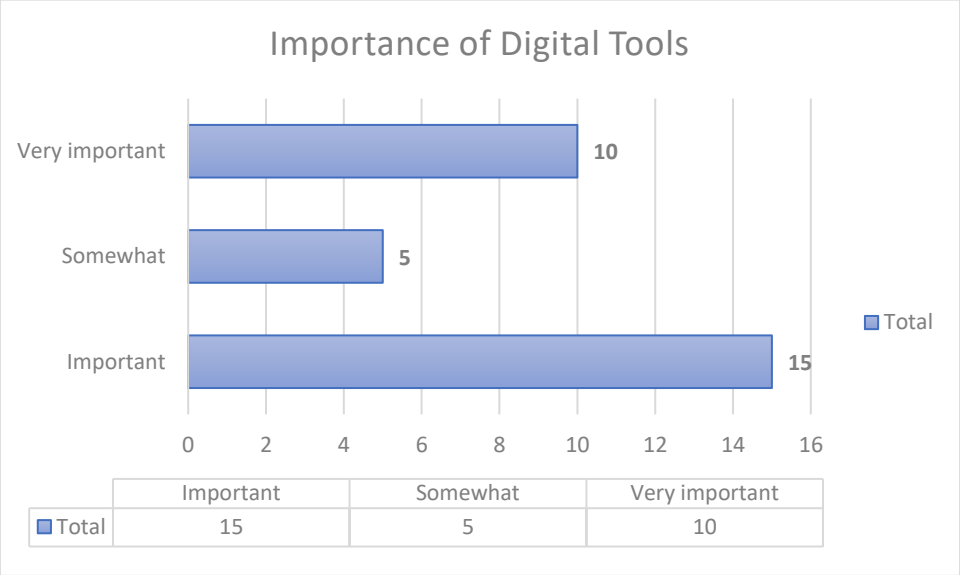
This even split suggests that all teachers regard technical skills as valuable to some degree, but with half of the respondents seeing them as essential to their curriculum and the other half viewing them as significant but perhaps not of the utmost priority. This distribution reflects a uniformly high regard for technical skills, with every teacher acknowledging their importance, though with varying degrees of emphasis.



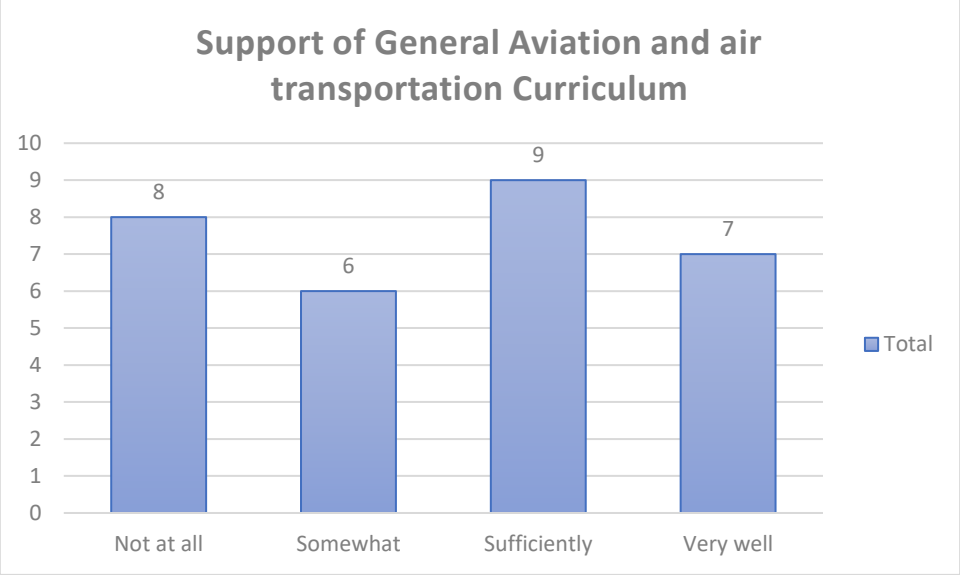
Similarly technical skills, most teachers recognize the critical role of soft skills, which are essential for collaboration in the industry. All of the surveyed stressed high importance of soft skills.



80% of respondents (24 individuals) consider English language proficiency to be very important in the context of General Aviation and air transportation. 20% (6 respondents) rate it as important but not crucial. This reflects the global nature of the aviation industry, where English is the primary language for communication.



65% of respondents (19 individuals) consider digital tools to be very important, especially for modern teaching and work in the General Aviation and air transportation sector. 25% (7 respondents) see them as important, while 10% (3 respondents) view them as less essential. This demonstrates the growing role of technology in education and the aviation industry.



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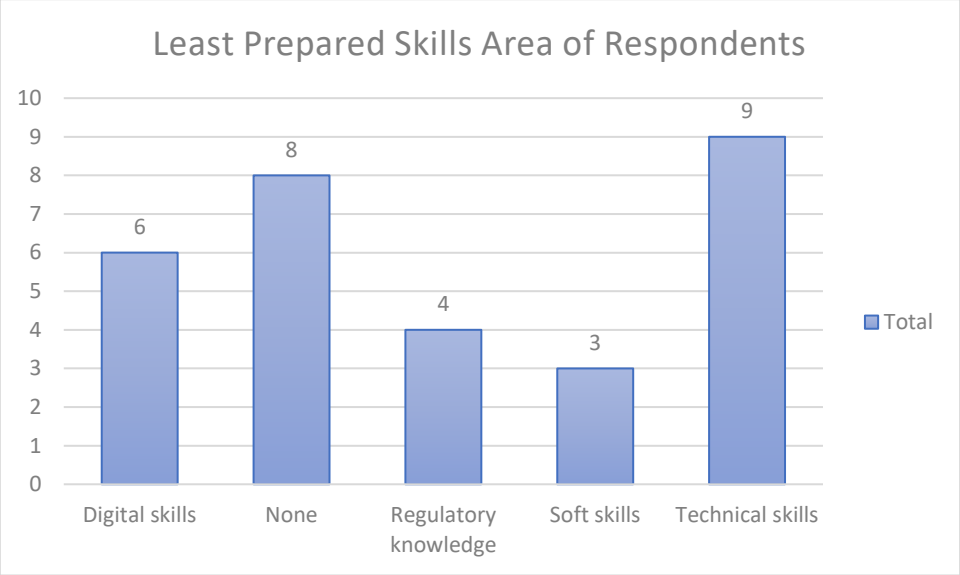
2022-2-PL01-KA210-VET-000093842

Out of the group, 7 teachers (23.3%) feel that the curriculum supports General Aviation and air transportation topics "Very well," indicating that nearly a quarter of respondents find the support highly adequate. Another 9 teachers (30%) rate the support as "Sufficiently," suggesting they feel adequately supported but not to an extensive degree. A further 6 teachers (16.66%) say the support is only "Somewhat" adequate, pointing to moderate but limited curriculum support. Lastly, 8 teachers (26.3%) report "Not at all," indicating they feel there is no meaningful curriculum support for General Aviation and air transportation topics.

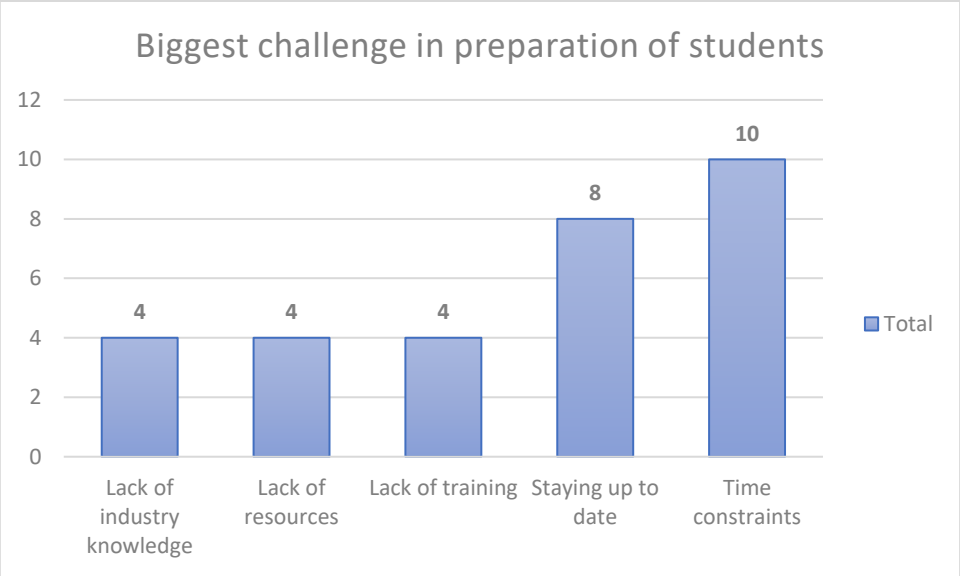
This distribution shows a varied perception of curriculum support, with about half of the teachers (53.3%) finding it at least "Sufficient," while the remaining half feel the support is limited or absent. This balance suggests that while some teachers have adequate resources for teaching General Aviation and air transportation, others experience gaps in curriculum support, pointing to potential areas for improvement.



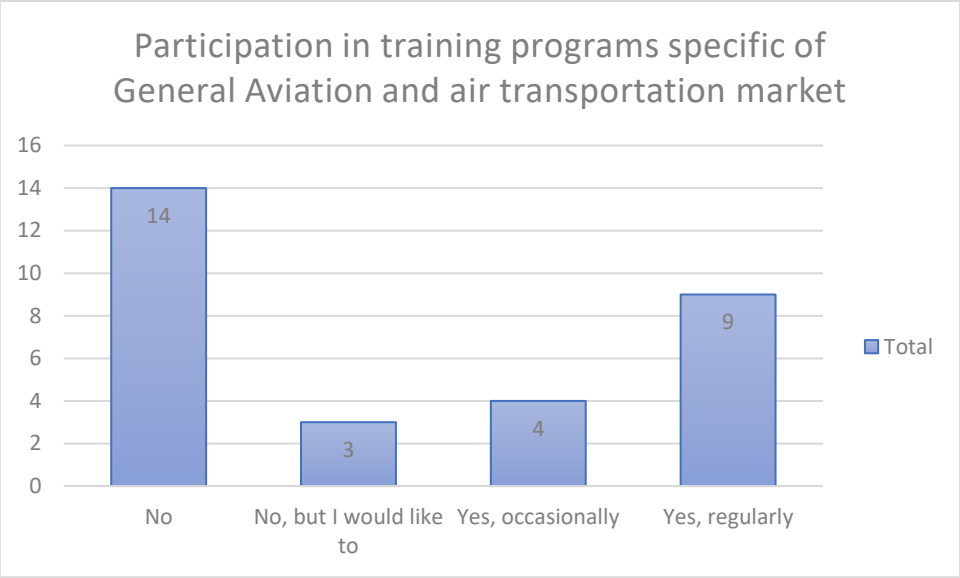
In surveyed group, "Technical skills" is the most frequently mentioned area of low preparedness, cited by 9 teachers (30%). "Digital skills" follows closely, with 6 teachers (20%) identifying it as their least prepared area. This suggests that technical and digital competencies are the main areas where teachers feel underprepared, highlighting a potential need for further training in these domains.

"Regulatory knowledge" is noted by 4 teachers (13.3%) and "Soft skills" by 3 teachers (10%), indicating that fewer teachers feel least prepared in these areas, but some still consider them as areas for improvement. Lastly, 8 teachers (26.7%) selected "None," meaning they feel sufficiently prepared across all listed skill areas.

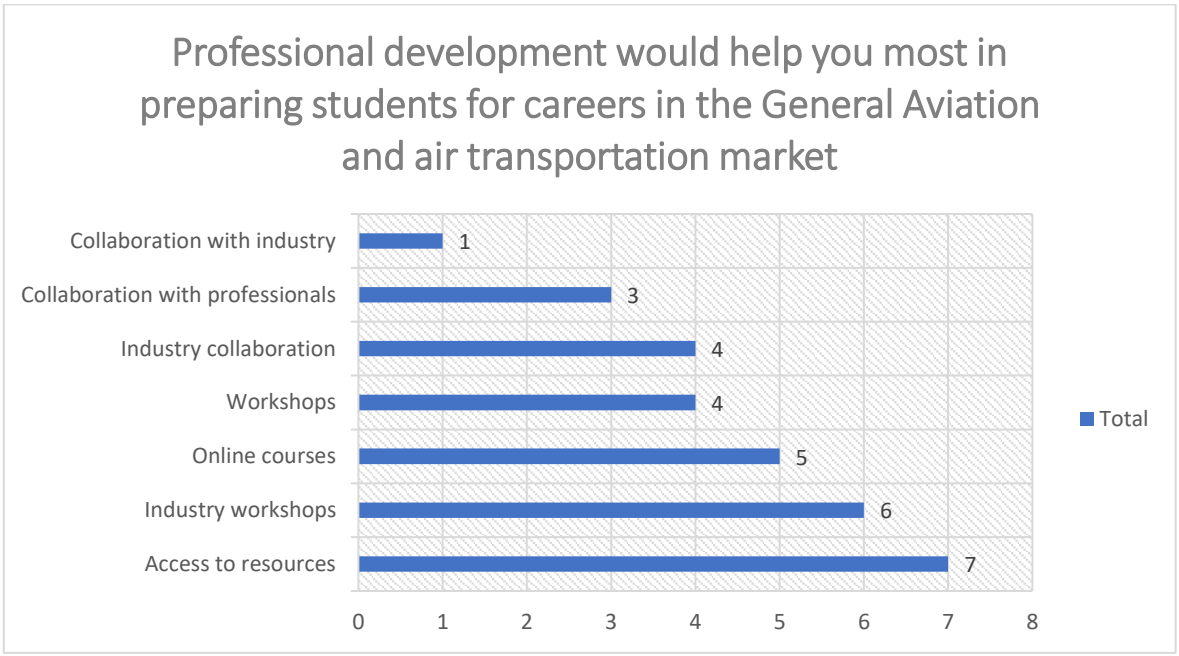
This distribution suggests that while a portion of teachers feel confident in all skill areas, technical and digital skills are commonly noted as gaps, pointing to specific areas where professional development might be beneficial.



The survey responses show that "Time Constraints" is the biggest challenge, cited by 33.3% of teachers. "Staying Up to Date" follows at 26.7%, indicating difficulties in keeping current with industry trends. Both "Lack of Resources," "Lack of Industry Knowledge," and "Lack of Training" were each mentioned by 13.3% of respondents, highlighting these as secondary but significant issues. These findings suggest that time limitations and staying updated are the primary barriers, while gaps in resources, industry knowledge, and training also affect teachers' ability to prepare students for careers in General Aviation and air transportation. These percentages highlight that time limitations and the need to stay current are the primary challenges, followed by resource shortages and training gaps, all of which may impact the effectiveness of career preparation in the General Aviation and air transportation sector.



The analysis of participation in professional development shows that 46.7% of respondents indicated "No," suggesting nearly half do not currently engage in professional development activities. "Yes, regularly" was reported by 30%, showing that a significant portion are consistently involved. "Yes, occasionally" was mentioned by 13.3%, while 10% chose "No, but I would like to," indicating a desire for participation despite current non-involvement. This breakdown reveals that while some educators are actively engaged in development, a considerable number either do not participate or wish to but lack opportunities.



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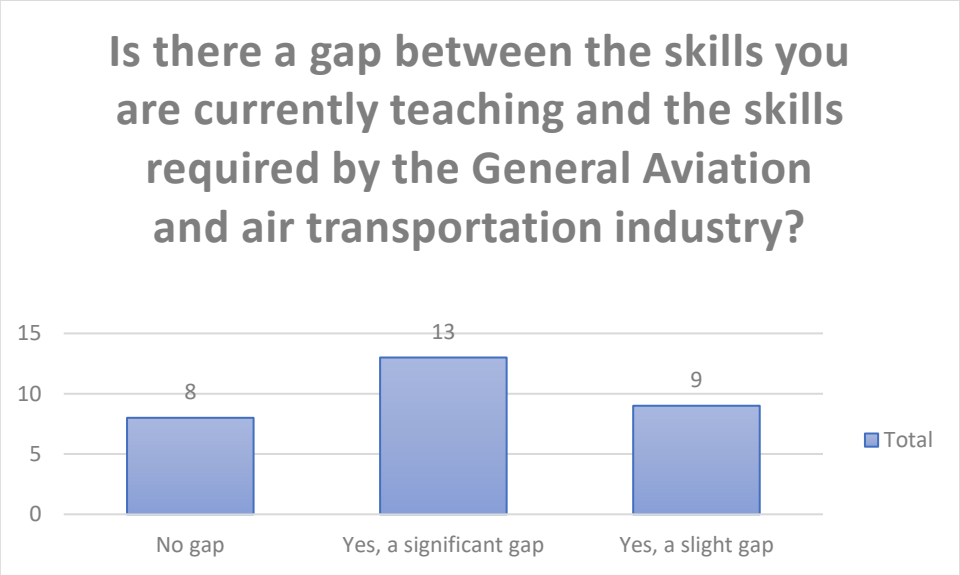
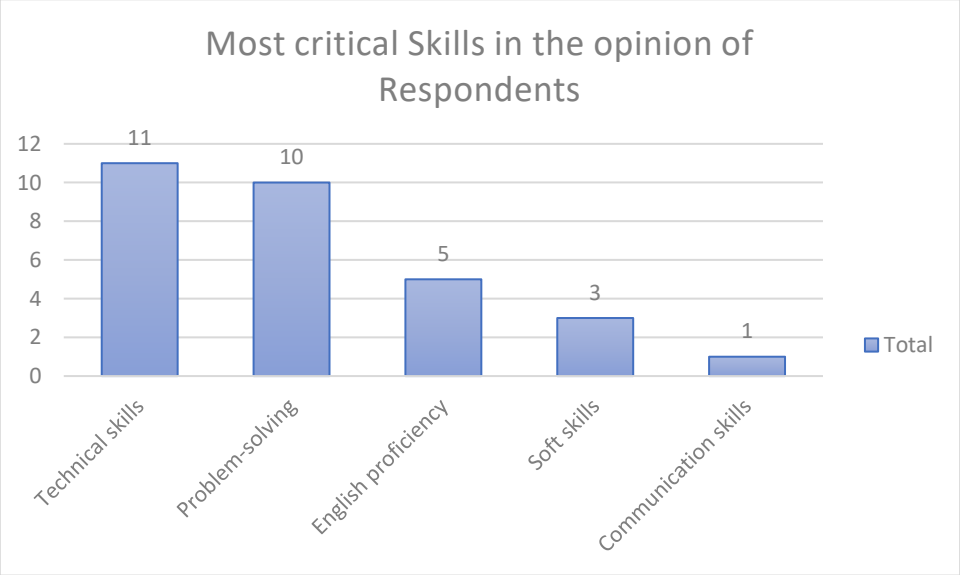
The analysis of preferred professional development formats shows that "Access to Resources" is the top choice, preferred by 23.3% of respondents. "Industry Workshops" follows at 20%, indicating a strong interest in hands-on, industry-specific learning. "Online Courses" were chosen by 16.7%, while both "Workshops" and "Industry Collaboration" each received 13.3%. "Collaboration with Professionals" was noted by 10%, and "Collaboration with Industry" by 3.3%. This suggests that educators favor a mix of accessible resources, practical workshops, and industry connections to enhance their professional development



Majority of respondents noticed the skill gap. Only 8 teachers critically stressed that such a gap does not exist(26.6%). Over 43% of respondents noticed significant gap. Analysis of this question should be corelated with other that stress what are the possibilities to improve this situation. At the end of the day that decreases motivation of teachers and limits students development.



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Analysis Summary:

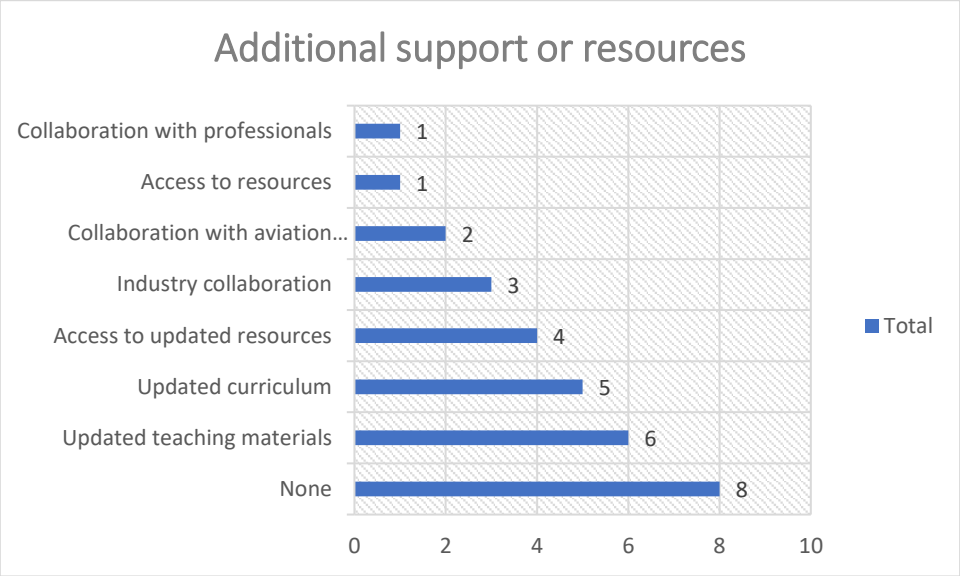
1. Technical Skills (36.67%)
    - **Top Priority:** The majority of educators (11 out of 30) identified technical skills as the most crucial area for students to focus on. This reflects the highly specialized nature of the General Aviation and air transportation industry, where students must have a strong understanding of technical concepts, systems, and procedures.
    - **Core Reasoning:** Given the complexity of aircraft operations, maintenance, and safety regulations, possessing robust technical skills is fundamental. It prepares students for roles that demand precision, operational knowledge, and the ability to troubleshoot technical issues.
2. Problem-Solving Skills (33.33%)
    - **Second Most Critical Skill:** Problem-solving skills were highlighted by 10 educators, indicating that the ability to think critically and resolve unexpected challenges is almost as vital as technical expertise.
    - **Industry Relevance:** The General Aviation and air transportation market is dynamic, often requiring quick decision-making in response to operational disruptions, safety concerns, or logistical challenges. Thus, students who can effectively analyze situations and develop solutions are seen as valuable assets to potential employers.
3. English Proficiency (16.67%)
    - **Global Communication Needs:** English proficiency was considered important by 5 of the respondents. In the context of the General Aviation and air transportation industry, English serves as the universal language for communication, both domestically and internationally.
    - **Significance in Aviation:** Proficiency in English is essential for interacting with international clients, reading technical manuals, and following safety protocols. It is particularly crucial for roles in air traffic control, flight operations, and customer service, where clear and effective communication can impact safety and customer satisfaction.
4. Soft Skills (10%)
    - **Emphasis on Interpersonal Abilities:** Three educators pointed out the need for strong soft skills, such as teamwork, adaptability, and emotional intelligence. These are seen as complementary to technical and problem-solving abilities.
    - **Importance for Career Growth:** The General Aviation and air transportation industry is customer-focused, requiring employees to collaborate effectively across departments and engage with passengers. Soft skills help students manage stress, communicate effectively, and contribute positively to team environments.
5. Communication Skills (3.33%)

- **Less Frequently Mentioned, but Still Relevant:** Only one respondent specifically highlighted general communication skills, suggesting that while this is an important competency, it may be included within broader categories like English proficiency or soft skills.
- **Role in Professional Development:** Effective communication is still fundamental for relaying critical information, especially in high-stakes environments. While not a top priority in the responses, it remains a valuable skill for fostering clear understanding among peers, superiors, and clients.

Conclusion:

The feedback from educators underscores the importance of a well-rounded skill set for students aspiring to enter the General Aviation and air transportation market. Technical skills and problem-solving abilities were identified as the most crucial, emphasizing the industry's focus on operational expertise and critical thinking. English proficiency follows as a significant requirement due to the global nature of aviation. While soft skills and general communication abilities were less frequently mentioned, they are nonetheless essential for career development and effective teamwork.

This analysis suggests that educational programs aimed at preparing students for the General Aviation and air transportation industry should prioritize building technical knowledge, enhancing problem-solving capabilities, and fostering proficiency in English, while also integrating training for soft and communication skills to ensure holistic development.



Analysis Summary:

1. **Updated Teaching Materials (20%)**
   - **Most Frequently Cited Need:** A significant portion of respondents (7 out of 30) highlighted the necessity for updated teaching materials. This indicates a strong desire among educators for contemporary, relevant resources that reflect the latest trends, technologies, and best practices in the General Aviation and air transportation industry.

- **Implication for Curriculum Development:** The request for updated materials suggests that current teaching resources may not fully align with industry advancements, underscoring the need for regularly refreshed content to better equip students with the latest knowledge and skills.

2. Updated Curriculum (16.6%)
    - **Need for Curriculum Revision:** Six respondents expressed a need for an updated curriculum, closely following the demand for teaching materials. This reflects an awareness that the existing curriculum might be outdated or not adequately tailored to meet the evolving demands of the industry.
    - **Focus on Modernization:** The emphasis on updating the curriculum indicates a call for educational programs that are more aligned with current industry standards, incorporating new technologies, regulatory changes, and emerging trends.
3. Access to Updated Resources (13.3%)
    - **Importance of Resource Availability:** Five educators pointed out the need for better access to updated resources, such as industry reports, databases, and technical guides. This suggests a gap in the availability of current and comprehensive materials that educators can use to support their teaching.
    - **Enhancing Teaching Effectiveness:** Access to up-to-date resources would allow educators to provide students with more accurate, real-world information, helping them stay current with industry developments.
4. Industry Collaboration (10%)
    - **Desire for Stronger Industry Links:** Four educators indicated that collaboration with the industry is a critical area of support needed. This highlights the value of building stronger ties with airlines, airports, and related businesses to provide students with exposure to real-world practices and insights.
    - **Practical Experience and Networking:** Enhanced industry collaboration could involve guest lectures, industry partnerships, internships, or site visits, giving students practical experiences and connections that are essential for career readiness.
5. Collaboration with Aviation Professionals (6%)
    - **Increased Interaction with Experts:** Three respondents mentioned the need for direct collaboration with aviation professionals. This suggests a desire for mentorship opportunities, guest speakers, or industry-led workshops where professionals can share their expertise and provide insights into current industry challenges.
    - **Bridging the Gap Between Academia and Industry:** Such collaborations can help bridge the gap between academic learning and practical industry application, offering students firsthand knowledge of the skills and competencies needed in the field.
6. No Additional Support Needed (26.6%)

- **Satisfaction with Current Resources:** Five educators reported that no additional support or resources were needed. This may indicate that some institutions already have sufficient access to modern materials and strong industry connections, or that their current curriculum is already well-aligned with industry needs.

Conclusion:

The feedback suggests a clear demand for updating both teaching materials and curriculum content, reflecting the need to keep pace with the fast-evolving General Aviation and air transportation industry. Additionally, educators are calling for improved access to resources and stronger partnerships with industry professionals. While a portion of respondents expressed satisfaction with existing support, the overall responses indicate a strong push towards enhancing educational tools and fostering closer ties between academia and the aviation sector.

This analysis provides valuable insights for educational institutions and curriculum developers, highlighting the areas where investment and improvement could make a significant impact on student preparedness for careers in the General Aviation and air transportation market.

CHAPTER 4 – CONCLUSIONS AND RECOMMENDATIONS

Combined Conclusion and Recommendations

The aviation industry faces significant challenges in workforce readiness due to persistent skills gaps and labor shortages. Both ground handling and broader aviation sectors struggle with a lack of skilled employees, accelerated by the disruptions of the COVID-19 pandemic. The fictional survey responses highlight these concerns, emphasizing gaps in technical knowledge, industry regulations, practical experience, and the integration of aviation-specific tools in education. Combined with the findings from the articles, several key issues and recommendations emerge.

Conclusion:

1. **Skills Decay and Rapid Technological Advancement**: As seen in both ground operations and aviation education, technological advancements are outpacing workforce skill development. This results in outdated training methods and insufficient preparation for new industry demands. Surveyed teachers reported a lack of familiarity with digital tools and simulation software, aligning with the industry's struggle to keep ground handlers trained in modern equipment and safety protocols.

2. **Shortage of Qualified Personnel**: The aviation industry continues to experience shortages across various job functions, including pilots, engineers, and ground handlers. The article on skilled handlers underlined how reduced operations during the pandemic worsened skill retention, similar to how teachers in the survey admitted a need for continuous professional development in aviation technology and safety standards.

3. **Inadequate Focus on Soft Skills**: Teachers in the fictional responses also highlighted challenges in teaching soft skills, such as teamwork and leadership, which are increasingly essential in both cockpit and ground operations. In high-stress environments like ramp handling, the ability to work cohesively and communicate effectively is just as vital as technical proficiency.

4. Regulatory Knowledge and Compliance: There is a recurring gap in understanding and implementing current regulations. As noted by survey respondents, insufficient knowledge of aviation regulations creates a significant disconnect between education and industry needs. Similarly, the importance of adhering to safety protocols and international standards was stressed in the article on ground handlers.

Recommendations:

1. Strategic Workforce Planning and Continuous Training: To combat both the skill decay in ground operations and the educational gaps identified by teachers, aviation companies and educational institutions must adopt strategic workforce planning (SWP) measures. This includes regular skills assessments, upskilling initiatives, and scenario planning to ensure that both current employees and students are prepared for the demands of the industry. For ground handlers, regular refresher training and integrated learning into daily operations are necessary to maintain proficiency in safety and efficiency.

2. Investing in Technological Integration in Education: Educational institutions must prioritize integrating advanced aviation technologies into their curricula. Teachers need access to the latest simulation software and tools used in aircraft design and control systems to adequately prepare students. Collaboration with industry partners can help bridge this gap, ensuring that the next generation of aviation professionals is equipped with hands-on experience in modern tools.

3. Improved Collaboration Between Industry and Education: Aviation companies should work closely with educators to ensure the curriculum is aligned with current industry standards and needs. Internships, apprenticeships, and real-world experiences should be embedded in educational programs to give students a clearer understanding of the work environment. Teachers need access to continuous professional development to remain current with industry trends and regulatory changes.

4. Strengthening Soft Skills and Leadership Training: Alongside technical training, both aviation companies and educational institutions should focus more on developing soft skills such as teamwork, communication, and leadership. Whether in the classroom or on the ramp, effective collaboration and problem-solving skills are essential in maintaining safe and efficient operations.

5. Upskilling and Mental Health Support for Ground Handlers: Ground handlers face particularly high-stress conditions, especially post-pandemic. In addition to upskilling, companies should provide mental health support and stress management programs to improve employee well-being and job performance, as highlighted in the necessity of skilled handlers.

Crucial part of above conclusions and recommendations were taken from the research and other project "Leveling the Competence Gaps of Teachers in Professions Related to Air Transport" activities that took place during the trainings in Poland and Italy. Project beneficiaries were teachers and instructors from General Aviation field.

By addressing these issues through a holistic and proactive approach, the aviation industry can mitigate current shortages and skill gaps, ensuring a well-prepared workforce capable of meeting future challenges.

It is finally deserving to be stressed that whole research was possible only because of co-funded Erasmus+ project “Leveling the Competence Gaps of Teachers in Professions Related to Air Transport” programme, action type KA210-VET - Small-scale partnerships in vocational education and training that is co-funded by the European Union.

To identify and compare competency gaps among teachers and trainers in Poland and Italy, project partners conducted variety of research, interviews, and study visits with directors of technical/vocational schools and employers from the sector in Poland and Italy. The developed material—in English, Polish, and Italian—will be submitted to the relevant educational and local authorities in Poland and Italy, which, we hope, will contribute to the modernization of teacher and trainer development systems in the partner countries of the project.

Both the study visits to technical schools and training centers for the General Aviation sector in Poland and Italy, as well as the training at factories and organizations servicing General Aviation, will allow project participants to become familiar with solutions used in small-scale aviation. In the long term, this will help make aviation-related professions more attractive to young people who do not plan a career in large corporations but would gladly develop their passion for mechanics and aviation within local communities and by working for smaller firms and organizations.

As part of the dissemination activities, project partners and participants will share the acquired experience and knowledge with other entities that conduct vocational training for the General Aviation sector. The continuous changes in the industry require frequent retraining of employees and adjustments to the educational framework of vocational training. Currently, there is a strong demand for updated and market-relevant training programs, not only from the perspective of employees and students but also from employers.

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APPENDIXES 1 – Interviews - Answers

Person 1: Technical Air School Director

1. Primary Causes of Skill Gaps:
   "The primary causes of skill gaps among graduates are twofold. First, the rapid evolution of technology in aviation outpaces the ability of educational institutions to integrate these changes into curricula. Second, there is a mismatch between theoretical knowledge imparted in classrooms and the practical, hands-on experience required in the field. Additionally, some students enter with insufficient foundational knowledge in STEM subjects."

2. Specific Skills Lacking:
   "Graduates often lack practical problem-solving abilities, especially in high-pressure environments. Their theoretical knowledge is solid, but the lack of exposure to real-world situations leaves them unprepared for the challenges they face in technical maintenance or ground operations. Furthermore, soft skills like communication and teamwork are frequently underdeveloped."

3. Preparedness for Careers:
   "Graduates from technical high schools tend to be better prepared for technical roles, but they often struggle with operational duties like customer service or handling logistics. Those pursuing non-technical roles like ground handling are often not well-versed in managing customer interactions or understanding operational procedures."

4. Differences Between Schools:
   "We've seen differences in the quality of education provided by schools based on their funding, resources, and teaching staff. Some institutions place greater emphasis on practical learning through industry partnerships, while others focus more on theoretical learning, which leads to disparities in students' readiness."

5. Curriculum Alignment with Industry Needs:
   "The curriculum is often outdated. While we cover the basics, the industry requires more specialized, up-to-date training. Many of the newer technologies, such as automation and AI in aircraft maintenance, are not adequately covered in current programs."

6. Practical Training Gaps:
   "We do provide practical training, but there is often not enough access to the latest technologies or real-world operational settings. Internship programs and real-world exposure are crucial but insufficiently integrated into many training programs."

7. Measures for Improvement:
   "We need more collaboration with airlines and ground handling companies to design curriculum and practical training that meet the evolving needs of the industry. Offering more

internships, workshops, and simulations would better prepare students for real-world situations."

8. Role of Industry Partnerships:
   "Industry partnerships are vital. By working with airlines and maintenance providers, we can ensure our students are trained on the latest technologies and procedures. These partnerships also help create job placement pipelines."

9. Adapting to Emerging Trends:
   "Incorporating courses on automation, AI, and sustainability would be crucial. As the aviation industry is rapidly changing, we need to ensure our students are equipped with skills that will remain relevant in the coming years."

10. Solutions for Teacher Skill Gaps:
    "Teachers need continuous professional development to stay up-to-date with new technologies and industry practices. Offering workshops, certifications, and industry immersion programs for instructors would go a long way in bridging their skills gaps."

Person 2: Director of a Ground Handling Company

1. Primary Causes of Skill Gaps:
   "The aviation industry has faced several disruptions, especially due to the pandemic, which caused many experienced workers to leave. The rapid technological advancements in ground handling, such as automation in baggage handling and the introduction of AI systems for operational management, have outpaced the training programs available for new graduates."

2. Specific Skills Lacking:
   "Technical skills, such as proficiency in handling modern baggage systems or troubleshooting automated processes, are often lacking. Also, soft skills such as communication, customer service, and teamwork are overlooked in training programs but are essential for working in a ground handling environment."

3. Preparedness for Careers:
   "Graduates often come with basic knowledge but lack the hands-on experience to handle complex operations. They struggle when it comes to operational flexibility, critical thinking, and customer interaction, which are key components of ground handling roles."

4. Differences Between Schools:
   "Some high schools and vocational institutes provide a hands-on approach with better access to industry-standard tools and equipment. However, many others still focus too heavily on theoretical knowledge, which is insufficient for the demands of real-world operations."

5. Curriculum Alignment with Industry Needs:
   "In many cases, the curriculum does not fully address the operational challenges we face in ground handling. For example, there is little focus on logistics, real-time decision-making, and emergency response protocols, which are key to our daily operations."

6. Practical Training Gaps:
   "While there are internship programs, they are often short-term and fail to offer enough depth. Graduates are sometimes unable to adapt quickly to the rapid pace of real-world operations, especially during peak times at airports."

7. Measures for Improvement:
   "We need more comprehensive, industry-driven training programs that offer continuous learning opportunities. Long-term internships, collaborations with airport management, and on-the-job training could help better prepare students for the demands of ground operations."

8. Role of Industry Partnerships:
   "Partnerships are essential. By working closely with schools, we can provide input on the skill requirements and create real-world training programs that align better with industry needs. We also look to recruit directly from institutions that offer these tailored training programs."

9. Adapting to Emerging Trends:
   "With the increasing use of automation and digital systems, training programs must evolve to cover these technologies. Graduates should be prepared to manage automated systems and understand their implications on operational efficiency."

10. Solutions for Teacher Skill Gaps:
    "Teachers need to engage with the industry regularly to stay current. They should participate in training programs and industry seminars to understand new trends, systems, and operational strategies. Regular teacher exchanges between schools and operational centers would be beneficial."

Person 3: Professional Air Trainer Instructor

1. Primary Causes of Skill Gaps:
   "The skills gap often comes from a disconnect between educational programs and industry requirements. Educational institutions are not always in sync with the latest technological advancements, and there is a lack of industry exposure in the curriculum. Moreover, many graduates lack the necessary hands-on experience before entering the workforce."

2. Specific Skills Lacking:
   "Graduates frequently lack technical skills such as troubleshooting and diagnosing issues with aircraft systems. They also lack soft skills, including customer service, conflict resolution, and effective communication, all of which are necessary for air crew and ground staff roles."

3. Preparedness for Careers:
   "In my experience, graduates are generally well-prepared for basic technical knowledge but are often unprepared for the complex, real-time problem-solving required in air transport. There's a lot of theoretical knowledge, but not enough on-the-job experience."

4. Differences Between Schools:
   "The major differences I see are based on the focus of the programs. Some schools provide a

more hands-on curriculum with more industry partnerships, while others focus too heavily on classroom learning. The schools with stronger industry ties tend to produce graduates who are more adaptable."

5. Curriculum Alignment with Industry Needs:
   "The curriculum is often behind the curve. Technologies like AI and automation are becoming commonplace in the industry, but many schools still teach outdated methods. There needs to be a constant update to training materials, and more emphasis should be placed on new technologies."

6. Practical Training Gaps:
   "We do see some gaps in practical training, especially when it comes to new systems. Graduates may understand the theory but lack experience using the latest technologies, which creates a steep learning curve once they are employed."

7. Measures for Improvement:
   "A solution could be incorporating more simulations and practical experiences into the curriculum. Virtual and augmented reality tools can offer a safe, cost-effective way to expose students to real-world scenarios. More collaboration between educational institutions and employers is essential for effective training."

8. Role of Industry Partnerships:
   "These partnerships are critical. By collaborating with airlines and technical training centers, we can ensure that students are learning up-to-date techniques and are exposed to real-world challenges. These partnerships can also offer internship opportunities that make the transition from school to work smoother."

9. Adapting to Emerging Trends:
   "As technology evolves, training programs must evolve too

Appendix 2 – Questionnaire

Section 1: Demographic Information

1. What is your highest level of education?
    - Bachelor's degree
    - Master's degree
    - Ph.D.
    - Other (please specify)
2. How many years of experience do you have as a high school teacher?
    - 0-5 years
    - 6-10 years
    - 11-15 years
    - 16+ years
3. Do you have any specific qualifications or certifications related to General Aviation and air transportation or aviation?
    - Yes (please specify).....
    - No
4. What subjects do you primarily teach?
    - Mathematics
    - Physics
    - Engineering
    - Economics/Business
    - English
    - Other (please specify)

Section 2: Current Skills and Teaching Practices

5. How familiar are you with the key competencies required for careers in the General Aviation and air transportation market?
    - Not familiar
    - Somewhat familiar
    - Familiar
    - Very familiar
6. Do you integrate topics related to General Aviation and air transportation (e.g., logistics, aviation safety, air traffic management) into your teaching?
    - Yes, frequently
    - Occasionally
    - Rarely
    - Never
7. Which of the following skills do you feel most prepared to teach? (Select all that apply)
    - Technical skills (e.g., aviation mechanics, engineering)
    - Soft skills (e.g., communication, teamwork, problem-solving)
    - Digital skills (e.g., software related to General Aviation and air transportation, data analysis)
    - Safety and regulation knowledge (e.g., air safety standards)
    - Language proficiency (e.g., English for aviation communication)
8. Do you currently collaborate with industry professionals (e.g., aviation companies, airlines) to stay up to date with General Aviation and air transportation trends?
    - Yes
    - No
    - Occasionally

Section 3: Perceived Importance of Skills

9. How important do you think it is for students aiming to work in the General Aviation and air transportation sector to develop technical skills?
    - Not important
    - Somewhat important
    - Important
    - Very important
10. How important are soft skills (e.g., communication, teamwork, leadership) for students in this field?
    - Not important
    - Somewhat important
    - Important
    - Very important
11. How important is English language proficiency (especially technical and aviation-specific English) for your students' future careers?
    - Not important
    - Somewhat important
    - Important
    - Very important
12. How important is it to have an understanding of digital tools (e.g., data management systems, software used in General Aviation and air transportation)?
    - Not important
    - Somewhat important
    - Important
    - Very important
13. How well does the current curriculum support the development of the skills required for the General Aviation and air transportation industry?
    - Not at all
    - Somewhat
    - Sufficiently
    - Very well

Section 4: Training Needs and Identifying Gaps

14. Which areas do you feel least prepared to teach in relation to General Aviation and air transportation?
    - Technical skills
    - Digital skills
    - Soft skills
    - Regulatory knowledge
    - Other (please specify) .....
15. What are the biggest challenges you face when preparing students for careers in the General Aviation and air transportation sector? (Select all that apply)
    - Lack of resources or materials
    - Lack of industry-specific knowledge or training
    - Time constraints within the curriculum
    - Difficulty staying up to date with industry trends
    - Other (please specify) .....
16. Have you participated in any professional development or training programs specifically related to the General Aviation and air transportation market?
    - Yes, regularly
    - Yes, occasionally
    - No, but I would like to
    - No, and I am not interested
17. What type of professional development would help you most in preparing students for careers in the General Aviation and air transportation market? (Select all that apply)
    - Industry workshops or seminars
    - Online courses on aviation or General Aviation and air transportation
    - Collaboration with aviation professionals
    - Access to updated teaching materials and resources
    - Other (please specify) .....
18. Do you feel there is a gap between the skills you are currently teaching and the skills required by the General Aviation and air transportation industry?
    - Yes, a significant gap

- Yes, a slight gap
- No, the skills are aligned
- Not sure

Section 5: Open-ended Questions

19. In your opinion, what are the most critical skills that students should develop to be successful in the General Aviation and air transportation market?

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20. What additional support or resources would help you better prepare students for careers in the General Aviation and air transportation industry?

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