Maryland CTE Programs of Study

Agriculture Animal Science III (2025)

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Introduction. 2

A **Career and technical education instruction provides content aligned with challenging academic standards and relevant technical knowledge and skills for students to further their education and succeed in current or emerging professions.** 2.A

B **The Agriculture Career Cluster concentrates on scientific advancement of agriscience, cultivation, processing, and distribution of agricultural products, employing advanced technologies and sustainable practices to optimize global food systems. This Cluster also supports other plant- and animal-based industries including regenerative agriculture, sustainable logging, and fisheries. This Cluster has meaningful connections with the Energy and Natural Resources Cluster, highlighting a symbiotic relationship that emphasizes stewardship and resilient communities.** 2.B

C **The Agriculture Science Career & Technical Education Program of Study begins with Agriculture Science I, a common foundations course covering plant and animal biology, soils, water, and sustainable food systems. From there, districts may offer one or both two-course pathways: Crop Science II–III, which prepares students for the BASF Plant Science certification while using drone and satellite imagery in labs that align with both the University of Maryland's PLSC 112 Introductory Crop Science and the University of Maryland Eastern Shore's PLSC 184 Introduction to Plant Science; and Animal Science II–III, which culminates in the Elanco Fundamentals of Animal Science credential and capstone projects that map to UMD's ANSC 101 Principles of Animal Science as well as UMES's ANPT 114 Introduction to Animal Science. The Animal Science pathway also lays the academic and clinical groundwork for an optional fourth- level Veterinary Medicine IV course, enabling students to pursue the Elanco Veterinary Medicine certification.** 2.C

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D **In Agriculture Animal Science III capstone projects might compare feed-additive effects on growth, audit a local operation for Beef Quality Assurance compliance, or produce a business plan for a student-run livestock enterprise. Deliverables include a scientific poster or short video presentation, a polished digital portfolio, and an individualized post-secondary transition plan aligned to ANSC 101 competencies and animal-science career pathways.** 2.D

E **Students will participate in at least two Career-Connected Education and Work-Based Learning experiences in this course, which might include informational interviews or job shadowing relevant to the program of study.** 2.E

F **Students are encouraged to participate in extended learning experiences through aligned Career and Technical Student Organizations (CTSOs). CTSOs are a cocurricular requirement in the Carl D. Perkins Act, and alignment to CTSO activities is an expectation for CTE programs in the state of Maryland.** 2.F

Knowledge and Skills. 3

A **The student demonstrates the necessary skills for career development, maintenance of employability, and successful completion of course outcomes. The student is expected to:** 3.A

1 Identify and demonstrate positive work behaviors that enhance employability and job advancement, such as regular attendance, promptness, proper attire, maintenance of a clean and safe work environment, and pride in work. 3.A.1

2 Demonstrate positive personal qualities such as flexibility, open-mindedness, initiative, active listening, and a willingness to learn. 3.A.2

3 Employ effective reading, writing, and technical documentation skills. 3.A.3

4 Solve problems using critical thinking techniques and structured troubleshooting methodologies. 3.A.4

5 Demonstrate leadership skills and collaborate effectively as a team member. 3.A.5

6 Implement safety procedures, including proper handling of hardware and following cybersecurity guidelines. 3.A.6

7 Exhibit an understanding of legal and ethical responsibilities in the Agriculture science field, following data privacy laws and best practices for security. 3.A.7

8 Demonstrate time-management skills and the ability to prioritize tasks in a technical setting. 3.A.8

B **The student identifies various career pathways in the agriculture science field. The student is expected to:** 3.B

1 Develop a career plan that includes the necessary education, certifications, job skills, and experience for specific roles in Agriculture science. 3.B.1

2 Create a professional resume and portfolio that reflect skills, projects, certifications, and recommendations. 3.B.2

3 Demonstrate effective interview skills for roles in agriculture science. 3.B.3

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C **The student develops technology and digital literacy skills. The student is expected to:** 3.C

1. Apply secure file-management practices (e.g., clear naming conventions, logical folder structures, routine backups, and version control) when handling digital documents, GIS layers, sensor logs, and drone imagery. 3.C.1
2. Evaluate the credibility and reliability of online resources—such as peer-reviewed journals, extension databases, and regulatory websites—to inform agriscience decisions and validate research findings. 3.C.2
3. Demonstrate safe, ethical, and legal use of digital platforms by following data-privacy laws, honoring software licenses and fair-use guidelines, and sharing geospatial or aerial imagery responsibly. 3.C.3
4. Collaborate effectively through cloud-based tools (shared drives, real-time documents, virtual whiteboards, project-management apps) to coordinate tasks, exchange data, and communicate with peers, mentors, and industry partners. 3.C.4
5. Integrate multiple software applications (spreadsheets, GIS programs, drone-flight planners, sensor dashboards, and basic statistical packages) to analyze and visualize data that support precision agriculture, animal-enterprise management, and sustainability decisions. 3.C.5

D **The student integrates core academic skills into animal science practices. The student is expected to:** 3.D

1. Apply mathematical concepts—including ratio, proportion, algebraic equations, and introductory statistics—to balance livestock rations, calibrate field equipment, compute medication dosages, and analyze yield- or growth-rate data. 3.D.1
2. Design and conduct scientific investigations by formulating testable hypotheses, controlling variables, collecting quantitative and qualitative data, and interpreting results with spreadsheets or graphing tools. 3.D.2
3. Produce clear, well-organized technical documents (lab reports, research briefs, standard- operating procedures) that follow accepted formatting and citation styles such as APA or MLA. 3.D.3
4. Read, interpret, and synthesize complex informational texts (peer-reviewed articles, extension bulletins, regulatory guidelines, product labels) to support evidence-based decision-making in crop and animal sciences. 3.D.4
5. Present findings to diverse audiences through oral presentations, data-rich posters, and multimedia formats, employing effective visuals, precise terminology, and audience- appropriate explanations. 3.D.5

E **The student demonstrates the necessary skills to relate anatomical specialization and physiological regulation to animal adaptation, productivity, and welfare. The student is expected to:** 3.E

1. Compare musculoskeletal adaptations for locomotion in poultry, horses, dogs, and cattle; explain how structure supports species-specific roles (flight, endurance, companionship, meat production). 3.E.1

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2 Use handheld sensors or a free smartphone app to monitor rumen pH, heart-rate variability, or body-surface temperature during a feeding or handling session; interpret data to assess stress and health status. 3.E.2

3 Evaluate thermoregulation strategies (sweating, panting, feather fluffing, huddling) and recommend facility or management adjustments for heat- or cold-stress mitigation. 3.E.3

4 Relate endocrine responses (growth, lactation, stress) to seasonal, nutritional, and management cues; diagram feedback loops for one hormone system. 3.E.4

5 Present a case study that links an anatomical/physiological disorder (e.g., bloat, hip dysplasia) to prevention or treatment protocols. 3.E.5

F The student demonstrates the necessary skills to integrate quantitative genetics and emerging biotechnologies into responsible animal-breeding decisions. The student is expected to: 3.F

1 Calculate simple selection indexes combining at least three EPD/EBV traits; justify sire or dam choices that balance production, health, and welfare goals. 3.F.1

2 Analyze teacher-provided SNP or genomic-estimated breeding value (GEBV) data using a templated spreadsheet; summarize how molecular information refines traditional selection. 3.F.2

3 Outline the steps, costs, and success rates for in vitro fertilization (IVF) and embryo transfer (ET); compare to artificial insemination for one livestock species. 3.F.3

4 Debate societal and regulatory perspectives on gene editing vs. transgenics in food-animal, laboratory, and companion-animal contexts; craft a position statement citing current policy. 3.F.4

5 Design a breeding plan for a zoo or conservation program that maximizes genetic diversity using studbook data (simulated if needed). 3.F.5

G The student demonstrates the necessary skills to optimize rations, feeding systems, and resource use for sustainable animal production. The student is expected to: 3.G

1 Balance a finishing-steer ration and a senior-dog maintenance diet with a free web-based ration-formulator; compare predicted performance and cost per unit of gain. 3.G.1

2 Conduct a feed-additive trial (yeast culture, enzyme, or probiotic) on a small animal or class micro-livestock project; record intake, weight gain, and feed-conversion ratio (FCR). 3.G.2

3 Interpret net-energy and amino-acid requirements from extension tables; explain how phase feeding or precision feeding reduces waste nutrients. 3.G.3

4 Calculate water-to-feed ratios for poultry, swine, and dairy; recommend watering-system improvements for hygiene and conservation. 3.G.4

5 Analyze life-cycle assessment (LCA) data for conventional vs. alternative protein systems (e.g., beef, insect, cultured meat) and discuss implications for global food security. 3.G.5

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H **The student demonstrates the necessary skills to implement holistic animal-health programs that safeguard animals, people, and the environment. The student is expected to:** 3.H

1. Construct a written herd/flock health protocol that integrates vaccination, parasite control, biosecurity zoning, and residue-avoidance plans; obtain veterinarian feedback if available. 3.H.1
2. Calculate withdrawal intervals and dosage rates from online drug-label libraries; practice correct administration technique on models or inert materials under PPE guidelines. 3.H.2
3. Diagnose common metabolic or management disorders (ketosis, foot rot, canine obesity) from case descriptions; propose evidence-based treatment and prevention. 3.H.3
4. Apply audit checklists (e.g., Beef Quality Assurance, UEP Cage-Free) to evaluate welfare compliance in a local or virtual facility; suggest two cost-effective improvements. 3.H.4
5. Explain zoonotic-disease pathways (rabies, salmonellosis, influenza) and develop a public- education infographic for peers or community audiences. 3.H.5

I **The student demonstrates the necessary skills to connect real-time production data to product quality, economics, and consumer demand. The student is expected to:** 3.I

1. Identify key performance indicators (KPIs) for beef, dairy, pork, broiler, egg, aquaculture, and companion-animal enterprises; compare class data to regional benchmarks. 3.I.1
2. Grade carcass or egg-quality images with free virtual tools; correlate live-animal management decisions (nutrition, genetics, handling) to product outcomes. 3.I.2
3. Use current market reports to compute breakeven prices, gross margins, or cost-of-production for one enterprise; discuss risk-management options (hedging, insurance). 3.I.3
4. Evaluate value-added labeling programs (organic, grass-fed, cage-free, certified humane) for compliance costs, consumer perception, and price premiums. 3.I.4
5. Draft a simplified business plan or pitch deck for a student-run animal enterprise or SAE, including projected budgets and marketing strategy. 3.I.5

J **The student demonstrates the necessary skills to synthesize animal-science knowledge through inquiry, professional documentation, and leadership activities. The student is expected to:** 3.J

1. Design and carry out an independent or team research project aligned to any standard above; collect and analyze data with spreadsheet-based statistics (t-test, simple regression). 3.J.1
2. Prepare either (a) a full scientific poster or (b) a concise three-slide video presentation summarizing the project; deliver findings at an FFA Agriscience Fair, local symposium, or virtual conference. 3.J.2

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3 Compile a digital portfolio that includes the Elanco certification credential, SAE records, project abstracts, facility audits, and a reflective essay mapped to ANSC 101 learning outcomes. 3.J.3

4 Conduct an informational interview with a professional in one animal-science career (veterinary tech, feed-sales, lab-animal care, zoo keeper, researcher); summarize required education, certifications, and emerging skills. 3.J.4

5 Create a post-secondary plan highlighting dual-enrollment options, scholarship opportunities, and experiential-learning programs (internships, undergraduate research) in animal science or related majors. 3.J.5