

Competency-Based Learning Model for Aviation Maintenance Technology

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She began her academic career as Instructor I from 2014 to 2018, demonstrating strong commitment and competence in technical instruction. In recognition of her professional growth and contributions, she was promoted to Instructor III in 2021, and subsequently attained the rank of Assistant Professor II in 2023, which she presently holds.

Safe and reliable flight operations depend on the professionalism of aviation maintenance personnel. Every aircraft that safely reaches its destination does so because of competent technicians working behind the scenes. As aviation continues to evolve, aircraft maintenance education programs must keep pace with advancing technologies and industry demands. Competency-based learning has become increasingly popular in technical and vocational education programs. Skills-based learning that allows students to master technical tasks, accumulate knowledge, and practice professional attitudes creates graduates who enter the workforce ready to perform their jobs with confidence, skill, and accountability.

Competency-based learning allows students to progress through a curriculum at their own pace by demonstrating mastery of predetermined skills. Competency-based instruction differs from teacher-centered courses by allowing students to learn at their own pace until they can

demonstrate proficiency. Instead of grading students on the number of hours they spend in a classroom and on their ability to pass written tests, competency-based programs assess learners on their ability to meet instructor-defined performance standards. In aviation maintenance technology, those standards might include the ability to inspect aircraft components, diagnose faults, perform maintenance procedures, adhere to safe work practices, and accurately record maintenance data.

Education and training for aviation maintenance technicians must prioritize safety, quality assurance procedures, and regulatory compliance. The responsibilities of maintenance technicians directly impact the safety of passengers, crew, and the public. Simple mistakes during an inspection or maintenance procedure can have serious repercussions. For this reason, merely teaching students the theory behind aircraft maintenance does not produce graduates who possess the competencies required for safe aircraft operations. Instead, students must have repeated opportunities to practice each skill until they can demonstrate competency in a simulated work environment. Competency-based learning provides students with those opportunities to practice, receive feedback, improve, and master skills before returning to the classroom.

Skills-based learning is a strength of competency-based instruction. Technical students spend the majority of their time in labs, workshops, or aircraft hangars practicing their trade. Performing aircraft inspections, servicing engines, conducting hydraulic system maintenance, troubleshooting avionics, and repairing sheet metal and composite components are examples of hands-on activities that allow students to translate what they learn in the classroom into real-world maintenance skills. Through regular performance assessments, instructors can provide additional support to students who need it while ensuring all students meet established performance standards.

Competency-based learning puts students at the center of their education. Because each student will master skills at different rates, some students may understand how to perform an aircraft inspection while others may still be struggling. Competency-based instruction does not allow students

to advance until they demonstrate proficiency in the skills. Instead of being pushed through a curriculum at the same pace, learners have the time and instructional support they need to fully understand subject matter. As students master each competency, they are motivated to improve their skills and learn more. This mindset allows students to take ownership of their learning and encourages lifelong improvement.

Industry partners can play an active role in helping institutions develop competency standards. Because aircraft maintenance programs typically use national qualification frameworks or industry-defined performance standards, many of the skills students are expected to learn are defined by those standards. Skills such as knowledge components, technical abilities, awareness of safety procedures, communication protocols, and professional conduct are often adopted directly from industry standards. Ensuring that classroom learning meets or exceeds industry expectations allows institutions to produce graduates who meet employer expectations and maintain hireable qualifications. Adopting industry competencies also enables students to graduate from aviation maintenance programs ready to meet workforce demands.

Safety also plays a critical role in competency-based education. A culture of safety is critical to any aviation maintenance program. Beyond teaching students how to properly perform maintenance procedures, students should understand why these procedures are put in place. Students should know how to identify hazards, wear proper personal protective equipment (PPE), follow manufacturers' maintenance manuals, record completed work, and communicate with other technicians. Each of these practices can be directly tied to performance competencies that students must demonstrate before graduating. Safety consciousness is one of the many professional habits students will develop during competency-based training and carry into the workplace.

The technological advances of modern aviation require students to think critically and solve problems. Jet engines, avionics, aircraft materials, and aircraft electronics are constantly evolving. With new computerized

technology, electronics, and composite materials being utilized in the design of commercial aircraft, technicians must learn how to diagnose and solve problems using available resources. Competency-based instruction allows students to work through simulated maintenance scenarios using equipment manuals, technical guides, and logical troubleshooting procedures. Developing critical thinking and analytical skills allows students to work through problems while maintaining safety.

Technology has allowed many educators to strengthen their competency-based training programs. Flight simulators, virtual aircraft maintenance trainers, computer-based training modules, augmented reality solutions, and electronic maintenance documentation allow students to practice technical skills in low-risk environments. These tools allow students to repeat skills as often as necessary to develop technical competence. They also allow students to visualize aircraft components and instantaneously receive feedback on their performance. Teaching students how to use electronics, access digital information, and interpret automated maintenance solutions helps educators prepare them for a technologically advanced workplace.

Although competency-based learning creates an environment for skills development, several challenges can impede its adoption. Skills-based laboratories require considerable funding to provide students with aircraft, engines, tools, simulators, testing equipment, and instructional technologies. Instructors must also have up-to-date knowledge of the industry and stay current with new aircraft entering service and advances in aircraft technology. Developing valid assessment methods to measure student performance can also be difficult. These assessments require careful consideration, standardized criteria, and ideally collaboration with industry partners. Implementing competency-based education requires institutions to invest time and money and to receive support from government stakeholders and industry partners.

Collaboration with industry partners can be beneficial for institutions and students. Airlines, maintenance and repair organizations, aircraft manufacturers, and civil aviation authorities can provide students with on-the-job training through internships and apprenticeships. Allowing

students to experience working in an operational environment will give them the opportunity to apply what they learn in the classroom and understand what is expected of them in the workplace. Industry partners can also provide valuable advice and knowledge to keep the curriculum up to date with advancing technology and skill demands.

In addition to collaborating with industry partners, institutions should also focus on training faculty to teach competency-based courses. Aviation instructors should regularly update their technical knowledge, assessment strategies, and instructional techniques. Professional development workshops, industry immersions, certification courses, and research allow educators to stay current with industry standards and provide students with quality instruction. Competency-based instructors should not only teach; they should lead by example and show students what it means to be a professional in the field.

Competency-based learning creates a new atmosphere for technical education. Mastery-driven programs emphasize proficiency in skills rather than time spent sitting in a classroom. Ensuring that students master skills and meet each performance competency develops graduates who possess the technical knowledge, skills, professional attitudes, and safety standards the aviation industry demands. By creating learner-centered environments that promote real-world skills, practicing professionalism in the classroom, and collaborating with industry partners on competency standards and curriculum, institutions can graduate students who are ready to tackle the ever-changing field of aviation maintenance.

Learning is a continuous process that does not end when students graduate from college. Institutions should not only produce graduates who meet industry standards but also students who are willing to continue learning throughout their careers. By adopting competency-based learning, students will think critically, communicate effectively, and realize the importance of professional and ethical conduct in the workplace. Students who possess these graduate attributes will enable the field of aviation maintenance to grow and advance in the future.