



Vocational Technical Education Framework



Arts & Communication Services Occupational Cluster

Radio & Television Broadcasting (VRTV)

CIP Code 090701

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Massachusetts Department of Elementary and Secondary Education

Office for Career/Vocational Technical Education

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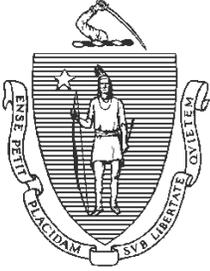
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Commissioner's Letter



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Mitchell D. Chester, Ed.D.
Commissioner

July 2014

Dear Colleagues,

I am pleased to present to you the *Massachusetts Vocational Technical Education Frameworks*, adopted by the Department of Elementary and Secondary Education in June 2014. These frameworks, one for each of the 44 vocational technical programs, include standards in multiple strands representing all aspects of the industries that students in the vocational technical education program are preparing to enter.

The frameworks also include a crosswalk between the technical standards and relevant standards in Massachusetts Curriculum Frameworks to support effective integration of academic and technical content.

The comments and suggestions received during revision of the 2007 *Massachusetts Vocational Technical Education Frameworks* have strengthened these frameworks. We will continue to work with schools and districts to implement the 2014 *Massachusetts Vocational Technical Education Frameworks* over the next several years, and we encourage your comments.

I want to thank everyone who worked with us to create challenging learning standards for Massachusetts students. I am proud of the work that has been accomplished.

Sincerely,

Mitchell D. Chester, Ed.D.
Commissioner of Elementary and Secondary Education

Introduction

Overview & Organization and Key Changes

Overview

The Massachusetts Department of Elementary and Secondary Education understands the necessity of maintaining current Vocational Technical Education Frameworks which ensure career/vocational technical education students across the Commonwealth are taught the most rigorous standards aligned to the needs of business and industry.

With the advent of the Massachusetts Teaching & Learning System the Office for Career/Vocational Technical Education (CVTE) recognized the significance of including career/vocational technical education in the system and developed a comprehensive plan for including vocational technical education. The plan was designed in a Two Phase Process. Phase One included the revision of strands two, three, and six, of all of the Vocational Technical Education Frameworks. Phase Two consisted of three major components (projects) all equally crucial;

1. The revision of Strands One, Four, and Five to complete the revision of all six strands of the Vocational Technical Education Frameworks;
2. Statewide Professional Development on all revised strands, with training on strands two, three, and six delivered fall 2013, and training on strands one, four, and five delivered spring 2014;
3. The creation and development of additional Model Curriculum Unit (MCU) Teams.

The Office for Career/Vocational Technical Education Framework Team, with support from consultants, began Phase One in the 2012-2013 school year, to revise three of the six strands contained in all of the Vocational Technical Education (VTE) Frameworks. The state was organized into “Collaborative Partnerships” comprised of teams of project administrators, highly qualified subject matter educators, and business and industry partners, whose task was to revise Strand Two – Technical, Strand Three – Embedded Academics, and Strand Six – Technology Literacy. Each team met with a vocational advisory committee which included business and industry representatives and postsecondary education professionals, whose mission was to review and revise the team’s draft document during the revisionary process. Once strand two was revised, academic teachers (typically one English Language Arts teacher, one Mathematics teacher, and one Science teacher) worked with the technical subject matter teachers to develop a crosswalk between academic curricula standards and the technical standards, and provided examples of embedded academic content.

The Office for Career/Vocational Technical Education solicited statewide input from technical and academic teachers and administrators at the annual Massachusetts Association of Vocational Administrators (MAVA)/Massachusetts Vocational Association (MVA) - Connecting for Success Conference. Each framework team met with their content colleagues and reviewed the draft revisions and obtained valuable feedback. Additionally, all drafts were reviewed and revised by the Massachusetts Vocational Technical Teacher Testing Program, to ensure appropriate measurable language.

Project consultants designed a new template to ensure all framework teams entered new standards and additional resources in a consistent manner. The framework teams created an “Appendix” listing potential industry recognized credentials attainable by secondary students; lists of professional, student, and relevant government organizations; and useful resources and websites. ** It is important to note that although most Framework Teams provided information for the “Appendix”, not all teams did. Therefore, sub-headings within the “Appendix” without information have been deleted.* Disclaimer: Reference in the Appendices Section to any specific commercial products, processes, or services, or the use of any trade, firm or corporation name is for the information and convenience of the public, and does not constitute endorsement or recommendation by the Massachusetts Department of Elementary and Secondary Education.

The Office for Career/Vocational Technical Education facilitated a comprehensive vetting process throughout the Commonwealth. During the fall of 2012 districts throughout Massachusetts solicited feedback from each Vocational Program’s Advisory Committee members at the Fall Board meetings. Additionally, the Office for Career/Vocational Technical Education met with various licensing boards at the Massachusetts Division of Professional Licensure and provided the applicable draft framework to each board for review. All framework drafts were posted on the CVTE website for public comment. Comments and suggested revisions received were shared with each framework team for response and edits, as appropriate.

The Phase I Process was completed on an accelerated timetable and resulted in all Vocational Technical Education Frameworks; Strand Two and Strand Six, revised with current, rigorous, relevant standards. Strand Three has been redesigned into a crosswalk which directly correlates academic and technical standards. An appendix of useful material for technical teachers recommended by their peers was added to each framework.

Phase II of the Framework Revision Process consisted of three major projects;

1. The Strands One, Four & Five Project, to complete the revision of all six strands of the Vocational Technical Education Frameworks;
2. Statewide Professional Development on all revised strands, with training on strands two, three, and six delivered fall 2013, and training on strands one, four, and five delivered spring 2014;
3. The creation and development of additional Model Curriculum Unit (MCU) Teams.

The Strands One, Four, & Five Project began in the fall of 2013 with the formation of a leadership team and three work groups. Co-Managers led the leadership team comprised of three Strand Coordinators who facilitated work teams and reviewed, researched, and revised these common strands. All skills specific to the vocational technical program have been included into Strand Two Technical.

The Strand One Team revised the safety knowledge and skills that all students need to acquire. The team included relevant issues (i.e., bullying, climate), laws, regulations, guidelines and policies pertaining to safety.

The Strand Four Team revised the Employability Knowledge and Skills that all students need to acquire. Teams considered current research on career readiness, including the work of the College Career Readiness Task Force convened by the Department, changes in workplace, technological changes that

impact how people perform their work (i.e., communications methods), and included standards that emphasize the need for lifelong learning and adaptability given the multiple career changes over an individual's working life. The team recommended this strand be renamed to: Career Readiness.

The Strand Five Team revised the Management & Entrepreneurship Knowledge and Skills that all students need to acquire. All business owners and employees must possess management and financial skills to be productive members of society. Skills included financial knowledge and basic business management skills.

All Strand One, Four and Five Project Teams worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Massachusetts Career and Technical Student Organizations to crosswalk standards to national Career & Technical Student Organizations Curricula, as applicable.

The Office for Career/Vocational Technical Education contracted the MAVA Consultant Team to work closely with the office to complete all of the work accomplished during Phase II of the Project.

A remarkable amount of work was accomplished through the efforts of hundreds of professionals who collaborated and diligently supported this work. The Office for Career/Vocational Technical Education is grateful for all the support received from the field, particularly all of the teachers (technical and academic), administrators, advisory committee members, business and industry representatives, the Division of Professional Licensure - boards, the Massachusetts Association of Vocational Administrators, the MAVA Consultants, and the Massachusetts Vocational Association, whose contributions were tremendous.

Special thanks to all staff in the Office for Career/Vocational Technical Education and the CVTE Framework Revision Team who provided guidance and numerous contributions during Phase One of the project.

Organization and Key Changes

This section contains the following:

- Highlights of Changes to the Vocational Technical Education Frameworks; which includes a summary of changes made to each strand.
- Organization of the Frameworks – Strand Two illustrates structure of topic headings, standards and objectives, and performance examples.

Highlights of Changes to the Vocational Technical Education Frameworks:

Strand One:

Safety and Health Knowledge and Skills have been revised to contain the safety standards that are common to all programs. The Strand One Team worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Career and Technical Student Organizations (CTSO) to crosswalk standards to national CTSSO Curricula, as applicable.

- No objectives were deleted, only modified.
- Language and wording was clarified.
- Additions included a focus on maintaining a safe school and workplace in terms of creating a positive climate/environment.
- Student safety credential program has been revised.
- Safety attire has been revised.
- Emergency equipment and fire safety has been revised.
- Many new Performance Examples have been included.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below titled: "Organization of the Frameworks – Strand Two". All strands were organized in that manner, with the exception of the former Strand Three.

Strand Two:

The Technical Standards Knowledge and Skills have been revised to reflect business and industry changes since the adoption of the 2007 Vocational Technical Education Frameworks (VTEF). There are additional changes to Strand Two below:

- The Technical Knowledge and Skills (Strand Two) section contains standards specific to the particular vocational program; suffix "a" (as common to all programs) and suffix "c" (as common within a cluster) have been removed.
- Each VTEF Strand Two begins with safety and health knowledge and skills specific to the particular vocational program.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below

titled: “Organization of the Frameworks – Strand Two”. All strands were organized in that manner, with the exception of the former Strand Three.

- Strand Two of the Frameworks for Animal Science, Environmental Science and Technology, and Horticulture, begin with core standards required for all participants in the programs, followed by a series of standards organized in concentrations. See the section below titled: “Organization of the Frameworks – Strand Two” for more information.
- An update to some of the vocational programs framework is the addition of advanced or supplemental standards which are noted in Strand Two by an asterisk (*). *These standards are not required, but are provided as suggestions that districts may choose to use to increase the depth of a particular topic, or add additional topics, particularly for advanced students or for those seniors who do not participate in cooperative education.* See the section below titled: “Organization of the Frameworks – Strand Two” for more information.

Strand Three:

Since the purpose of Strand Three was to correlate academic content that was *embedded* in the knowledge and skills necessary to perform certain technical skills, it was logical to highlight those connections through a crosswalk between the academic curriculum standards and the technical standards (Strand Two). The crosswalk directly correlates the English Language Arts (2011) and Mathematics (2011) Frameworks, incorporating the Common Core Standards and the Science and Technology/Engineering Frameworks. The crosswalk can be found in the appendix of each vocational framework. The crosswalk also includes performance examples which illustrate integrated academic and technical content.

- Embedded Academics has been replaced with a crosswalk between the academic curriculum standards and the technical knowledge and skills standards. The crosswalk is located in the Appendices.

Strand Four:

Employability (and Career Readiness) Knowledge and Skills focused on providing students with general knowledge and skills to be college and career ready. The Strand Four Team worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Career and Technical Student Organizations to crosswalk standards to national CTSO Curricula, as applicable.

- Language and wording were clarified.
- Additions included a focus on providing students with skills for employability/career readiness.
- Modifications included Career Exploration & Navigation, Communication in the Workplace, and Work Ethic & Professionalism.
- New Performance Examples have been included.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below titled: “Organization of the Frameworks – Strand Two”. All strands were organized in that manner, with the exception of the former Strand Three.

Strand Five:

Strand Five contains Management and Entrepreneurship Knowledge and Skills that are general for all students. The Strand Five Team worked collaboratively with staff from the Department of Elementary and Secondary Education and the Advisors of the Massachusetts Career and Technical Student Organizations to crosswalk standards to national Career & Technical Student Organizations Curricula, as applicable.

- Language and wording were clarified and organized into a logical format.
- The Strand Five Team felt that the 2007 curriculum remained valid.
- Additions included a focus on providing students with skills for management and entrepreneurship applicable to all vocational programs.
- Modifications included Starting and Managing a Business, Marketing, and Financial Concepts & Applications in Business, and Legal/Ethical/Social Responsibilities.
- New Performance Examples have been included.
- Within each strand, standards and objectives were grouped under Topic Headings, which are displayed in bold. Each standard is followed by a performance example. See the section below titled: "Organization of the Frameworks – Strand Two". All strands were organized in that manner, with the exception of the former Strand Three.

Strand Six

Strand Six Technology Literacy Knowledge and Skills has been replaced with the 2008 Massachusetts Technology Literacy Standards and Expectations Framework.

Appendix¹

Each framework contains an “Appendix” section which includes an Embedded Academic Crosswalk, Industry Recognized Credentials, Statewide Articulation Agreements, Professional, Governmental, and Student Organizations, Resources, and relevant websites.

The Appendix² contains:

- Embedded Academic crosswalks for English Language Arts, Mathematics, and Science & Technology/Engineering.
- Statewide Articulations: Current statewide Articulation Agreements and/or Apprenticeship Programs available to the specific vocational program are listed on this page. The development of new statewide articulations continues, and therefore these pages will be revised as new agreements are finalized.
- Industry-Recognized Credentials: Technical Teacher Teams generated lists of credentials for the vocational programs. Program Advisory Committees throughout the state reviewed and provided recommendations through the validation process. *The credential list has been provided as a resource only and districts are not obligated to provide all of the specified credentials for students.*
- Other: These pages provide lists of reference materials, government agencies, professional and student organizations, and useful websites created by each framework team. These are intended as helpful resources for technical teachers, identified by peers. These are not recommended or required by the Department of Elementary & Secondary Education.

¹ *Note: Although most Framework Teams provided information for the “Appendix”, not all teams did. Therefore, sub-headings within the “Appendix” without information have been deleted.*

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Organization of the Frameworks – Strand Two

The Vocational Technical Education Frameworks contain knowledge and skills covering all aspects of industry, reflected in six strands: Safety and Health, Technical, Embedded Academics, Employability, Management and Entrepreneurship, and Technological.

Within each strand, standards and objectives were grouped under topic headings, which are displayed in bold. Each standard is followed by a performance example. In the excerpt below, 2.A is the topic; 2.A.01 is the first standard and 2.A.01.01 and 2.A.01.02 are the objectives under that standard.

2.A Automotive Technology Specific Safety Practices

- 2.A.01 Identify and describe safety procedures when dealing with different types of automotive lifts according to current industry standards.
- 2.A.01.01 Demonstrate procedures for safe lift operations.
 - 2.A.01.02 Demonstrate safe use, placement and storage of floor jacks and jack stands.

2.A.01 Performance Example:

- Student will set up lift using manufacturer’s suggested lift points.

- 2.A.02 Demonstrate and describe safety procedures when dealing with high pressure systems including necessary ventilation according to current industry standards.
- 2.A.02.01 Describe and demonstrate the importance of safety procedures to be used when servicing high pressurized systems (fuel systems, brakes, air conditioning, suspension, hydraulic systems, etc.).
 - 2.A.02.02 Describe and demonstrate safe use of oxygen/acetylene torches and electric welding equipment.
 - 2.A.02.03 Demonstrate ventilation procedures to be followed when working in the lab/shop area.

2.A.02 Performance Example:

- Student will relieve fuel system pressure to perform necessary repairs.

- 2.A.03 Identify and describe safety procedures when dealing with electrical circuits according to current industry standards.
- 2.A.03.01 Describe safety procedures to be followed when servicing supplemental restraint systems.
 - 2.A.03.02 Demonstrate safety awareness of high voltage circuits of electric or hybrid electric vehicles and related safety precautions.

2.A.03 Performance Example:

- Safely disable Supplemental Restraint System (SRS) air bag for repair using manufacturer’s recommendations.

There are additional changes to some of the Frameworks Strand Two (Technical Knowledge and Skills). Specifically, Strand Two of the Frameworks for Animal Science, Environmental Science and Technology and Horticulture begin with core standards required for all participants in the programs, followed by a series of standards organized in concentrations. For example, Strand Two of the Horticulture Framework begins with the core standards required of all Horticulture students

(Topics 2.A through 2.I). These standards are followed by the three concentrations: Arboriculture (Topics 2.J through 2.L), Greenhouse Management and Floriculture (Topics 2.J. through 2.L) and Landscape and Turf Management (Topics 2.M through 2.Q).

Advanced / Supplemental Standards (Not Required)

Another variation that is new to the revised Strand Two Frameworks is the addition of advanced or supplemental standards which are noted with the use of an asterisk (*). *These standards are not required, but are provided as suggestions that districts may choose to use to increase the depth of a particular topic, or add additional topics, particularly for advanced students or for those seniors who do not participate in cooperative education.*

The following is an example from Automotive Technology, where entire topics were added:

Advanced Automotive Technology Technical Knowledge and Skills

Note: The following competencies are optional, supplementary competencies suitable for advanced students. These are not required.

2.CC Demonstrate appropriate engine repair techniques.

2.CC.01 Perform appropriate cylinder Head Repair.

2.CC.01.01* Diagnose, remove and replace cylinder head(s).

2.CC.01.02* Clean and visually inspect a cylinder head for cracks; check gasket surface areas for warpage and surface finish; check passage condition; determine necessary action.

The following is an example from the Strand Two Radio and Television Broadcasting Framework that shows the addition of an advanced objective, 2.B.04.08*:

2.B.04 Explain concepts fundamental to shooting in cinema and video.

- 2.B.04.01 Compare and contrast a single-camera and a multiple-camera production.
- 2.B.04.02 Explain the importance of shooting for the edit (i.e., match on action, sequencing, coverage).
- 2.B.04.03 Explain the importance of continuity.
- 2.B.04.04 Explain the 180° Rule line, and its application in various cinema scenarios.
- 2.B.04.05 Identify and establish a specific point-of-view when shooting from a script.
- 2.B.04.06 Analyze the methods in which specific shots can evoke emotion from an audience.
- 2.B.04.07 Define drop frame and non-drop frame code shooting and explain how to account for both when preparing for an edit.
- 2.B.04.08* Describe various cinematographic methods necessary when shooting scenes that incorporate post-production visual effect

2.B.04 Performance Examples:

- Students will list similarities and differences of single-camera and multiple-camera shoots.
- Students will describe multiple shooting considerations that are useful in streamlining the editing process.

Arts & Communication Services Occupational Cluster

Radio & Television Broadcasting Framework (VRTV)

Strand 1: Safety and Health Knowledge and Skills

1.A Fundamentals of Health and Safety

- 1.A.01 Describe and apply health and safety regulations.
- 1.A.01.01 Identify, describe and apply health and safety regulations that apply to specific tasks and jobs. Students must complete a safety credential program, e.g., Occupational Safety and Health Administration 10, CareerSafe and ServSafe.
 - 1.A.01.02 Identify, describe and apply Environmental Protection Agency (EPA) and other environmental protection regulations that apply to specific tasks and jobs in the specific occupational area.
 - 1.A.01.03 Identify, describe and apply Right-To-Know (Hazard Communication Policy) and other communicative regulations that apply to specific tasks and jobs in the specific occupational area.
 - 1.A.01.04 Explain procedures for documenting and reporting hazards to appropriate authorities.
 - 1.A.01.05 Identify and describe potential consequences for non-compliance with appropriate health and safety regulations.
 - 1.A.01.06 Identify and list contact information for appropriate health and safety agencies and resources.

1. A.01 Performance Examples:

- List and define OSHA Health and Safety Regulations, EPA and other environmental protection regulations to occupational area.
- List and define Right-to-Know regulations and reporting of hazards and contact information for appropriate health and safety agencies.
- List the laws and rules of regulatory agencies governing sanitation and safety.
- Utilize OSHA as well as health and safety websites for purposes of research.

- 1.A.02 Demonstrate appropriate health and safety practices based on the specific occupational area.
- 1.A.02.01 Identify, describe and demonstrate the effective use of Safety Data Sheets (SDS).
 - 1.A.02.02 Read and interpret chemical, product and equipment labels to determine appropriate health and safety considerations.
 - 1.A.02.03 Identify, describe and demonstrate personal, shop and job site safety practices and procedures.
 - 1.A.02.04 Demonstrate safe dress and use of relevant safety gear, personal protective equipment (PPE) and ergonomics, e.g., wrist rests, adjustable workspaces, equipment, gloves, proper footwear, earplugs, eye protection and breathing apparatus.
 - 1.A.02.05 Demonstrate appropriate safe body mechanics, including appropriate lifting techniques and ergonomics.

- 1.A.02.06 Locate emergency equipment, first aid kit, SDS information directories and emergency action/response plan/escape routes in your lab, shop and classroom, including labels and signage that follow OSHA Hazard Communication Program (HAZCOM), eyewash stations, shower facilities, sinks, fire extinguishers, fire blankets, telephone, master power switches and emergency exits.
- 1.A.02.07 Demonstrate the safe use, storage, and maintenance of every piece of equipment in the lab, shop and classroom, e.g., the OSHA Lockout/Tagout Program (LOTO).
- 1.A.02.08 Describe safety practices and procedures to be followed when working with and around electricity, e.g., ground fault circuit interrupter (GFCI) and frayed wiring.
- 1.A.02.09 Handle, store, dispose of and recycle hazardous, flammable and combustible materials, according to EPA, OSHA and product specifications.
- 1.A.02.10 Demonstrate appropriate workspace cleaning, sanitation, disinfection and sterilization procedures required in specific occupational areas, e.g., Workplace Housekeeping OSHA Regulations.

1. A.02 Performance Examples:

- Identify, describe and demonstrate the use of SDS.
- List and demonstrate shop dress code, safety procedures and location of emergency equipment in labor classroom.
- Define and demonstrate safe storage and maintenance of equipment and proper disposal or recycling of hazardous, flammable and combustible materials.
- Identify, describe and demonstrate the Universal Precautions set of guidelines.

- 1.A.03 Demonstrate appropriate responses to situations that may threaten health and safety.
 - 1.A.03.01 Describe First Aid procedures for potential injuries and other health concerns in the specific occupational area.
 - 1.A.03.02 Describe the importance of emergency preparedness and an emergency action/response plan.
 - 1.A.03.03 Describe procedures used to handle emergency situations, defensive measures and accidents, including identification, reporting, response, evacuation plans and follow-up procedures.
 - 1.A.03.04 Identify, describe and demonstrate safety practices in specific occupational areas used to avoid accidents.
 - 1.A.03.05 Identify and describe fire protection, protection, precautions and response procedures.
 - 1.A.03.06 Discuss the role of the individual and the company/organization in ensuring workplace safety including transportation to and from school, school activities and the workplace.
 - 1.A.03.07 Discuss ways to identify, prevent and report school and workplace violence, discrimination, harassment and bullying.
 - 1.A.03.08 Demonstrate positive and appropriate behavior that contributes to a safe and healthy environment in school and the workplace.

1. A.03 Performance Example:

- Define first aid procedures and protocols used to handle emergency situations and practices used to avoid accidents.
- View safety videos and discuss the role of workplace safety.
- Attend or participate in a human rights alliance organization presentation.
- Observe and/or demonstrate the appropriate use of a fire extinguisher using the (PASS) technique: Pull, Aim, Squeeze, Sweep.
- Review and discuss specific policies, procedures and protocols regarding discrimination, harassment and bullying.
- Discuss and/or role-play proper and respectful behavior that contributes to a positive climate.
- Discuss and/or demonstrate behavior that contributes to a collaborative/teamwork environment.

Selected Websites

- Bullying Prevention and Intervention Resources : www.doe.mass.edu/bullying
- Centers for Disease Control and Prevention: www.cdc.gov
- Environmental Protection Agency : www.epa.gov
- “Lost Youth – Four Stories of Injured Young Workers”– WorkSafeBC:
<http://www2.worksafebc.com/Publications/Multimedia/Videos.asp?reportid=34291>
- Massachusetts Department of Elementary and Secondary Education. (2011). Career/Vocational Technical Education Safety Guide: www.doe.mass.edu/cte
- Massachusetts Department of Elementary and Secondary Education: www.doe.mass.edu
- Massachusetts Emergency Management Agency: www.mass.gov/eopss/agencies/mema
- Massachusetts General Law: www.malegislature.gov
- Massachusetts Health and Human Services: www.mass.gov/dph
- Massachusetts Right to Know Law Summary:
<http://www.mass.gov/lwd/docs/dos/mwshp/hib397.pdf>
- Safety Data Sheet: www.sdsonline.com
- National Fire Protection Association: www.nfpa.org
- Protection of Student Rights: Massachusetts General Law:
<https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXII/Chapter76/Section5>
- Occupational Safety and Health Administration: www.osha.gov
- Readiness and Emergency Management for Schools: www.rems.ed.gov
- Safe and Healthy Learning Environments: www.doe.mass.edu/ssce/safety.html

Strand 2: Technical Knowledge and Skills

2.A Fundamentals of Health and Safety in Television and Cinema Production

- 2.A.01 Identify, explain and demonstrate studio production in accordance with current industry and OSHA safety standards.
- 2.A.01.01 Explain and demonstrate how to safely set up a ladder and use it both with and without equipment.
 - 2.A.01.02 Identify how to organize cameras and other production equipment in the studio with proper aisles and egress.
 - 2.A.01.03 Demonstrate how to hang and focus lighting instruments with proper safety cables and tools.
 - 2.A.01.04 Demonstrate how to run cables in the studio using proper taping/covering techniques.
 - 2.A.01.05 Explain how to work with electrical sources and alternating current (AC) or battery powered cinema and video equipment in the studio.

2.A.01 Performance Example:

- Students will list methods to set up a studio production following safety guidelines.

- 2.A.02 Identify, explain and demonstrate on-location production in accordance with current industry and OSHA safety standards.
- 2.A.02.01 Explain the safety practices for working away, on-location, or in an open environment.
 - 2.A.02.02 Describe how to organize cameras and other production equipment when working on location while maintaining appropriate aisles and egress.
 - 2.A.02.03 Demonstrate how to run cables when working on location and using taping/covering techniques.
 - 2.A.02.04 Explain the necessary safety equipment required and the safety procedures you must follow when working in places of high elevation.
 - 2.A.02.05 Explain and demonstrate how to properly set up and safely secure lighting equipment when working on location.
 - 2.A.02.06 Explain how to safely work with electrical sources and AC or battery powered cinema and video equipment.

2.A.02 Performance Examples:

- Students will list methods to set up an on-location production following safety guidelines.
- Students will create a safety plan for use during an on-location production.

- 2.A.03 Identify proper procedures for handling fragile equipment.
- 2.A.03.01 Explain the safe and proper method for replacing the lamps in various types of studio or portable lighting equipment.
 - 2.A.03.02 Demonstrate how to properly follow manufacturer guidelines and operational procedures for specific cinema and video equipment.
 - 2.A.03.03 Demonstrate how to properly handle, carry, or transport specific cinema or video equipment when working on location.

2.A.03 Performance Examples:

- Students will demonstrate the handling and usage of cinema and video equipment.
- Students will demonstrate how to change a lamp in a lighting instrument.

2.B Fundamentals of Cinema and Video Production

- 2.B.01 Explain concepts fundamental to cinema/video design and composition.
- 2.B.01.01 Identify the elements of design (i.e., line, texture, color, scale, movement).
 - 2.B.01.02 Identify basic camera shots (i.e., establishing, wide, medium, close-up, two-shot, three-shot, knee, bust, cross, over-the-shoulder).
 - 2.B.01.03 Identify rules of camera movement (i.e., nose room, head room, lead room, overscan areas, safe areas, tilt, track, truck, zoom, arc, cant, tongue, dolly).
 - 2.B.01.04 Identify elements of composition (i.e., rule of thirds, built in frame, strong diagonal, leading lines, symmetrical balance, asymmetrical balance, contrast, simplicity).
 - 2.B.01.05 List criteria used to analyze and critique aspects of cinema and video.
 - 2.B.01.06* Identify advanced elements of composition (i.e., Golden Rectangle, Fibonacci spiral, rectangle rebatement).

2.B.01 Performance Examples:

- Students will create a visual example demonstrating multiple composition techniques.
- Students will demonstrate basic camera shots and basic camera movements.
- Students will critique and analyze a video or cinema focusing on multiple criteria.

- 2.B.02 Explain concepts fundamental to lighting in cinema and video.
- 2.B.02.01 Differentiate between types of lighting techniques for cinema and lighting techniques for video.
 - 2.B.02.02 Explain the differences between spectral light and diffused light.
 - 2.B.02.03 Identify the qualities and characteristics of light (i.e., intensity, distribution, direction, color, movement, scale, texture, hard/soft focus).
 - 2.B.02.04 Contrast properties of reflection versus properties of refraction.
 - 2.B.02.05 Define and use terms relevant to lighting color theory (i.e., Kelvin color temperature, visible spectrum, natural/artificial light).
 - 2.B.02.06 Analyze the methods in which color and light can evoke emotion from an audience.
 - 2.B.02.07 Explain the use of gels/filters to compensate for light source color temperature.
 - 2.B.02.08 Draw and label a studio set up for three-point lighting (i.e., key, fill, back).
 - 2.B.02.09 Draw and label a studio light plot for various productions.
 - 2.B.02.10* Diagram a dimmer/channel chart for a light plot in a studio.
 - 2.B.02.11* Explain the inverse square law in its relation to positional lighting.
 - 2.B.02.12* Identify and describe color temperatures specific to various lighting instruments.

2.B.02 Performance Examples:

- Students will draft a light plot for a studio or remote production.
- Students will list and identify properties of light.
- Students will use gels or filters to adjust a light source for temperature, mood, and color.

- 2.B.03 Explain concepts fundamental to sets and props in cinema and video.
- 2.B.03.01 Identify aspects of set and prop design for cinema and video.
 - 2.B.03.02 Draw and label a basic studio ground plan.
 - 2.B.03.03 Draw and label a remote-shoot ground plan.
 - 2.B.03.04 Draw a concept sketch of a set piece for a remote-shoot.
 - 2.B.03.05* Design a unit set for use in a cinema or video production.

- 2.B.03 Performance Examples:
- Students will draft a ground plan for a set or prop for a studio or remote production.
 - Students will use measuring/scale techniques for preparation of a concept sketch of a set piece or prop.

- 2.B.04 Explain concepts fundamental to shooting in cinema and video.
- 2.B.04.01 Compare and contrast a single-camera and a multiple-camera production.
- 2.B.04.02 Explain the importance of shooting for the edit (i.e., match on action, sequencing, coverage).
- 2.B.04.03 Explain the importance of continuity.
- 2.B.04.04 Explain the 180° Rule line, and its application in various cinema scenarios.
- 2.B.04.05 Identify and establish a specific point-of-view when shooting from a script.
- 2.B.04.06 Analyze the methods in which specific shots can evoke emotion from an audience.
- 2.B.04.07 Define drop frame and non-drop frame code shooting and explain how to account for both when preparing for an edit.
- 2.B.04.08* Describe various cinematographic methods necessary when shooting scenes that incorporate post-production visual effects.

- 2.B.04 Performance Examples:
- Students will list similarities and differences of single-camera and multiple-camera shoots.
 - Students will describe multiple shooting considerations that are useful in streamlining the editing process.

- 2.B.05 Explain the differences between broadcast and non-broadcast media formats.
- 2.B.05.01 Differentiate between various digital media formats.
- 2.B.05.02 Define rastering and resolution as it relates to cinema and video.
- 2.B.05.03 List major broadcast standards (i.e., Advanced Television Systems Committee (ATSC), Phase Alternating Line (PAL), Sequential Color with Memory (SECAM)), their respective regions, and characteristics of each.
- 2.B.05.04 Compare and contrast television color standards (Red/Green/Blue (RGB) vs. 601/709).
- 2.B.05.05 Identify common aspect ratios (i.e., 4:3, 16:9, letterbox, pillarbox).
- 2.B.05.06* Explain chroma subsampling and its relationship to video imaging.

- 2.B.05 Performance Example:
- Students will list various appropriate media formats and broadcasting signals used in cinema and video production.

2.C Fundamentals of Broadcast Journalism

- 2.C.01 Define and describe broadcasting.
- 2.C.01.01 Explain the history of broadcasting.
- 2.C.01.02 Discuss today's trends in television broadcasting.
- 2.C.01.03 List criteria used to analyze and critique aspects of a television broadcast.
- 2.C.01.04* Identify key individuals who influenced change throughout the development of television broadcasting.

- 2.C.01 Performance Example:
- Students will analyze today's broadcasting standards in relation to the history of broadcasting.

- 2.C.02 Identify production roles in broadcast journalism.
- 2.C.02.01 Identify types of lighting techniques for a television broadcast.

- 2.C.02.02 Identify types of audio techniques for a television broadcast.
- 2.C.02.03 Identify types of camera shots appropriate for a television broadcast.
- 2.C.02.04 Identify characteristics of on-screen talent.
- 2.C.02.05 Differentiate between broadcast production roles.

- 2.C.02 Performance Example:
- Students will identify production roles and responsibilities in broadcast journalism and describe how they interrelate to one another.

- 2.C.03 Explain the role of media literacy in today's broadcast journalism.
- 2.C.03.01 Explain the difference between news, feature, opinion, sports, and other forms of news writing and reporting.
 - 2.C.03.02 Explain the differences between Electronic Newsgathering (ENG), Electronic Field Production (EFP) and studio productions.
 - 2.C.03.03 Explain characteristics of newsworthiness, ethics, and bias.
 - 2.C.03.04 Explain the use of b-roll in broadcast journalism.
 - 2.C.03.05 Discuss the pros and cons of "going live" with a story.
 - 2.C.03.06 Explain the role of research in news reporting.
 - 2.C.03.07 Explain television, cinema, and video copyright laws and describe the needs for each.
 - 2.C.03.08 Describe the Federal Communications Commission (FCC) regulations and examine the necessity for such regulations in television broadcasting.
 - 2.C.03.09 Explain multiple perspectives of the argument regarding regulations of broadcasting by the FCC.
 - 2.C.03.10* Identify major broadcasting legislation and copyright court cases, and explain their significance to today's broadcasting regulation standards.

- 2.C.03 Performance Example:
- Students will explain the importance of unbiased reporting, newsworthiness, ethics, and copyright in the creation and distribution of news programs.

2.D Fundamentals of Photography

- 2.D.01 Explain concepts fundamental to photography and composition.
- 2.D.01.01 Identify the elements of design (i.e., line, texture, color, scale, movement).
 - 2.D.01.02 Identify elements of composition (i.e., rule of thirds, built in frame, strong diagonal, leading lines, symmetrical balance, asymmetrical balance, contrast simplicity).
 - 2.D.01.03 List criteria used to analyze and critique aspects of photography.
 - 2.D.01.04* Identify advanced elements of composition (i.e., Golden Rectangle, Fibonacci spiral, rectangle rebatement).

- 2.D.01 Performance Examples:
- Students will create a visual example demonstrating composition and design elements.
 - Students will critique and analyze a photograph based on multiple criteria.

- 2.D.02 Explain concepts fundamental to exposure in photography.
- 2.D.02.01 Define exposure and the variables that control exposure (i.e., aperture, shutter speed, International Organization for Standardization (ISO)).
 - 2.D.02.02 Diagram the exposure triangle, showing the connection between aperture, shutter speed, and ISO.
 - 2.D.02.03 List the range of f-stops, as a measurement of aperture, common with most cameras.

- 2.D.02.04 List the range of shutter speeds common with most cameras.
- 2.D.02.05 List the range of ISO common with most cameras.
- 2.D.02.06 Define exposure value, and how the exposure value table shows the connection between aperture, shutter speed, and ISO.
- 2.D.02.07 Explain how variation in aperture can affect depth of field in an image.
- 2.D.02.08 Explain how variation of shutter speed can affect motion in an image.
- 2.D.02.09 Explain how variation of ISO can affect image detail and quality.
- 2.D.02.10* Describe the use and application of a light meter in determining proper exposure.
- 2.D.02.11* Diagram an exposure value table, showing the connection between aperture, shutter speed, and ISO.
- 2.D.02.12* Describe high dynamic range imaging (HDR).

2.D.02 Performance Examples:

- Students will draw a diagram of the Exposure Triangle, and describe the interrelation of aperture, shutter speed, and cinema speed/ISO.
- Students will examine how adjusting exposure variables directly relates to the amount of light available in the creation of an image.
- Students will list the ranges of each of the exposure variables: aperture, shutter speed, and cinema speed/ISO.

2.D.03 Explain concepts fundamental to the use of lenses in photography.

- 2.D.03.01 Identify types of lenses (i.e., normal, wide angle, telephoto, variable zoom, macro, fisheye).
- 2.D.03.02 Describe the differences in lenses and their effects on the composition of an image.
- 2.D.03.03 Define focal length and describe how it relates to the size of a lens.
- 2.D.03.04 Describe how the focal length can affect depth of field.
- 2.D.03.05 Explain how lenses are used to refract light.
- 2.D.03.06 Explain how lenses are used to focus an image.
- 2.D.03.07* Explain how varying types of lenses and camera positioning can affect image framing and perspective.
- 2.D.03.08* Explain the characteristics and applications of special purpose lenses (i.e., swing shift lens, slant-focus lens, pitching lens, Dynalens).

2.D.03 Performance Examples:

- Students will compare the similarities between the workings of a cinema lens and the human eye.
- Students will describe how the curvature of a lens and the placement of a lens affect the directionality of light and the focus of an image.

2.D.04 Explain and demonstrate the use of media formats in photography.

- 2.D.04.01 Differentiate between digital media formats in digital and dark room photography.
- 2.D.04.02 Define raster and resolution as it relates to photography.
- 2.D.04.03 Identify common image sensors found in a digital camera (i.e., Complimentary Metal-Oxide-Semiconductor (CMOS)).
- 2.D.04.04 Identify common photo preparation software tools and describe how photo preparation software affects raw/compressed images.
- 2.D.04.05 Explain and demonstrate how photo editing tools can be used to make common adjustments to an image (i.e., sizing, cropping, hue/saturation, brightness/contrast, dodge/burn).

- 2.D.04.06 Identify advanced concepts relating to image sensors in cameras (i.e., debayering, bayer pattern image, bayer filter mosaic, color filter array).

2.D.04 Performance Examples:

- Students will edit a digital photograph using photo editing software to adjust the size, cropping, hue/saturation, brightness/contrast, and dodge/burn.
- Students will contrast the differences between digital media formats in relation to digital and dark room photography.

2.E Fundamentals of Audio Production

2.E.01 Explain the properties of sound in audio production.

- 2.E.01.01 Identify terms used when describing properties of sound (i.e., frequency, pitch, intensity).
- 2.E.01.02 Identify terms used when measuring sound (i.e., decibels, hertz).
- 2.E.01.03 Explain frequency response.
- 2.E.01.04 Identify characteristics of digital, Amplitude Modulation (AM), Frequency Modulation (FM), and satellite signals.
- 2.E.01.05* Calculate the differences between frequency, pitch, and intensity relating to the human voice.

2.E.01 Performance Examples:

- Students will list and identify terms relating to properties of sound.
- Students will collect frequency data and chart a wave frequency illustration using gathered data.

2.E.02 Explain types of microphones used in audio production.

- 2.E.02.01 Identify types of microphones (i.e., omni-directional, cardioid, super-cardioid, hyper-cardioid, bi-directional, unidirectional).
- 2.E.02.02 Identify common microphone pick-up patterns.
- 2.E.02.03 Differentiate between types of microphones for different situations.
- 2.E.02.04 Explain the differences between balanced and unbalanced cables and signals.
- 2.E.02.05* Differentiate between dynamic and condenser type microphones and identify the pros and cons of each.

2.E.02 Performance Examples:

- Students will diagram pick up patterns for various types of microphones.
- Students will analyze how different types of microphones are best suited for various types of productions.

2.E.03 Explain types of recording devices in audio production.

- 2.E.03.01 Identify various audio devices (recorders, mixers).
- 2.E.03.02 Identify the elements of an audio mixer (i.e., input channels, volume controls, trim, equalizer (EQ) controls, pan pots, volume unit (VU) meters, cue channels, submixes, auxiliary channels, output volume controls).
- 2.E.03.03 Connect an audio mixer to a variety of sources.
- 2.E.03.04 Operate an audio mixer with multiple sources.
- 2.E.03.05 Explain the differences between microphone and line inputs.
- 2.E.03.06 Explain impedance and its connection to microphone sources.
- 2.E.03.07* Identify various digital recording media devices.

2.E.03 Performance Example:

- Students will demonstrate use of an audio mixer to control the high, mid, and low frequencies of a human voice.

2.E.04 Use audio equipment to record sound.

- 2.E.04.01 Differentiate between manual and automatic recording levels.
- 2.E.04.02 Identify various digital audio formats (i.e., mp3, wav, aiff, m4a).
- 2.E.04.03 Explain the importance of using nat sound in a production.
- 2.E.04.04 Identify vocal techniques used for recording audio (i.e., enunciation, pronunciation, inflection, pacing, modulation, dialect).
- 2.E.04.05 Identify terms used when recording audio (narration, voice over (VO), sound on tape (SOT), and voice over sound on tape (VOSOT)).
- 2.E.04.06 Record various types of audio (live, narration, VO, SOT, VOSOT).
- 2.E.04.07 Set recording levels on a variety of recording devices, including multiple sources' VU levels.
- 2.E.04.08 Explain microphone placement in studio and on-location productions.
- 2.E.04.09 Define the 60-cycle hum.
- 2.E.04.10 Describe troubleshooting methods for studio and on-location audio productions.
- 2.E.04.11* Explain the role of a Foley artist and create a Foley audio track for a cinema or video production.
- 2.E.04.12* Explain basic acoustics and the importance of sound control in studio and on-location productions.

2.E.04 Performance Example:

- Students will record audio for a production using a variety of audio recording devices and techniques.

2.E.05* Explain and demonstrate announcing techniques used in audio and video production according to current industry standards.

- 2.E.05.01* Demonstrate microphone placement to eliminate plosive sounds while announcing.
- 2.E.05.02* Describe breathing techniques for effective announcing (i.e., diaphragmatic breathing, relaxation, posture).
- 2.E.05.03* Explain how to prepare copy for vocal delivery (i.e., marking breathing breaks, emphasizing key words, clarify pronunciation, fit copy to time slots).
- 2.E.05.04* Demonstrate appropriate vocal styles used for announcing, news reporting, commercial delivery, disc jockey, and drama/entertainment.

2.E.05 Performance Examples:

- Students will analyze the characteristics of various radio broadcast genres (i.e., announcing, news reporting, commercial delivery, disc jockey, drama/entertainment).
- Students will host a simulated radio broadcast.

2.F Studio and Field Equipment Use

2.F.01 Explain parts of a video camera and video camera accessories.

- 2.F.01.01 Identify and describe basic video camera elements (i.e., lens/optics, liquid crystal display (LCD) screen, eye piece, zoom control, focus control, menu navigation, recording mechanism/media, battery/power adapter, A/V input and output).
- 2.F.01.02 Identify and adjust basic video camera functions (i.e., aperture, shutter speed, ISO, white/black balance, phase, gain, filters)

- 2.F.01.03 Identify various video camera support equipment (i.e., tripod, dolly, pan/tilt head, steadicam, external camera control, matte box).
- 2.F.01.04* Identify advanced video camera accessories (i.e., jib arm, crane, tracking shot, waterproof housing, vehicle mounts, aerial shooting mounts).

2.F.01 Performance Example:

- Students will properly set up and adjust video camera and tripod settings for a production shoot.

2.F.02 Describe and demonstrate the use of parts of a still/DSLR (Digital Single Lens Reflex) camera and DSLR accessories.

- 2.F.02.01 Identify and describe basic DSLR camera elements (i.e., lens/optics, LCD screen, eye piece, zoom control, focus control, menu navigation, recording media, battery/power adapter, universal serial bus (USB) output).
- 2.F.02.02 Identify and adjust basic DSLR camera functions (i.e., aperture, shutter speed, ISO, color balance, gain, filters).
- 2.F.02.03 Identify and use various DSLR camera support equipment (i.e., monopod, tripod, steadicam, matte box).
- 2.F.02.04* Identify various types of lens filters and their purpose and use in controlling the image quality or appearance (i.e., polarizing, neutral-density, infrared, ultraviolet, diffusion, tone control, color conversion/compensation, Didymium, special effect).

2.F.02 Performance Example:

- Students will set up and adjust a DSLR camera for a photography shoot.

2.F.03 Explain and demonstrate the use of the various types of studio and field lighting equipment.

- 2.F.03.01 Identify various studio lighting instruments (i.e., fluorescent, scoop, ellipsoidal, tungsten, hydragyrum medium-arc iodide (HMI), light-emitting diode (LED)) and their application in a studio.
- 2.F.03.02 Identify various field lighting instruments (i.e., soft box, portable light kit).
- 2.F.03.03 Identify and describe lighting instrument accessories (i.e., scrims, barn doors, flags, cookies/gobos, reflector kits, grip kits, gels).
- 2.F.03.04 Explain and demonstrate how to remove and replace lamps.
- 2.E.05.05* Identify and demonstrate the procedures for changing electrical connectors for various lighting cables (i.e., Edison, twist-lock, stage pin).

2.F.03 Performance Example:

- Students will set up lighting equipment for use in both a studio and an on-location production.

2.F.04 Explain and demonstrate the use of various types of studio and control room equipment.

- 2.F.04.01 Identify, describe the function of, and use a production switcher.
- 2.F.04.02 Identify, describe the function of, and use camera control unit (CCU).
- 2.F.04.03 Identify, describe the function of, and use character generator.
- 2.F.04.04 Identify, describe the function of, and use an audio mixer.
- 2.F.04.05 Identify, describe the function of, and use a playback/recording device.
- 2.F.04.06 Identify, describe the function of, and use a waveform monitor and vectorscope.
- 2.F.04.07 Identify and describe the use and application of an intercom system.

2.F.04 Performance Examples:

- Students will set up the control room to prepare for a studio production.
- Students will diagram the signal flow between sources in a studio control room.

2.F.05 Explain types of basic audio/video connectors and their applications.

- 2.F.05.01 Identify basic audio connectors (i.e., mini, quarter inch, XLR, optical, RCA).
- 2.F.05.02 Identify basic video connectors (i.e., Bayonet Neill-Concelman (BNC), F-connector, video graphics array (VGA), digital visual interface (DVI), Radio Corporation of America (RCA), luminance/chrominance (Y/C), high definition multi-media interface (HDMI)).
- 2.F.05.03 Identify basic computer/data connectors (i.e., USB, firewire, eSata, thunderbolt).
- 2.F.05.04 Differentiate between composite, S-Video, component and HD/SDI connectors.
- 2.F.05.05 Roll and store cables.

2.F.05 Performance Example:

- Students will explain the importance of choosing the appropriate cable for a variety of given applications.

2.G Aspects of Pre-Production

2.G.01 Demonstrate appropriate methods for developing an idea or concept for a cinema or video production.

- 2.G.01.01 Write a treatment/synopsis for a cinema or video.
- 2.G.01.02 Research a show topic.
- 2.G.01.03 Identify target audiences and objectives for a production.
- 2.G.01.04 Write a production script/screenplay for a variety of productions (i.e., news broadcast, narrative cinema/video, documentary).
- 2.G.01.05 Create a storyboard from a script/screenplay.
- 2.G.01.06 Pitch a cinema or video idea to a prospective client or producer.
- 2.G.01.07* Write a production script/screenplay and refine/edit the text with the purpose of enhancing the story (i.e., message, symbolism, character development, story development).

2.G.01 Performance Examples:

- Students will write a script/screenplay for a news broadcast, narrative cinema/video, or documentary.
- Students will pitch a cinema/video idea to a prospective client or producer.
- Students will draw a storyboard from a script/screenplay depicting specific cinema/video camera shots.

2.G.02 Demonstrate appropriate methods for planning a cinema or video production.

- 2.G.02.01 Describe and perform duties of pre-production personnel.
- 2.G.02.02 Assign roles for a production.
- 2.G.02.03 Develop a shooting schedule, emphasizing time management for each production aspect, based on a script/screenplay.
- 2.G.02.04 Create call sheets appropriate to shoot schedule and production personnel.
- 2.G.02.05 List practices used to schedule project workflow.
- 2.G.02.06 Scout locations for productions.
- 2.G.02.07 State the importance of obtaining approval and sign-off.
- 2.G.02.08 Identify procedures for obtaining licenses and permits.
- 2.G.02.09 Design and execute sets/props for a production.
- 2.G.02.10 Audition and cast a production based on a script/screenplay.

- 2.G.02.11* Research and develop a budget for a proposed cinema or video production including cost of equipment and personnel.
- 2.G.02.12* Interview and hire crew personnel for a proposed cinema or video production.

2.G.02 Performance Examples:

- Students will develop a shooting schedule, call sheet, and rehearsal schedule for various production personnel.
- Students will describe the procedures for procuring a location for a cinema/video shoot.

2.G.03 Demonstrate appropriate methods for setting up a studio or remote production.

- 2.G.03.01 Plan a studio or remote set-up.
- 2.G.03.02 Block/rehearse a scene based on a script/screenplay (i.e., working with actors, cameras, lights, grips).
- 2.G.03.03 Set up audio for a studio or remote production.
- 2.G.03.04 Position lights for a studio or remote production.
- 2.G.03.05 Position sets/props for a studio or remote production.
- 2.G.03.06 Position cameras for a studio or remote production.
- 2.G.03.07* Identify and apply advanced cinematography techniques to compensate for changing conditions when shooting on-location (i.e., available light, weather, scenery, natural elements).

2.G.03 Performance Examples:

- Students will arrange a studio or remote production cinema/video shoot with correct positioning of audio, lights, sets/props, and cameras.
- Students will rehearse a scripted cinema/video scene with cast and crew.

2.H Aspects of Production

2.H.01 Demonstrate operation of a video camera during a studio or remote production.

- 2.H.01.01 Demonstrate movements of a video camera.
- 2.H.01.02 Compose shots following basic composition guidelines.
- 2.H.01.03 Follow a moving subject while keeping the subject properly framed.
- 2.H.01.04 Move the camera using a tripod, dolly, and pan-tilt head.
- 2.H.01.05* Operate the camera using a steadicam, jib or crane.
- 2.E.05.06* Compose shots following advanced composition guidelines.
- 2.E.05.07* Perform complex camera movements and shots (i.e., truck and zoom, rack-focus, pull-focus, interior to exterior, exterior to interior).
- 2.E.05.08* Explain the characteristics and purpose of varying frame rates when shooting a cinema or video production (i.e., time-lapse, slow motion, speed ramping, time-slice/bullet time).

2.H.01 Performance Example:

- Students will operate a video camera during a studio or remote production employing various camera techniques.

2.H.02 Demonstrate operation of audio equipment during a studio or remote production.

- 2.H.02.01 Record audio using audio devices, including recorders and mixers.
- 2.H.02.02 Set up audio for a studio or remote production, including setting levels.
- 2.H.02.03 Record audio to account for timecode/sync.

2.H.02 Performance Example:

- Students will operate audio equipment during a studio or remote production employing various recording techniques.

- 2.H.03 Demonstrate operation of a production switcher during a live production.
- 2.H.03.01 Describe chroma key and its uses in live and post production.
 - 2.H.03.02 Set up chroma key for use in a live production.
 - 2.H.03.03 Select between different inputs on a switcher.
 - 2.H.03.04 Use a variety of switcher transitions (i.e., wipe, dissolve).

2.H.03 Performance Examples:

- Students will operate a production switcher during a live production employing various transitions.
- Students will determine the appropriate settings for chroma key using a production switcher and various background color choices.

- 2.H.04 Demonstrate operation of a character generator during a studio or remote production.
- 2.H.04.01 Key text over a piece of live video using a character generator.
 - 2.H.04.02 Create a lower-third graphic for use in a production.
 - 2.H.04.03 Create a title graphic for use in a production.
 - 2.H.04.04 Create a digital on-screen graphic (bug graphic) for use in a production.

2.H.04 Performance Examples:

- Students will operate a character generator during a live production.
- Students will create various types of graphics for use in a production.

- 2.H.05 Demonstrate techniques appropriate to on-screen talent in a production.
- 2.H.05.01 Perform in front of a camera with a microphone.
 - 2.H.05.02 Read off of a teleprompter.
 - 2.H.05.03 Rehearse and perform a scene from a script/screenplay.
 - 2.H.05.04 Interview a subject both on camera and off camera to acquire information about a chosen subject.

2.H.05 Performance Examples:

- Students will perform on-camera in various cinema/video scenarios.
- Students will plan and conduct an interview based on gathered data in a relevant researched subject matter.

- 2.H.06 Demonstrate techniques appropriate to the role of a producer and director in a production.
- 2.H.06.01 Manage cast and crew required for a production.
 - 2.H.06.02 Use checklists to ensure proper execution of a production plan.
 - 2.H.06.03 Describe and perform duties of production personnel.
 - 2.H.06.04 Shoot/record a studio production script/screenplay.
 - 2.H.06.05 Shoot/record a field production script/screenplay.

2.H.06 Performance Examples:

- Students will produce and direct a studio or field production script/screenplay.
- Students will contrast the roles and responsibilities of a producer and a director.

2.I Aspects of Post-Production

- 2.I.01 Demonstrate appropriate methods for planning the post-production stage of a project.
- 2.I.01.01 Describe and perform duties of post-production personnel.
 - 2.I.01.02 Work with a producer/director to establish objectives for editing a project.
 - 2.I.01.03 Identify resources for editing audio and video.
 - 2.I.01.04 Prepare an edit log or outline for editing.

- 2.I.01.05 Define metadata and explain how media should be labeled in order to store and access within a database.
- 2.I.01.06 Explain the importance of back-up, recovery, and media redundancy.

2.I.01 Performance Example:

- Students will work with a producer/director to create objectives and prepare an outline for editing.

- 2.I.02 Demonstrate appropriate methods of setting and adjusting user preferences within a non-linear editing software program.
 - 2.I.02.01 Choose appropriate compression and frame rates for digital video.
 - 2.I.02.02 Define drop frame and non-drop frame time code.
 - 2.I.02.03 Establish general preferences and settings for a project.
 - 2.I.02.04 Establish appropriate device control preferences.
 - 2.I.02.05 Establish appropriate capture/import/ingest preferences.
 - 2.I.02.06 Establish appropriate scratch disk preferences.

2.I.02 Performance Example:

- Students will choose and adjust settings and user preferences for a non-linear editing software program.

- 2.I.03 Demonstrate appropriate methods of creating a project and organizing media within that project.
 - 2.I.03.01 Create a new project or open an existing project.
 - 2.I.03.02 Create a proxy/off-line edit workflow for a project.
 - 2.I.03.03 Identify components of a workspace within non-linear editing software.
 - 2.I.03.04 Demonstrate best practices used to label and log media.
 - 2.I.03.05 Create and use bins to organize media.
 - 2.I.03.06 Prepare images digitally for inclusion in a program.
 - 2.I.03.07 Capture audio/video from a tape.
 - 2.I.03.08 Import or ingest audio/video/media from a file or drive based device.
 - 2.I.03.09 Demonstrate use of computer-based audio/recording software.

2.I.03 Performance Example:

- Students will create a project and organize media within that project.

- 2.I.04 Demonstrate appropriate methods of creating a rough cut.
 - 2.I.04.01 Identify the tracks of a sequence/timeline (i.e., video, audio, timecode).
 - 2.I.04.02 Create a new sequence/timeline.
 - 2.I.04.03 Differentiate between insert/splice and assemble/overwrite edit.
 - 2.I.04.04 Use a variety of basic editing tools (i.e., splice/overwrite, mark in/out, extract/lift).
 - 2.I.04.05 Use b-roll/cutaway footage to enhance a project.
 - 2.I.04.06 Edit a project for specific objectives (i.e., match-on-action, 180° Rule line, continuity, mood, pacing for speech, music).
 - 2.I.04.07 Explain why jump-cuts detract from a finished video.

2.I.04 Performance Examples:

- Students will create a sequence/timeline and assemble media within that sequence/timeline.
- Students will evaluate the importance of continuity while editing.

- 2.I.05 Demonstrate various methods of refining an edited sequence/timeline.
- 2.I.05.01 Move audio/video clips within a sequence/timeline.
 - 2.I.05.02 Trim audio/video clips within a sequence/timeline.
 - 2.I.05.03 Use L-cut edits to enhance a video.
 - 2.I.05.04 Alternate between camera shots within a sequence/timeline manually or by using a multi-cam tool.
 - 2.I.05.05 Use various transitions to enhance a video (i.e., dissolve, fade, wipe).
 - 2.I.05.06 Make appropriate adjustments to audio levels within a sequence/timeline.
 - 2.E.05.07* Apply advanced editing techniques to enhance the continuity, flow and timing of a narrative story (i.e., slip edit, slide edit, replace edit, fit-to-fill).
 - 2.E.05.08* Apply basic audio filtering techniques (i.e., banpass/reject, noise-reduction, reverb, digital delay, compressors, expanders) to live and prerecorded audio signals.

2.I.05 Performance Examples:

- Students will edit audio/video within a sequence/timeline.
- Students will use audio/video transitions and apply editing techniques to a sequence/timeline.

- 2.I.06 Demonstrate various methods of enhancing and finishing an edited sequence/timeline.
- 2.I.06.01 Add text to a project within a sequence/timeline (i.e., lower third, title graphic, on-screen graphic/bug).
 - 2.I.06.02 Composite video over video within a sequence/timeline (i.e., picture-in-picture, split screen, alpha channel).
 - 2.I.06.03 Apply filters and effects to audio/video within a sequence/timeline.
 - 2.I.06.04 Make appropriate adjustments to the color, gamma, and levels of video in a sequence/timeline (i.e., balance/correct for color, enhance the mood, create a desired effect).
 - 2.I.06.05 Render portions of a sequence/timeline for the purpose of viewing an applied effect, graphic, or composite.
 - 2.I.06.06* Demonstrate techniques of key-frame editing to adjust the parameters and properties of video, filters or effects over time.
 - 2.E.05.07* Create and apply advanced enhancements to video on a sequence/timeline (i.e., animated graphics, 3D compositing, special effects).

2.I.06 Performance Examples:

- Students will demonstrate the use of video compositing and special effects for editing.
- Students will employ the use of a color correcting tool to alter colors for a variety of specifications.

- 2.I.07 Demonstrate appropriate methods of exporting media from a sequence/timeline for distribution.
- 2.I.07.01 Describe procedures that prepare products for mastering, publishing, and distribution.
 - 2.I.07.02 Define codec, identify various media formats (i.e., mp4, H.264), and give common uses for each.
 - 2.I.07.03 Dub a program to DVD.
 - 2.I.07.04 Compare and contrast streamed and downloaded video.
 - 2.I.07.05 Explain considerations specific to creating audio/video for the internet.
 - 2.I.07.06 Export audio/video for use on portable devices.
 - 2.I.07.07* Export video for additional editing and refining within outside software applications (i.e., visual effects generation, graphics animation, sound editing and enhancement).

2.1.07 Performance Example:

- Students will export a sequence/timeline for various distribution methods.

Strand 3: Embedded Academics

Strand 3: Embedded Academics, a critical piece of a Vocational Technical Education Framework, are presented as Crosswalks between the Massachusetts Vocational Technical Education Frameworks and the Massachusetts Curriculum Frameworks. These Crosswalks are located in the Appendix of this Framework.

Academic Crosswalks

[Appendix A:](#) [English Language Arts](#)

[Appendix B:](#) [Mathematics](#)

[Appendix C:](#) [Science and Technology/Engineering](#)

Earth and Space Science

Life Science (Biology)

Physical Science (Chemistry and Physics)

Technology/Engineering

Strand 4: Employability and Career Readiness

4.A Career Exploration and Navigation

- 4.A.01 Develop a career plan and portfolio.
 - 4.A.01.01 Develop and revise career plan annually based on workplace awareness and skill attainment.
 - 4.A.01.02 Assess personal strengths and interest areas to determine potential careers, career pathways and career ladders.
 - 4.A.01.03 Examine potential career field(s)/discipline(s) and identify criteria to select, secure and keep employment in chosen field(s).
 - 4.A.01.04 Research and evaluate a variety of careers utilizing multiple sources of information and resources to determine potential career(s) and alternatives.
 - 4.A.01.05 Identify training and education requirements that lead to employment in chosen field(s) and demonstrate skills related to evaluating employment opportunities.
 - 4.A.01.06 Explore and evaluate postsecondary educational opportunities including degrees and certifications available, traditional and nontraditional postsecondary pathways, technical school and apprenticeships, cost of education, financing methods including scholarships and loans and the cost of loan repayment.
 - 4.A.01.07 Create a portfolio showcasing academic and career growth including a career plan, safety credential, resume and a competency profile demonstrating the acquisition of the knowledge and skills associated with at least two years of full-time study in the Chapter 74 program.

- 4.A.02 Demonstrate job search skills.
 - 4.A.02.01 Conduct a job search and complete written and electronic job applications, resumes, cover letters and related correspondence for a chosen career path.
 - 4.A.02.02 Explore and evaluate postsecondary job opportunities and career pathways specific to career technical areas.
 - 4.A.02.03 Identify role and use of social media and networking for staying current with career and employment trends as well as networking, job seeking and career development opportunities.
 - 4.A.02.04 Demonstrate ability to use social media and networking to develop useful occupational contacts, job seeking and career development opportunities.

- 4.A.03 Demonstrate all phases of the job interview process.
 - 4.A.03.01 Gather relevant information about potential employer(s) from multiple print and digital sources, assessing the credibility and accuracy of each source.
 - 4.A.03.02 Identify employment eligibility criteria, such as drug/alcohol free status, clean driving record, etc.

- 4.A.03.03 Practice effective interviewing skills: appearance, inquiry and dialogue with interviewer, positive attitude and evidence of work ethic and skills.
- 4.A.03.04 Explore and evaluate employment benefit packages including wages, vacation, health care, union dues, cafeteria plans, tuition reimbursement, retirement and 401K.

4. A Performance Examples:
- Conduct research to analyze and present on specific careers within a cluster.
 - Conduct web-based job search using sites such as Monster.com, CareerBuilder.com, Indeed.com, Snagajob.com, Simplyhired.com and others.
 - Create profile on social media/networking site such as LinkedIn and/or LinkedIn University for postsecondary research and employment opportunities.
 - Complete online job application.
 - Conduct and videotape practice interviews for instructor and student analysis.
 - Provide students with sample employment and benefit packages for evaluation.

4.B Communication in the Workplace

- 4.B.01 Demonstrate appropriate oral and written communication skills in the workplace.
 - 4.B.01.01 Communicate effectively using the language and vocabulary appropriate to a variety of audiences within the workplace including coworkers, supervisors and customers.
 - 4.B.01.02 Read technical and work-related documents and demonstrate understanding in oral discussion and written exercise.
 - 4.B.01.03 Demonstrate professional writing skills in work-related materials and communications (e.g., letters, memoranda, instructions and directions, reports, summaries, notes and/or outlines).
 - 4.B.01.04 Use a variety of writing/publishing/presentation applications to create and present information in the workplace.
 - 4.B.01.05 Identify, locate, evaluate and use print and electronic resources to resolve issues or problems in the workplace.
 - 4.B.01.06 Use a variety of financial and data analysis tools to analyze and interpret information in the workplace.
 - 4.B.01.07 Orally present technical and work-related information to a variety of audiences.
 - 4.B.01.08 Identify and demonstrate professional non-verbal communication.
- 4.B.02 Demonstrate active listening skills.
 - 4.B.02.01 Listen attentively and respectfully to others.
 - 4.B.02.02 Focus attentively, make eye contact or other affirming gestures, confirm understanding and follow directions.
 - 4.B.02.03 Show initiative in improving communication skills by asking follow-up questions of speaker in order to confirm understanding.

4. B Performance Examples:
- Read and analyze technical instructions to learn what makes them effective.
 - Read and analyze technical instructions to follow directions and/or solve a problem.
 - Examine a technical document and use it to write a set of instructions for another student to follow and evaluate.
 - Analyze websites for effective technical writing and design.
 - Create brochures and presentations using software and/or Web 2.0 tools to convey technical information.
 - Conduct research using the Internet, print documents, observations and interviews to create a technical guide.

4.C Work Ethic and Professionalism

- 4.C.01 Demonstrate attendance and punctuality.
- 4.C.01.01 Identify and practice professional time-management and attendance behaviors including punctuality, reliability, planning and flexibility.
- 4.C.02 Demonstrate proper workplace appearance.
- 4.C.02.01 Identify and practice professional appearance specific to the workplace.
- 4.C.02.02 Identify and practice personal hygiene appropriate for duties specific to the workplace.
- 4.C.02.03 Identify and wear required safety gear specific to the workplace.
- 4.C.03 Accepts direction and constructive criticism.
- 4.C.03.01 Demonstrate ability (both verbally and non-verbally) to accept direction and constructive criticism and to implement solutions to change behaviors.
- 4.C.03.02 Ask appropriate questions to clarify understanding of feedback.
- 4.C.03.03 Analyze own learning style and seek instructions in a preferred format that works best for their understanding (such as oral, written or visual instruction).
- 4.C.04 Demonstrate motivation and initiative.
- 4.C.04.01 Evaluate assigned tasks for time to completion and prioritization.
- 4.C.04.02 Demonstrate motivation through enthusiasm, engagement, accurate completion of tasks and activities.
- 4.C.04.03 Demonstrate initiative by requesting new assignments and challenges.
- 4.C.04.04 Explain proposed solutions to challenges observed in the workplace.
- 4.C.04.05 Demonstrate the ability to evaluate multiple solutions to problems and challenges using critical reasoning and workplace/industry knowledge and select the best solution to the problem.
- 4.C.04.06 Implement solution(s) to challenges and/or problem(s) observed in the workplace.
- 4.C.04.07 See projects through completion and check work for quality and accuracy.
- 4.C.05 Demonstrate awareness of workplace culture and policy.

- 4.C.05.01 Display ethical behavior in use of time, resources, computers and information.
- 4.C.05.02 Identify the mission of the organization and/or department.
- 4.C.05.03 Explain the benefits of a diverse workplace.
- 4.C.05.04 Demonstrate a respect for diversity and its benefit to the workplace.

- 4.C.06 Interact appropriately with coworkers.
 - 4.C.06.01 Work productively with individuals and in teams.
 - 4.C.06.02 Develop positive mentoring and collaborative relationships within work environment.
 - 4.C.06.03 Show respect and collegiality, both formally and informally.
 - 4.C.06.04 Explain and follow workplace policy on the use of cell phones and other forms of social media.
 - 4.C.06.05 Maintain focus on tasks and avoid negative topics or excessive personal conversations in the workplace.
 - 4.C.06.06 Negotiate solutions to interpersonal and workplace conflicts.

4. C Performance Examples:

- Complete a learning style analysis tool.
- Develop a rubric to assess work ethic and professionalism as detailed in the standards above.

Student Organizations

Business Professionals of America

www.bpa.org

Selected Websites

- 5 Ways to Ace a Job Interview: http://kidshealth.org/teen/school_jobs/jobs/tips_interview.html
- America’s Career Resource Network: <http://acrn.ovae.org/teachers/careerexpclassrm.htm>
- Career Cruiser – Florida Department of Education: <http://www.fldoe.org/workforce/pdf/cruiser.pdf>
- Career Development Guide and Glossary: <http://www.doe.mass.edu/connect/cde.html>
- Career One Stop: <http://www.careeronestop.org/>
- Career Plan: <http://www.doe.mass.edu/cd/plan/intro.html>
- Career Plan Model: http://www.doe.mass.edu/ccr/epp/samples/cpmodel_11x17.pdf
- Checklist: <http://www.doe.mass.edu/cd/plan/checklist.pdf>
- Career Tech: http://www.okcareertech.org/cac/Pages/resources_products/ethics_web_sites.htm
- Ethics Resource Center: <http://www.ethics.org/>
- Interaction in the Workplace: <http://hrweb.berkeley.edu/guides/managing-hr/interaction/communication>

- Individual Learning Plans: How-to Guide: “Promoting Quality Individualized Learning Plans: A How to Guide on the High School Years” <http://www.ncwd-youth.info/ilp/how-to-guide>
- ILP Fact Sheet: <http://www.ncwd-youth.info/fact-sheet/individualized-learning-plan>
- ILP Policy Brief: <http://www.ncwd-youth.info/ilp/produce-college-and-career-ready-high-school-graduates>
- ILP Resources Home Page: <http://www.ncwd-youth.info/ilp>
- Interview Skills Lesson Plans:
<http://www.amphi.com/media/1220281/interview%20skills%20lesson%20plan.doc>
- Labor and Workforce Development: <http://www.mass.gov/lwd/employment-services/preparing-for-your-job-search/>
- Maine Community College System – Center for Career Development:
http://www.ccd.me.edu/careerprep/CareerPrepCurriculum_LP-6.pdf
- Massachusetts Work-Based Learning: <http://skillspages.com/masswbl>
- North Dakota Association of Agriculture Educators:
http://www.ndaae.org/attachments/File/Preparing_students_for_a_Job_Interview.pptx
- NY CTE Learning Standards—Career Development and Occupational Studies (CDOS) Resource Guide with Core Curriculum : <http://www.p12.nysed.gov/cte/cdlearn/cdosresourceguide.html>
- Occupational Outlook Handbook: <http://www.bls.gov/ooh/>
- Purdue OWL Job Search Resources (for writing resumes, applications, and letters):
<https://owl.english.purdue.edu/engagement/34/>
- Soft Skills to Pay the Bills — Mastering Soft Skills for Workplace Success:
<http://www.dol.gov/odep/topics/youth/softskills/>
- US Department of Labor: <http://www.dol.gov/dol/audience/aud-unemployed.htm>
- Workplace Communication:
<http://www.regionalskillstraining.com/sites/default/files/content/WC%20Book%201.pdf>
- Your Plan For the Future: <http://www.yourplanforthefuture.org>

Strand 5: Management and Entrepreneurship Knowledge and Skills

5.A Starting a Business

- 5.A.01 Demonstrate an understanding of the practices required to start a business.
 - 5.A.01.01 Define entrepreneurship and be able to recognize and describe the characteristics of an entrepreneur.
 - 5.A.01.02 Compare and contrast types of business ownership (i.e., sole proprietorships, franchises, partnerships, corporations).
 - 5.A.01.03 Identify and explain the purpose and contents of a business plan.
 - 5.A.01.04 Demonstrate an understanding of the principles and concepts of a business's supply chain (i.e., suppliers, producers and consumers).

5. A Performance Examples:

- Develop a presentation pertaining to an entrepreneur and their business.
- Communicate with a business owner and discuss the pros and cons of starting and owning a business. Summarize the main points of the discussion.
- Choose a product or service and describe the process leading to distribution.
- Write a business plan for a business in your community.

5.B Managing a Business

- 5.B.01 Demonstrate an understanding of managing a business.
 - 5.B.01.01 Formulate short- and long-term business goals.
 - 5.B.01.02 Demonstrate effective verbal, written and visual communication skills.
 - 5.B.01.03 Utilize a decision-making process to make effective business decisions.
 - 5.B.01.04 Identify a business's chain of command and define its organizational structure.
 - 5.B.01.05 Identify and apply effective customer service skills and practices.
 - 5.B.01.06 Identify, interpret and develop written operating procedures and policies.
 - 5.B.01.07 Track inventory, productivity and labor cost.
 - 5.B.01.08 Demonstrate business meeting skills.
 - 5.B.01.09 Identify professional organizations and explore their benefits.

5. B Performance Examples:

- Working as a team, role-play situations that an entrepreneur might face in dealing with customers or employees.
- Contact a relevant professional organization and request information about its benefits, membership requirements and costs.
- Plan and conduct a business meeting.
- Identify companies that are known for customer service and list the practices that help differentiate themselves from all others in their industry.

5.C Marketing a Business

- 5.C.01 Demonstrate an understanding of marketing and promoting a business.
 - 5.C.01.01 Explain the role of business in the economy.
 - 5.C.01.02 Describe the relationship between business and community.
 - 5.C.01.03 Describe methods of market research and identifying target markets.

- 5.C.01.04 Describe and apply the concepts of a marketing mix (the 4Ps of marketing: product, price, place and promotion).
- 5.C.01.05 Compare and contrast the promotional tools and techniques used to sell products, services, images and ideas.
- 5.C.01.06 Describe the impact of supply and demand on a product or business.
- 5.C.01.07 Identify direct and indirect competition on a business.
- 5.C.01.08 Identify and use sales techniques to meet client needs and wants.
- 5.C.01.09 Discuss strategies to acquire and retain a customer base.

5. C Performance Examples:
- Research reliable sources to identify marketing and industry data related to a business.
 - Conduct market research by developing a survey and presenting the results.
 - Create a promotional campaign using a variety of media.
 - Write a marketing plan for a product.

5.D Financial Concepts and Applications in Business

- 5.D.01 Demonstrate an understanding of financial concepts and applications.
 - 5.D.01.01 Identify essential financial reports and understand their purpose (i.e., budget, balance sheet and income statement).
 - 5.D.01.02 Describe payroll practices (i.e., deductions – federal, FICA and state taxes and insurances).
 - 5.D.01.03 Identify the importance of maintaining accurate records.
 - 5.D.01.04 Apply practices related to pricing, purchasing and billing.
 - 5.D.01.05 Maintain and reconcile a checking account.
 - 5.D.01.06 Identify the options for funding a business.

5. D Performance Examples:
- Given an employee time card and rate of pay, calculate gross pay, taxes, deductions and net pay.
 - Develop a budget for a simulated business or project.
 - Analyze and discuss financial documents from a company.
 - Research various methods of funding a business.

5.E Legal/Ethical/Social Responsibilities

- 5.E.01 Demonstrate an understanding of legal, ethical and social responsibility for businesses.
 - 5.E.01.01 Identify state and federal laws and regulations related to managing a business.
 - 5.E.01.02 Describe and identify ethical business practices.
 - 5.E.01.03 Demonstrate an understanding of business contracts.
 - 5.E.01.04 Explain the role of diversity in the workplace.
 - 5.E.01.05 Explain the role of labor organizations.
 - 5.E.01.06 Identify practices that support clean energy technologies and encourage environmental sustainability.
 - 5.E.01.07 Demonstrate an understanding of how technology advancements impact business practices.

5.E Performance Example:

- Read and interpret a contract.
- Complete an application for a license, permit or certificate.
- Research federal, state and local regulations and laws required for a business.
- Participate in and summarize a discussion with a member of a labor or civil rights organization.

Selected Websites

- CVTE Strand 1, 4, and 5 Resources: <https://sites.google.com/a/mccanntech.org/cvte-strands-1-4-and-5-resources/>
- Entrepreneur: <http://www.entrepreneur.com>
- Inc. Magazine: <http://www.inc.com/>
- Junior Achievement “Be Entrepreneurial Program”: <https://www.juniorachievement.org/web/ja-usa/home>
- Kahn Academy Interviews with Entrepreneurs: <https://www.khanacademy.org/economics-finance-domain/entrepreneurship2/interviews-entrepreneurs>
- Kauffman Founders School: <http://www.entrepreneurship.org/en/founders-school.aspx>
- National Federation of Independent Business: www.nfib.com
- National Foundation for Teaching Entrepreneurship (NFTE): www.nfte.com
- SBA Loans: <http://www.sba.gov>
- SkillsUSA Professional Development Program Competency List: <http://www.skillsusa.org/downloads/PDF/lessons/professional/PDPPreview.pdf>
- Small Business Administration: www.sba.gov

Glossary

Term	Definition
Balance sheet	A statement of the assets, liabilities and capital of a business at a particular point in time.
Budget	An estimate of income and expenditure for a set period of time.
Business Ownership	Types of business ownership refer to the legal structure of an organization. Legal structures include: Sole Proprietorship, Partnerships, Corporations and Limited Liability Companies.
Business Plan	A written document that describes in detail your business goals and how you are going to achieve them from a marketing, operational and financial point of view.

Term

Chain of Command and Organizational Structure

**Definition**

Refers to the management structure of an organization. It identifies lines of authority, lines of communication, and reporting relationships. Organizational structure determines how the roles, power and responsibilities are assigned and coordinated and how information flows between the different levels of management. (A visual representation of this structure is called an org chart).

FICA

Federal Insurance Contributions Act requires taxes deducted from pay for supporting Social Security.

Income Statement

A financial statement providing operating results for a specific time period showing a business's revenues, expenses and profit or loss.

Market Research

- Primary: Surveys, Focus Groups, Observation
- Secondary: Websites, Internet

Marketing Mix

A set of controlled variables that formulate the strategic position of a product or service in the marketplace. These variables are known as the 4 P's of marketing and include product, place, price and promotion.

Methods to Track Inventory, Productivity and Labor Cost

Refers to the processes a business uses to account for: 1) the inflows and outflows of inventory and materials related to inventory; 2) the efficiency of operations and 3) the cost of labor including salary and benefits.

Promotional Tools and Techniques

The six elements of a promotional mix are: advertising, visual merchandising, public relations, publicity, personal selling and sales promotion.

Supply Chain

The supply chain, or channel of distribution, describes how the product is handled and/or distributed from suppliers with materials, to the manufacturer, wholesaler or retailer and finally to the consumer.

Target Market

Those who are most likely to buy your product or service.

Strand 6: Technology Literacy Knowledge and Skills

6.A Technology Literacy Knowledge and Skills (Grades 9 through 12)

- 6.A.01 Demonstrate proficiency in the use of computers and applications, as well as an understanding of the concepts underlying hardware, software, and connectivity.
 - 6.A.01.01 Use online help and other support to learn about features of hardware and software, as well as to assess and resolve problems.
 - 6.A.01.02 Install and uninstall software; compress and expand files (if the district allows it).
 - 6.A.01.03 Explain effective backup and recovery strategies.
 - 6.A.01.04 Apply advanced formatting and page layout features when appropriate (e.g., columns, templates, and styles) to improve the appearance of documents and materials.
 - 6.A.01.05 Use editing features appropriately (e.g., track changes, insert comments).
 - 6.A.01.06 Identify the use of word processing and desktop publishing skills in various careers.
 - 6.A.01.07 Identify the use of database skills in various careers.
 - 6.A.01.08 Define and use functions of a spreadsheet application (e.g., sort, filter, find).
 - 6.A.01.09 Explain how various formatting options are used to convey information in charts or graphs.
 - 6.A.01.10 Identify the use of spreadsheet skills in various careers.
 - 6.A.01.11 Use search engines and online directories.
 - 6.A.01.12 Explain the differences among various search engines and how they rank results.
 - 6.A.01.13 Explain and demonstrate effective search strategies for locating and retrieving electronic information (e.g., using syntax and Boolean logic operators).
 - 6.A.01.14 Describe good practices for password protection and authentication.
- 6.A.02 Demonstrate the responsible use of technology and an understanding of ethics and safety issues in using electronic media at home, in school, and in society.
 - 6.A.02.01 Demonstrate compliance with the school's Acceptable Use Policy.
 - 6.A.02.02 Explain issues related to the responsible use of technology (e.g., privacy, security).
 - 6.A.02.03 Explain laws restricting the use of copyrighted materials.
 - 6.A.02.04 Identify examples of plagiarism, and discuss the possible consequences of plagiarizing the work of others.
- 6.A.03 Design and implement a personal learning plan that includes the use of technology to support lifelong learning goals.
 - 6.A.03.01 Evaluate the authenticity, accuracy, appropriateness, and bias of electronic resources, including Web sites.
 - 6.A.03.02 Analyze the values and points of view that are presented in media messages.
 - 6.A.03.03 Describe devices, applications, and operating system features that offer accessibility for people with disabilities.

- 6.A.03.04 Evaluate school and work environments in terms of ergonomic practices.
- 6.A.03.05 Describe and use safe and appropriate practices when participating in online communities (e.g., discussion groups, blogs, social networking sites).
- 6.A.03.06 Explain and use practices to protect one's personal safety online (e.g., not sharing personal information with strangers, being alert for online predators, reporting suspicious activities).
- 6.A.03.07 Explain ways individuals can protect their technology systems and information from unethical users.
- 6.A.04 Demonstrate the ability to use technology for research, critical thinking, problem solving, decision making, communication, collaboration, creativity, and innovation.
 - 6.A.04.01 Devise and demonstrate strategies for efficiently collecting and organizing information from electronic sources.
 - 6.A.04.02 Compare, evaluate, and select appropriate electronic resources to locate specific information.
 - 6.A.04.03 Select the most appropriate search engines and directories for specific research tasks.
 - 6.A.04.04 Use a variety of media to present information for specific purposes (e.g., reports, research papers, presentations, newsletters, Web sites, podcasts, blogs), citing sources.
 - 6.A.04.05 Demonstrate how the use of various techniques and effects (e.g., editing, music, color, rhetorical devices) can be used to convey meaning in media.
 - 6.A.04.06 Use online communication tools to collaborate with peers, community members, and field experts as appropriate (e.g., bulletin boards, discussion forums, listservs, Web conferencing).
 - 6.A.04.07 Plan and implement a collaborative project with students in other classrooms and schools using telecommunications tools (e.g., e-mail, discussion forums, groupware, interactive Web sites, video conferencing).

Appendices

The framework teams created an “Appendix” listing potential industry recognized credentials attainable by secondary students; lists of professional, student, and relevant government organizations; and useful resources and websites. **** It is important to note that although most Framework Teams provided information for the “Appendix”, not all teams did. Therefore, sub-headings within the “Appendix” without information have been deleted.***

Disclaimer: Reference in the Appendices Section to any specific commercial products, processes, or services, or the use of any trade, firm or corporation name is for the information and convenience of the public, and does not constitute endorsement or recommendation by the Massachusetts Department of Elementary and Secondary Education.

Embedded Academic Crosswalks

Embedded English Language Arts and Literacy

CVTE Learning Standard Number	Strand Coding Designation Grades ELAs Learning Standard Number	Text of English Language Arts Learning Standard
2.A-2.I	WHST 9-12 #2 a-b	<p>Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.</p> <p>a. Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p>b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience’s knowledge of the topic.</p>
<p>Performance Example:</p> <ul style="list-style-type: none"> Students introduce and organize communication ideas in writing, including lists, identifications, comparisons, and discussions. Students develop their ideas in writing focusing on specific audiences. 		
2.A-2.D	WHST 9-12 #2 c-e	<p>Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among ideas and concepts.</p> <p>d. Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</p> <p>e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p>
<p>Performance Example:</p> <ul style="list-style-type: none"> Students expand their writing to include cinema/video specific terminology in a formal writing tone. 		
2.A.03, 2.B.01, 2.C.01, 2.C.03, 2.D.01, 2.E.02, 2.G.01, 2.G.02, 2.G.03, 2.H.05	Speaking 9-10 #3, 4, 6	<p>3. Evaluate a speaker’s point of view, reasoning, and use of evidence and rhetoric, identifying any fallacious reasoning or exaggerated or distorted evidence.</p> <p>4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task</p> <p>6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.</p>
<p>Performance Example:</p> <ul style="list-style-type: none"> Students present information or explain demonstration of cinema/video skills based on findings. 		
2.B.01, 2.C.01, 2.C.03, 2.D.01, 2.E.02	Writing 9-12 #1 a-e	<p>Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.</p> <p>a. Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences claim(s), counterclaims, reasons, and evidence.</p> <p>b. Develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience’s</p>

		<p>knowledge level, concerns, values, and possible biases.</p> <p>c. Use words, phrases, and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.</p> <p>d. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.</p> <p>e. Provide a concluding statement or section that follows from and supports the argument presented.</p>
<p>Performance Example:</p> <ul style="list-style-type: none"> Students analyze communications media, critique multiple arguments, and present their findings in well-organized, objective writing. 		
2.B. 02,2.B.03	RHIST 9-12 #4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-12 texts and topics.
<p>Performance Example:</p> <p>Students draft light plots and ground plans for studio or remote productions.</p>		
2.G.01	Writing 9-12 #3 a-e, RL 9-12 #5	<p>3. Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.</p> <p>a. Engage and orient the reader by setting out a problem, situation, or observation, establishing one or multiple point(s) of view, and introducing a narrator and/or characters; create a smooth progression of experiences or events.</p> <p>b. Use narrative techniques, such as dialogue, pacing, description, reflection, and multiple plot lines, to develop experiences, events, and/or characters.</p> <p>c. Use a variety of techniques to sequence events so that they build on one another to create a coherent whole.</p> <p>d. Use precise words and phrases, telling details, and sensory language to convey a vivid picture of the experiences, events, setting, and/or characters.</p> <p>e. Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.</p> <p>Analyze how an author’s choices concerning how to structure specific parts of a text (e.g., the choice of where to begin or end a story, the choice to provide a comedic or tragic resolution) contribute to its overall structure and meaning as well as its aesthetic impact.</p>
<p>Performance Example:</p> <ul style="list-style-type: none"> Students write scripts/screenplays and develop storyboards for news broadcasts, narrative cinema/video, or documentary productions. 		
2.H.05	Writing 9-12 #4,7	<p>4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)</p> <p>7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.</p>
<p>Performance Example:</p>		

<ul style="list-style-type: none"> Students plan and conduct interviews based on gathered data in a relevant, researched subject matter. 		
2.H.06	Speaking 9-12 #1 a-b	<ol style="list-style-type: none"> Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others’ ideas and expressing their own clearly and persuasively. <ol style="list-style-type: none"> Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas. Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
Performance Example: <ul style="list-style-type: none"> Students produce and direct a studio or field production script/screenplay. 		

Embedded Mathematics

CVTE Learning Standard Number	Math Content Conceptual Category and Domain Code Learning Standard Number	Text of Mathematics Learning Standard
2.B.05,2.D.04	G-SRT	Understand similarity in terms of similarity transformations. <ol style="list-style-type: none"> Verify experimentally the properties of dilations given by a center and a scale factor: <ol style="list-style-type: none"> A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged. The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
Performance Example: <ul style="list-style-type: none"> Students identify and adjust aspect ratios for cinema, video, and photography. 		
2.B.02, 2.B.03	G-MG	Apply geometric concepts in modeling situations. <ol style="list-style-type: none"> Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).
Performance Example: <ul style="list-style-type: none"> Students use proper measuring techniques to draft a light plot or ground plan for a set or prop for a studio or remote production. 		
2.E.01	F-IF, F-TF	Analyze functions using different representations. <ol style="list-style-type: none"> Graph exponential and logarithmic functions Model periodic phenomena with trigonometric functions. <ol style="list-style-type: none"> Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
Performance Example: <ul style="list-style-type: none"> Students collect frequency data and produce graphs and charts based on sound frequencies. 		
2.D.03	G-GPE	Translate between the geometric description and the equation for a conic section. <ol style="list-style-type: none"> (+) Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant. MA.3.a. (+) Use equations and graphs of conic sections to model real-world problems.

Performance Example: <ul style="list-style-type: none"> Students describe how the curvature of a lens and the placement of a lens affect the directionality of light and the focus of an image. 		
2.D.02	G-CO	Experiment with transformations in the plane. 1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc. 2. Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch). 12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.).
Performance Example: <ul style="list-style-type: none"> Students diagram various source flows/charts showing relationships between mediums. 		
2.D.02	F-IF, S-ID	Interpret functions that arise in applications in terms of the context. 4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. 5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. Summarize, represent, and interpret data on a single count or measurement variable. 1. Represent data with plots on the real number line (dot plots, histograms, and box plots). 2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
Performance Example: <ul style="list-style-type: none"> Students use photographic exposure elements to extrapolate data and graph their findings relating to range, median, and mean. 		

Embedded Science and Technology/Engineering

Earth and Space Science – Grades 6 – 8

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Earth and Space Science Learning Standard
2.B.02	Heat Transfer in the Earth System	4. Explain the relationship among the energy provided by the sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere.
Performance Example: <ul style="list-style-type: none"> Students identify color temperature based on Kelvin scale, and use gels/filters to adjust lighting colors. 		
2.B.03	Mapping the Earth	1. Recognize, interpret, and be able to create models of the earth's

		common physical features in various mapping representations, including contour maps.
Performance Example: <ul style="list-style-type: none"> Students use proper measuring/scale techniques for a concept sketch of a set piece or prop. 		
2.E.02	Matter and Energy in the Earth's System	1.2 Describe the characteristics of electromagnetic radiation and give examples of its impact on life and the Earth's systems.
Performance Example: <ul style="list-style-type: none"> Students explain and analyze the connection between microphones and speakers, and identify the tools appropriate for various types of productions. 		

Earth and Space Science – Grades 9 – 12

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Earth and Space Science Learning Standard
2.C.01, 2.G.01	SIS3	Analyze and interpret results of scientific investigations. Use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis
Performance Example: <ul style="list-style-type: none"> Students analyze the history of broadcasting through the development of one or more script/screenplays. 		
2.C.03, 2.G.01	SIS2	Design and conduct scientific investigations. Articulate and explain the major concepts being investigated and the purpose of an investigation Employ appropriate methods for accurately and consistently making observations, making and recording measurements at appropriate levels of precision collecting data or evidence in an organized way
Performance Example: <ul style="list-style-type: none"> Students explain the importance of unbiased reporting, newsworthiness, ethics, and copyright through the development of one or more script/screenplays. 		
2.H.05	SIS4	Communicate and apply the results of scientific investigations. Explain diagrams and charts that represent relationships of variables.
Performance Example: <ul style="list-style-type: none"> Students conduct research and conduct interviews based on gathered data. 		

Life Science (Biology) – Grades 6 - 8

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Biology Learning Standard
2.C.03	Changes in Ecosystems Over Time	17. Identify ways in which ecosystems have changed throughout geologic time in response to physical conditions, interactions among organisms, and the actions of humans. Describe how changes may be catastrophic such as volcanic eruptions or ice storms.
Performance Example: <ul style="list-style-type: none"> Students identify changes in the Earth, and explain/report upon those changes with unbiased story creation. 		
2.D.03	Systems in Living Things:	6. Identify the general functions of the major systems of the human body (digestion, respiration, circulation, excretion,

		protection from disease, and movement, control, and coordination) and describe ways that these systems interact with each other.
Performance Example:		
<ul style="list-style-type: none"> Students identify and label the human eye, and compare the eye's similarities to a camera lens. 		

Life Science (Biology) – Grades 9 - 12

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Biology Learning Standard
2.D.02, 2.D.03	Anatomy and Physiology	4.4 Explain how the nervous system (brain, spinal cord, sensory neurons, motor neurons) mediates communication among different parts of the body and mediates the body's interactions with the environment. Identify the basic unit of the nervous system, the neuron, and explain generally how it works.
Performance Example:		
<ul style="list-style-type: none"> Students examine variable light and its effects on the human eye's ability to adjust. 		
2.E.03	Anatomy and Physiology	4.3 Explain how the respiratory system (nose, pharynx, larynx, trachea, lungs, alveoli) provides exchange of oxygen and carbon dioxide.
Performance Example:		
<ul style="list-style-type: none"> Students demonstrate adjustments of an audio mixer to control the high, mid, and low frequencies of the human voice. 		
2.H.06	Ecology	6.1 Explain how birth, death, immigration, and emigration influence population size 6.2 Analyze changes in population size and biodiversity (speciation and extinction) that result from the following: natural causes, changes in climate, human activity, and the introduction of invasive, non-native species.
Performance Example:		
<ul style="list-style-type: none"> Students produce script/screenplays and reflect upon society's changing world. 		
2.H.05	SIS4	Communicate and apply the results of scientific investigations Use language and vocabulary appropriately, speak clearly and logically, and use appropriate technology (e.g., presentation software) and other tools to present findings
Performance Example:		
<ul style="list-style-type: none"> Students perform in front of a camera, presenting findings and research for broadcasts. 		
2.H.03	SIS2	Design and conduct scientific investigation Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration (if required), technique, maintenance, and storage
Performance Example:		
<ul style="list-style-type: none"> Students operate control room equipment for broadcasts. 		

Physical Science (Chemistry) – Grades 9 - 12

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Chemistry Learning Standard
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2.B.03	Properties of Matter	Central Concept: Physical and chemical properties reflect the nature of the interactions between molecules or atoms, and can be used to classify and describe matter.
Performance Example: <ul style="list-style-type: none"> Students draft and create set pieces for a set or prop in a studio or remote production. 		
2.B.03, 2.H.01, 2.G.02	SIS2	Design and conduct scientific investigations Properly use instruments, equipment, and materials.
Performance Example: <ul style="list-style-type: none"> Students follow pre-determined procedures to develop, scout, and shoot a remote production. 		
2.C.02, 2.G.02	SIS4	Communicate and apply the results of scientific investigations. Explain diagrams and charts that represent relationships of variables Develop descriptions of and explanations for scientific concepts that were a focus of one or more investigations Use language and vocabulary appropriately, speak clearly and logically, and use appropriate technology (e.g., presentation software) and other tools to present findings
Performance Example: <ul style="list-style-type: none"> Students develop production charts and materials for studio or remote productions. 		
2.D.04	Properties of Matter	1.2 Explain the difference between pure substances (elements and compounds) and mixtures. Differentiate between heterogeneous and homogeneous mixtures.
Performance Example: <ul style="list-style-type: none"> Students contrast differences between digital media formats in relation to digital and dark room photography. 		

Physical Science (Physics) – Grades 9 - 12

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Physics Learning Standard
2.B.02	Electromagnetic Radiation	6.1 Recognize that electromagnetic waves are transverse waves and travel at the speed of light through a vacuum. 6.2 Describe the electromagnetic spectrum in terms of frequency and wavelength, and identify the locations of radio waves, microwaves, infrared radiation, visible light (red, orange, yellow, green, blue, indigo, and violet), ultraviolet rays, x-rays, and gamma rays on the spectrum.
Performance Example: <ul style="list-style-type: none"> Students list and identify properties of light and the effects of gels or filters for temperature, mood, and color. 		
2.D.04, 2.E.01, 2.H.03	SIS2	Design and conduct scientific investigation. Articulate and explain the major concepts being investigated and the purpose of an investigation. Select required materials, equipment, and conditions for conducting an experiment. Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration (if required), technique, maintenance, and storage
Performance Example: <ul style="list-style-type: none"> Students collect and chart frequency data, and operate control equipment based on that data. 		
2.E.01,	Waves,	Central Concept: Waves carry energy from place to place without the

2.E.04	Mathematical Skills	transfer of matter. 4.1 Describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period) and explain the relationships among them. Recognize examples of simple harmonic motion. 4.6 Describe the apparent change in frequency of waves due to the motion of a source or a receiver (the Doppler effect). Construct and use tables and graphs to interpret data sets
Performance Example: <ul style="list-style-type: none"> Students record production audio based upon charted frequencies of the human voice. 		
2.E.02, 2.H.04	SIS4	Construct and use tables and graphs to interpret data sets Explain diagrams and charts that represent relationships of variables Communicate and apply the results of scientific investigations. Develop descriptions of and explanations for scientific concepts that were a focus of one or more investigations.
Performance Example: <ul style="list-style-type: none"> Students diagram pick up patterns for various types of microphones and analyze how different microphones are best suited for various types of productions. 		

Technology/Engineering – Grades 6 - 8

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Technology/Engineering Learning Standard
2.B.02, 2.B.03	Materials, Tools, and Machines	1.1 Given a design task, identify appropriate materials (e.g., wood, paper, plastic, aggregates, ceramics, metals, solvents, adhesives) based on specific properties and characteristics (e.g., strength, hardness, and flexibility). 1.2 Identify and explain appropriate measuring tools, hand tools, and power tools used to hold, lift, carry, fasten and separate, and explain their safe and proper use. 1.3 Identify and explain the safe and proper use of measuring tools, hand tools, and machines (e.g., band saw, drill press, hammer, screwdriver, pliers, tape measure, screws, nails, and other mechanical fasteners) needed to construct a prototype of an engineering design.
Performance Example: <ul style="list-style-type: none"> Students draft set designs and light plots, and use proper measuring/scale techniques for creation of a concept sketch. 		
2.E.02, 2.H, 2.I	Communication Technologies	3.1 Identify and explain the components of a communication system, i.e., source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination.
Performance Example: <ul style="list-style-type: none"> Students identify and explain various communication systems (i.e., video, audio, computer) and identify the components of each and their relation to cinema or video production. 		
2.F	Manufacturing Technologies	4.2 Explain and give examples of the impacts of interchangeable parts, components of mass-produced productions, and the use of automation, e.g., robotics.
Performance Example: <ul style="list-style-type: none"> Students identify components of audio/video equipment and demonstrate proper usage of equipment. 		
2.G.01	Communication Technologies	3.4 Identify and explain how symbols and icons (e.g., international symbols and graphics) are used to communicate

		a message.
Performance Example:		
<ul style="list-style-type: none"> Students use storyboards and scripts/screenplays to pitch a movie idea geared towards a specific target audience. 		
2.H.06	Communication Technologies	3.3 Identify and compare communication technologies and systems, i.e., audio, visual, printed, and mass communication.
Performance Example:		
<ul style="list-style-type: none"> Students explain the interrelationships between sources in the control room for a production. 		

Technology/Engineering – Grades 9 - 12

CVTE Learning Standard Number	Subject Area, Topic Heading and Learning Standard Number	Text of Technology/Engineering Learning Standard
2.A.01	Engineering Design	1.1 Identify and explain the steps of the engineering design process: identify the problem, research the problem, develop possible solutions, select the best possible solution(s), construct prototypes and/or models, test and evaluate, communicate the solutions, and redesign.
Performance Example:		
<ul style="list-style-type: none"> Students list methods to set up a studio production following proper safety guidelines. 		
2.A.02	Engineering Design	1.2 Understand that the engineering design process is used in the solution of problems and the advancement of society. Identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified.
Performance Example:		
<ul style="list-style-type: none"> Students create a safety plan for use during an on-location production, from methods listed for safety procedures. 		
2.A.03	Engineering Design, Steps of the Engineering Process	1.5 Interpret plans, diagrams, and working drawings in the construction of prototypes or models Steps of the Engineering Design Process 4. Select the best possible solution(s) Determine which solution(s) best meet(s) the original requirements
Performance Example:		
<ul style="list-style-type: none"> Students demonstrate proper handling of studio and field equipment. 		
2.B.02, 2.B.03, 2.B.04, 2.D.01	Engineering Design	1.3 Produce and analyze multi-view drawings (orthographic projections) and pictorial drawings (isometric, oblique, perspective), using various techniques. 1.4 Interpret and apply scale and proportion to orthographic projections and pictorial drawings (e.g., $\frac{1}{4}'' = 1'0''$, 1 cm = 1 m).
Performance Example:		
<ul style="list-style-type: none"> Students measure, draft, and produce light plots, ground plans, and models for studio or remote productions. 		
2.B.04	Communication Technologies	6.1 Explain how information travels through the following media: electrical wire, optical fiber, air, and space.
Performance Example:		
<ul style="list-style-type: none"> Students examine similarities and differences in wiring for single-camera and multiple-camera shoots. 		
2.B.05, 2.I.06	Communication Technologies	6.2 Differentiate between digital and analog signals. Describe how communication devices employ digital and analog technologies (e.g., computers, cell phones).
Performance Example:		
<ul style="list-style-type: none"> Students compare broadcasting signals used for audio/video production and audio/video export variables for a variety of consumer options. 		

2.B.02, 2.E.03	Energy and Power Technologies – Electrical Systems	5.1 Explain how to measure and calculate voltage, current, resistance, and power consumption in a series circuit and in a parallel circuit. Identify the instruments used to measure voltage, current, power consumption, and resistance.
Performance Example: <ul style="list-style-type: none"> Students describe the connections between sources in the use of an audio mixer or a light board, and properly calculate source power for each. 		
2.G.03	Steps of the Engineering Process	5. Construct one or more prototypes and/or models Model the selected solution(s) in two and three dimensions. 6. Test and evaluate the solution(s) Does it work? Does it meet the original design constraints?
Performance Example: <ul style="list-style-type: none"> Students arrange a studio or remote production shoot with correct positioning of audio, lights, sets/props, and cameras. 		

DESE Statewide Articulation Agreements

No Statewide Articulation Agreements at this time.

Industry Recognized Credentials (Licenses and Certifications/Specialty Programs)

Post Production Editing Software Certification Exams:

AVID Media Composer Certified User Exam

Final Cut Pro Associate User Exam

Final Cut Pro Certified User Exam

Adobe Premiere Certified User Exam

Other

Reference Materials

- Harris, P. (2012) Television Production and Broadcast Journalism. Tinley Park, IL: Goodheart-Willcox Publishing.
- Keller, D. (2011) The Video Collection Revealed: Adobe Premiere, Pro, After Effects, Soundbooth, and Encore CS5. Clifton Park, NY: Delmar Cengage Learning.
- Kennedy, A. (2011) Editing with Avid Media Composer 5. Berkley, CA: Peachpit Press.
- Tatano, R. (2012) Broadcast Journalism Street Smarts: the 2012 Survival Guide for Today's Television Newsroom. Accio Books.
- Weynand, D. (2012) Apple Pro Training Series: Final Cut Pro. Berkley, CA: Peachpit Press.
- Zettl, H. (2003) Video Basics. Boston, MA: Wadsworth Cengage Learning.
- Zettl, H. (2008) Television Production Handbook. Boston, MA: Wadsworth Cengage Learning.

Related National, Regional, and State Organizations

Advanced Televisions Systems Committee
1776 K Street NW, 8th Floor
Washington DC 20006
(202)872-9160
www.atsc.org

Alliance for Community Media
1760 Old Meadow Road, Suite 500
McLean, VA 22102
(703)506-2889
www.allcommunitymedia.org/

National Academy of Television Arts and Sciences
1697 Broadway, Suite 1001
New York, NY 10019
(212)586-8242
www.emmys.tv/

National Association of Broadcasters
1771 North Street NW
Washington DC 20036
(202)429-5300
www.nab.org

Video Educators of New England: Media Educators of America
P.O. Box 545
Randolph, MA 02368
(781)562-0007
www.mediaedoa.org/

Mass Access
23 Needham Street
Newton, MA 02461

(617)965-7200
www.massaccess.org/

Massachusetts Broadcasters Association
43 Riverside Avenue
Medford, MA 02155
(800)471-1875
www.massbroadcasters.org/

Professional Organizations

American Cinema Editors, Inc.
100 Universal City Plaza
Verna Fields Building, 2282 Rm 190
Universal City, CA 91608
(818)777-2900
www.ace-filmeditors.org/

Directors Guild of America
7920 Sunset Boulevard
Los Angeles, CA 90046
(310)289-2000
www.dga.org/

International Alliance of Theatrical Stage Employees (IATSE)
1430 Broadway, 20th Floor
New York, NY 10018
(212)730-7809
www.iatse-intl.org/

Local 600: International Cinematographers Guild
80th Eighth Ave. 14th Floor
New York, NY 10011
(212) 647-7300
<https://www.cameraguild.com/aboutus/aboutus.aspx>

Motion Picture Editors Guild
7715 Sunset Boulevard, Suite 200
Hollywood, CA 90046
(323)876-4770
www.editorsguild.com/

Student Organizations

High School Journalism Association
11690B Sunrise Valley Drive
Reston, VA 20191
(703)453-1125
www.hsj.org/

New England Student Film Festival

83 Park Street
Providence, RI 02903
(401)861-4445
www.film-festival.org/NEStudentFilmFest.php

Student Television Network
2768 Loker Avenue West
Carlsbad, CA 92010
(877)786-1001
www.studenttelevision.com/

Skills USA
14001 Skills USA Way
Leesburg, VA 20176
(703)777-8810
www.maskillsusa.org

Selected Websites

<http://www.creativecow.net> (Media Professionals Support Community)
<http://www.lynda.com> (Online Software Training Videos)
<http://www.bavug.org> (Boston Avid User Group)
<http://www.boscpug.org> (Boston Creative Pro User Group)
<http://www.mediaed.org> (Educational Videos for Teaching)
<http://www.thinkfinity.org/common-sense-media-educator-resources> (Media Educator Resources)
<http://www.medialit.org> (Center for Media Literacy)
<http://namele.net> (National Association for Media Literacy Education)
<http://mediaed.org.uk/> (Education ideas for teaching film, media, and filmmaking)
<http://filmeducation.org> (Film teacher resources)
<http://www.imdb.com> (Internet Movie Data Base)
<http://www.oscars.org/education> (Academy of Motion Picture Arts and Sciences)
<http://www.mafilm.org/mass-film-tax-credit-law-in-a-nutshell/>
<http://www.malegislature.gov/Laws/GeneralLaws/PartI/TitleIX/Chapter62>