3-D Modeling & Animation
Grades 10 -12

Units of Credit: One Year (Elective)

Prerequisites: Introduction to Technical Design or Introduction to Art

Course Description:
3-D Modeling & Animation is oriented for future animators, film producers, and game designers. Students explore all facets of what it takes to get 3-D models moving across the screen. Students discover for themselves how technology can take a project from concept to a completed digital story. This course provides students with a working knowledge of interpreting and creating 3-dimensional models and movement. Fundamentals will be covered through instruction, class discussion, Internet research, text/workbook, and hands-on projects. The class will culminate with an instructor-approved proejct. Students develop and use a variety of skills including assessing, organizing, problem solving, and analyzing in the application of drafting and design techniques. Students engage in a variety of learning activities including lecture and note taking, research, individual projects, demonstrations, and performance tasks. Students are assessed by observation, performance on tests, quizzes, assigned tasks and projects, and by the quality of work produced.

Topics:
- Spline, Box, and Point Edit Modeling
- Character Rigging and Posing
- Bone Hierarchies and an introduction to Inverse/Forward Kinematics
- Basic Texturing Properties – Transparency, Opacity, Diffuson, Luminosity, and Translucency Image Mapping, Uvs, Gradient and Procedural Textures
- Basic Lighting and Light Properties – Caustics, Refraactions, Reflection, Specularity Mapping
- Shadows, Gobos, Projections, Ray Tracing
- Light Volumetrics and Dynamics
- 3 Point Lighting and Advanced Lighting Plans
- Animation Techniques – Keyframing, Morphing, Deformations
- Motion Path Studies
- Dope Tracks and Dope Sheets

NOTE: Throughout this document, learning target types are identified as knowledge ("K"), reasoning ("R"), skill ("S"), or product ("P").

STANDARD 1: Students experience various career opportunities and assess personal career pathways.

Benchmark 1:
Explore and identify personal interests, aptitudes, and abilities and develop strategies to achieve tentative career goals.

Learning Targets *(Type)***:**
1. I can use Montana Career Information Systems (MCIS) and/or other systems or web resources to investigate and evaluate my personal interests, aptitudes and abilities. *(S)*
2. I can formulate tentative career goals. *(R)*
3. I can evaluate approaches for meeting my goals. *(R)*

Benchmark 2:
Utilize local resources to research career plans.

Learning Targets *(Type)***:**
1. I can identify local resources to develop career plans. *(K)*
2. I can contact my school career counselor or teacher to pursue career pathways. *(S)*

Benchmark 3:
Recognize the interrelationships of family, community, career, and leisure roles.

Learning Targets *(Type)***:**
1. I can describe the importance of balance between family and community in regards to career and leisure activities. *(K)*
2. I can compare and contrast the needs of career and leisure activities and how they relate to and/or affect family and community. *(R)*

STANDARD 2: Students demonstrate an understanding and apply principles of Resource Management (i.e., financial, time, personal management).

Benchmark 1:
Prepare a budget and keep financial records.

Learning Targets (*Type***):**
1. I can research and report cost of materials and time. *(R,S)*
2. I can document financial inputs and outputs. *(S)*
3. I can identify the necessity to maintain accurate financial records. *(K)*
4. I can stay within a fixed budget. *(S,P)*

Benchmark 2:
Prioritize, allocate time, prepare and follow schedules to complete a project.

Learning Targets (*Type***):**
1. I can estimate the required time to complete a project. *(R)*
2. I can prioritize resources, equipment and tasks. *(R)*
3. I can reflect upon completion. *(K)*

Benchmark 3:
Apply appropriate time to task.

Learning Targets (*Type***):**
1. I can implement a time schedule for task completion. *(S)*

Benchmark 4:
Use physical resources wisely to accomplish a goal.

Learning Targets (*Type***):**

1. I can identify the resources necessary to accomplish the task. *(K)*
2. I can maintain the tools of the trade. *(S)*
3. I can maximize the use of my resources. *(S)*

STANDARD 3: Students acquire and utilize personal and leadership skills to become successful, productive citizens.
Benchmark 1:
Demonstrate active leadership skills by participation in group activities and projects.
Learning Targets (*Type*):
1. I can investigate various leadership styles. *(R)*
2. I can apply leadership styles in group activities and projects. *(R)*
Benchmark 2:
Demonstrate positive personal and work ethics.
Learning Targets (*Type*):
1. I can show up for class and work on time. *(S)*
2. I can develop personal and work related goals. *(K,P)*
3. I can describe ethical behavior in the workplace. *(K)*
Benchmark 3:
Demonstrate skills to be a productive citizen.
Learning Targets (*Type*):
1. I can develop professional relationships with community members. *(S)*
2. I can contribute to my community in a positive manner. *(S,P)*
Benchmark 4:
Apply self-esteem building practices.
Learning Targets (*Type*):
1. I can define and provide evidence of my strengths in my career interest areas. *(K,S)*
2. I can persevere through set backs and stay focused on my goals. *(S)*
Benchmark 5:
Demonstrate appreciation for diverse perspective needs and characteristics.
Learning Targets (*Type*):
1. I can develop a working relationship with diverse populations. *(K,S)*
2. I can demonstrate communication skills that contribute to positive relationships. *(S)*
3. I can work to understand diverse points of view. *(R)*
Benchmark 6:
Practice several methods of effective communication.
Learning Targets (*Type*):
1. I can demonstrate good listening skills. *(S)*
2. I can effectively communicate verbally through collaborative projects. *(S,P)*
3. I can develop quality written professional communications. *(P)*

STANDARD 4: Student acquire and demonstrate current current technical skills leading to an occupation.
Benchmark 1:
Practice technical skills and procedures required for an occupation.
Learning Targets (*Type*):

1. I can apply accepted lettering practices and styles used in manufacturing graphics. *(K,S,R)*
2. I can use sketching techniques to develop drawing format and graphic problem solving. *(P,R,S)*
3. I can develop computer 3D models, and pictorials drawings. *(S)*
4. I can practice various roles required as a member of an effective team while recognizing individual differences and cultural diversity. *(R,S)*
5. I can demonstrate and teach a learned skill including performance evaluation of self and others in this process. *(S)*

Benchmark 2:
Practice safe and appropriate use of technology.
Learning Targets (*Type*):
1. I can operate a computer for an extended amount of time using ergonomic techniques. *(S)*
2. I can operate a computer without divulging important security, personal and identity information. *(S)*

Benchmark 3:
Select the appropriate tools, equipment, and procedures for the task.
Learning Targets (*Type*):
1. I can detail objects accurately through the principles of shape and size description. *(S)*
2. I can select goal-relevant activities, allocate time, and prepare and follow schedules. *(R,S)*
3. I can assess skills and distribute work accordingly; evaluate performance and provide feedback toward the accomplishment of personal and team goals. *(R,S)*
4. I can apply measurement skills to solve problems. *(K,S)*

Benchmark 4:
Manage and maintain technological tools and follow troubleshooting protocol.
Learning Targets (*Type*):
1. I can make and use appropriate symbols, pictures, diagrams, scaled drawings and models to simplify real life situations and solve problems (Science). *(S)*

Benchmark 5:
Apply technical information to a variety of sources.
Learning Targets (*Type*):
1. I can practice accepted standards, symbols, and conventions. *(K,S)*
2. I can gather, compile and analyze data from a variety of sources, and evaluate relevance and accuracy in making informed decisions in the workplace. *(R,S)*
3. I can organize, process, analyze, and maintain written and computerized records and other forms of information using systematic methods. *(R,S)*
4. I can acquire, organize, communicate, process, analyze and evaluate information from print and electronic sources. *(K,R,S)*
5. I can locate and demonstrate written technical information. *(K,S)*
6. I can use knowledge of geometry to solve problems. *(K,S)*
7. I can apply mathematical reasoning skills to solve problems. *(R,S)*
8. I can employ graphs, tables, maps and illustrations in making arguments and drawing conclusions (Science). *(R,S)*
9. I can use computers to organize data generated models and to do research for problem solving. (Science). *(R,S)*

STANDARD 5: Students know and demonstrate the requirements of the workplace through authentic application.

Benchmark 1:
Practice and demonstrate academic and technical skills to a workplace setting.
Learning Targets (*Type*):
1. I can practice, and demonstrate my technical workplace skills in my school lab. *(S)*
2. I can research, write and present on the technical content utilizing academic skills found in workplace settings. *(R,S,P)*

Benchmark 2:
Apply the concepts of entrepreneurship.
Learning Targets (*Type*):
1. I can explain the concepts of entrepreneurship. *(K)*
2. I can demonstrate the concepts of entrepreneurship through a unique project. *(R,S)*
3. I can present my unique project to an authentic audience. *(S,P)*

Benchmark 3:
Identify possible outcomes and consequences of decisions.
Learning Targets (*Type*):
1. I can identify possible consequences of carelessness and horseplay. *(K)*
2. I can explain potential outcomes of not following directions, (i.e. safety, guidelines, rubrics). *(R)*

Benchmark 4:
Use acceptable industry standard equipment in a school setting.
Learning Targets (*Type*):
1. I can successfully use acceptable industry standard equipment to produce an authentic product within budget constraints. *(S,R,P)*