Evidence of Student Learning
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Following is one example of marked improvement during an Intermediate 3D Modeling course, related to the competency "utilize 3D coordinate systems, construct 3D models and perform mathematical computations."

This course focuses on improving skills in analyzing real-world objects and recreating those forms as 3D models with professional-quality form and topology (the wireframe mesh that defines the form). Students focus on hard-surface and organic forms.

The first project of the quarter is a hard-surface project. Students can choose their own content within a set of parameters, and many are inspired by personal interests and hobbies. One student chose to create a Nintendo 3DS handheld game controller:

A reference photo of the hard-surface object

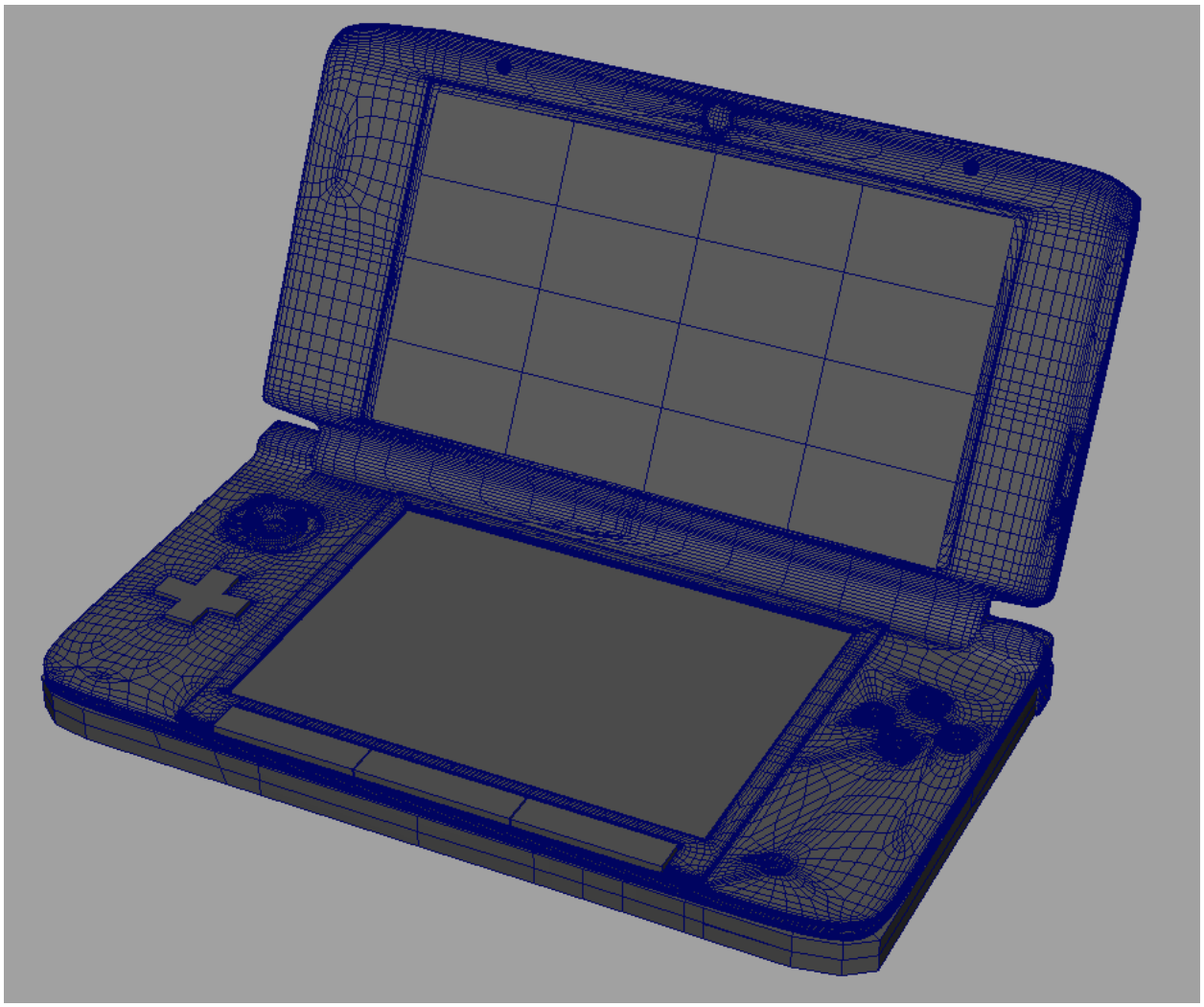
The 3D model as submitted appears below:

The 3D model of the game controller

The general forms of the 3D model resemble the references, but in analyzing the details, there are several areas where the form is not refined. Some examples appear in the following close-up.

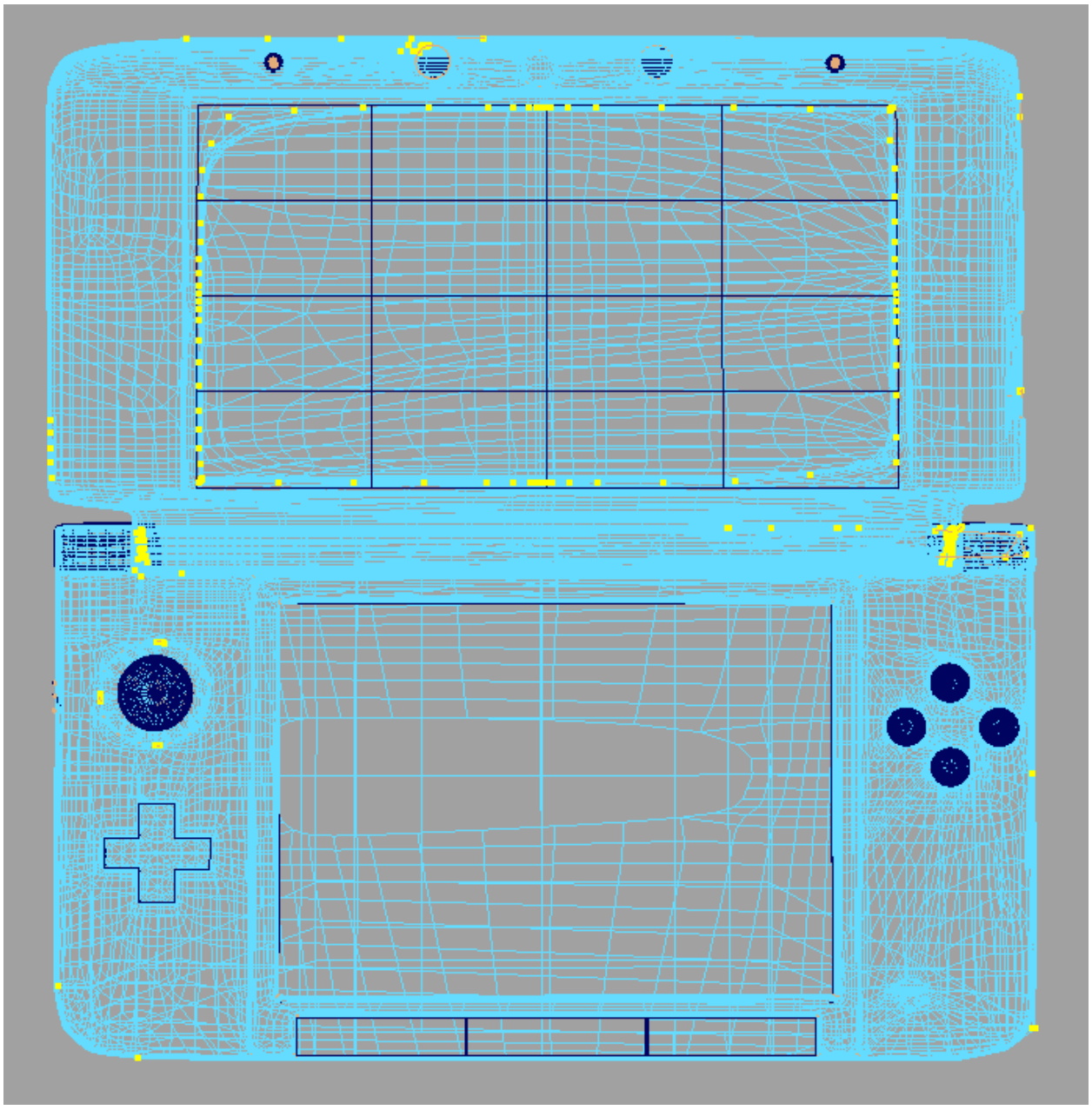
A close-up of the hard-surface model

Note the faceted corner at the bottom of the image, which should be smoothly rounded. There are also several wrinkles around the thumbstick (the cylindrical control in the upper left-hand region of the image). A slider switch on the left side of the 3DS has some pieces that are floating in midair, and the D-pad (the plus-shaped button near the center of the image) lacks beveled corners as well as a noticeable cut-out that allows the button to be pressed down.



The 3D model with wireframe

Viewing the wireframe reveals additional issues, the most striking of which is the unnecessarily high density of several of the meshes. There are also issues with edges not flowing logically given the features of the model, most notably along the ABXY buttons on the right side of the lower touch-screen, and on the knuckle (or hinge).



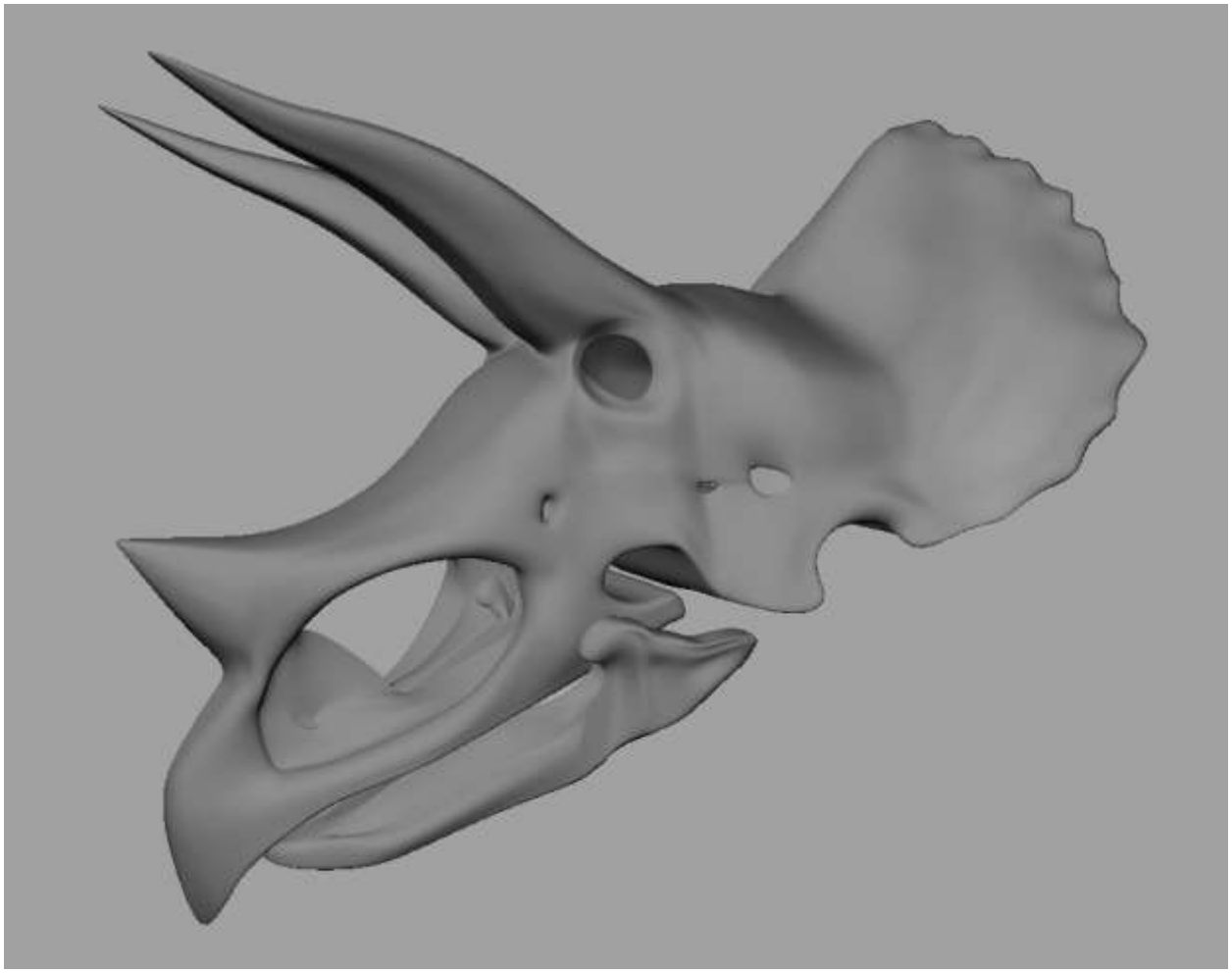
Indications of problems in topology

The above image is the result of a diagnostic step that highlights problematic topology in the mesh. The yellow and orange areas break the rules of “clean” modeling as required for proper use in production.

Overall, there are several issues with form and topology that indicate room for improvement as we move on to the student’s second project, which focuses on an organic form.

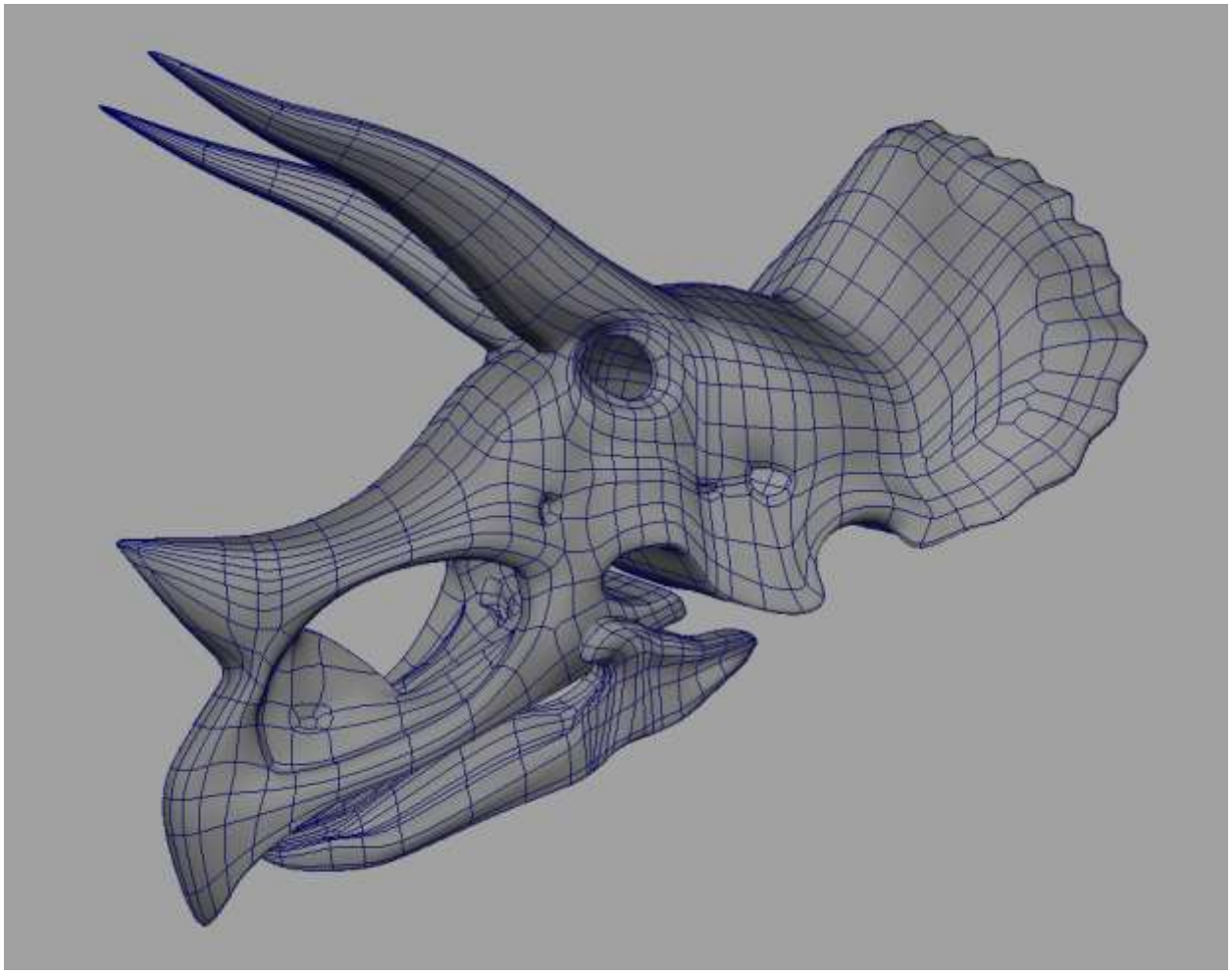
A triceratops skull from the local science museum

The 3D model as submitted appears below:



The 3D model of the dino skull

The forms here do a significantly better job of recreating the reference object. This is relatively complex form compared to the game controller, and yet there are very few unintended artifacts.



The wireframe of the dino skull

The wireframe also reveals significant improvement. The density of the mesh is appropriate to the details, and the edges flow along contours and around circular features.

The model is also completely within “clean” modeling guidelines, eliminating the problems revealed by the game controller diagnostic.

These two projects reveal one student’s marked improvement over the term, in analyzing reference objects, creating representative forms, and using modeling techniques that lead to clean and efficient topology.