Lessons Learned while Teaching Fundamentals of Autodesk Maya 2011

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Abstract. Summary of the course "Project Competence Multimedia: Maya", teaching methods used, success of the class, and lessons learned while teaching the class.

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1 Introduction

Usually people associate 3D with movies like Toy Story (Pixar, 1995), Shrek (Dreamworks, 2001), or James Cameron's Avatar (Twentieth Century Fox, 2009). But the movie industry is only a fraction of the 3D Industry. 3D is widely used in all fields of the Entertainment industry, for example, Computer Games, Visual Effects, as well as, full feature length movies; it also has branched out into Advertising, Architecture, Product Design, Physics simulations and various other fields.

Autodesk Maya is one of the leading 3D modeling tools currently available. Maya provides for 3D artists a wide range of tools to create and modify geometry. At the same time, Maya offers programmers a C++ interface, supports Qt-Widgets, and supports Python and Maya specific MEL-Scripting [1].

Even though Maya has been specialized for photorealistic renderings, it is used for every type of animation or simulation. For example, the 2D-Animation Series Southpark is in fact created in Maya [2].

The course "Project Competence Multimedia: Maya" teaches the basics of Modeling, Rendering, Animation, Dynamics, and Scripting in Maya. The topics cover all the basics of Maya [3]. For each subject a different teaching approach is needed. For a better understanding of these theoretical concepts, all topics are first discussed in theory and then presented with practical examples. To successfully receive credit for the class, each student must create and complete a simple Animation that shows that the student has learned all aspects taught in class.

1.1 Basics of how to Teach a Good Class

The advice from Digital Painter Bert Monroy: „Remember to play it's the best way to learn!"[4] is the best summery of how to teach a good class. It has been proven by neuroscientists that having fun while learning a subject, is the most efficient way to learn subjects [5]. Especially while experimenting and playing, the mind creates several connections between information.

As a lecturer you want to share knowledge with the students. The combination of playing and having fun ensures a good learning environment. Presenting theoretical subjects, combined with practical examples, enables a very quick understanding of complex subjects. Interacting with each individual ensures a feedback loop with the class to control the pace and the difficulty of the subject matter.

1.1.1 Have Fun

As a lecturer you need to have fun while teaching. If you are excited about the subject, the students will also be exited and create more impressive results. In addition you create an optimal stress-free environment that enables better learning [5].
Students have great fear of failing tests. Fear triggers the natural instinct to run away. The mind stops learning and starts looking for the nearest exit. The lecturer must prevent the students from feeling fear. You can achieve this by giving students positive feedback, so that they feel that by participating actively in class that they will not fail the final exam [5].

1.1.2 Use Maya

Usually when using Powerpoint slides students tend to focus entirely on the different slides you are presenting. They do not focus entirely to the speech that accompanies the slides. To keep the students interested you got to do something more exciting than just add a fancy transition effect to the slides.
The best way to keep the class interested, and invested into the class, is to do everything in Maya or with something directly related to Maya. Simply explaining a topic, while showing an example in Maya, you keep the class constantly interested. For example: To explain the components of a NURBS Sphere, create a NURBS Sphere - and then manipulate different components with the move-tool. While you are presenting the different components, encourage the students to experiment on their own. After explaining different concepts, let the students repeat your steps and walk around the class to see how far the students have progressed. Answer individual questions and talk about individual problems. If the topic has been partially understood, continue to the next subject.

1.1.3   Interaction

It is important to interact with the class to ensure a positive learning environment. The speed and difficulty of the class must be adjusted to the audience. If you explain the basics too fast, the students have more and more difficulties in later lessons. To ensure optimal conditions, talk with each individual student, answer every question. Common problems can be explained to the entire class. In the beginning, this slows down the class tremendously, but in later lessons you can cover multiple subjects very fast and the class will keep up with the pace. By treating students as individuals, they are more open to the subject and focus more on the class. Many students will come on a regular basis to the class and will even apologize if they have missed a lesson.

2   Participants

All students are students of Media Informatics. No other classes are prerequisites for this class. Since the class is voluntary, all participants are highly motivated. Many students already have certain basic knowledge of 3D or are very interested in learning about the subject. Because the audience has never been in a design class, certain basic rules for compositing or for camera-movements need to be explained in addition.

The lecture is limited to 20 participants to ensure that there is enough time during the lecture to answer questions and help students individually.

2   Teaching 3D Graphics using Maya

The lecture starts with the Maya UI, then continues with NURBS-Modeling, Rendering, Poly-Modeling, Animation and Dynamics. The last couple of lessons are to present other modules the students are interested in most, and to answer any remaining questions. The lectures are based on various projects of creating specific objects and refining them with each step.

While introducing the Maya interface, the students cannot grasp immediately the complete initial display. The students are expecting a simple sleek designed interface and only a few buttons are needed to create a 3D-Animation. The main focus in this first lesson is not doing something specific in Maya, it is more a slow start showing a "Single Pane View" and then switching to the "Four View" and back. Basic operations, like creating a primitive object and moving it, are enough for the first lesson. The UI is very intuitive and consistent; there is no need to explain for every window the same operations.

In the beginning it is important to repeatedly tell the students what keyboard shortcuts you are using. Later on, you can introduce new shortcuts.

The easiest way to start modeling is with NURBS-Curves. You first explain the different types of curves and then draw out a simple line to create a vase and use the

Revolve Tool to create the surface for the vase. After creating the simple vase, you draw a more complex line to create a wine or Martini glass.

In the following lessons you present one to two tools per lesson to present all basic types of tools on how to create, modify, and sculpt NURBS-geometry.

It is very important to let the students exercise working with these tools. So in the beginning of every lesson, you let the students create a new geometry with the previously presented tools.

By now about one third of the lecture has passed and the students still only are working with the default gray-shaded geometry. The students are eager to see some impressive renderings. They want to light their models and render them as quickly as possible. So instead of continuing to Poly-Modeling you introduce Lighting and Shadows. In the following lesson, you introduce the Mental Ray render engine and the architectural material (mia_material_x). Glass is a fairly simple material and produces a very nice result, but it needs something to reflect to be visually appealing. So, in addition, you need to introduce HDRi Lighting at the same time. This is a key lecture and many difficult topics are covered. But the students are more than satisfied when they see the stunning result of the final render of the Martini glass.

After giving the students a very satisfying result, you can move on with the class and introduce Polygon-Modeling. Even though the workflow is entirely different, the students will learn it quicker than NURBS-Modeling, because now they can build up on the previous lessons and are more comfortable to work with Maya. With the introduction of Rendering, the students will drift sometimes from the actual subject and make their own renders. You should explain different shading types parallel to Poly-Modeling.

At this point the students feel very confident that they can do anything they want in Maya. So you can start by introducing basic Key Frame and Path Animation and move on to several camera movement techniques. A very easy to animate - and very dramatic camera movement - is the vertigo effect, where the focal length and position of the camera change in a way so that the item of interest stays the same size.

The students now realize that the time they had planned on finishing the animation will probably not be enough, and that they really have to start working. On the other hand, the students are still willing to learn new topics. By teaching the basics of Dynamics, the students are given a tool to automate parts of their animation. Even though many students loathed physics in school, now changing different physical parameters and seeing interactively, how things are affected, fills the students with joy.

`In the last lecture(s) nothing new should be taught. Repeating multiple difficult topics (especially Lighting and Shading) and showing a complete workflow on how to create an animation, allows the students to recap all previous lessons. Combine this with giving the opportunity to ask specific questions and provide feedback on their ideas for their animation.

3 Lessons learned

Since the subject is very biased toward the entertainment industry, it is generally conceived as not suitable for academic pursuit [6]. Because it is fun and entertaining, it may be dismissed as some hobby for a couple of students they are interested in. Ironically, because it is fun and entertaining, the students are willing to learn more and more about the subjects, and they are not even aware that they are learning very complex and difficult subjects, like Global Illumination. The students are very interested in continuing their studies and start learning Python to write complex scripts to enhance their workflow with Maya.

Students will set extremely high standards for their final animation. While working on their individual animation, they will experiment and play with Maya and work with a lot of tools they have never seen in class. The students do actual effective self-study during the final project.

In the initial class, the students just handed in their final work. Ideally, the students should keep the tutor informed of their progress by sending in their storyboard, and before rendering, to send in a Pre-Visualization to get feedback if the animation is going in the right direction. In addition, for Storyboard, Playblast, and Final Animation, deadlines must be set to keep the students on track with an actual release schedule.

4 Future Work

The reception of the course was extremely high. One student successfully applied for an internship at a 3D-company based in Florida. In addition, Real Time Technologies (RTT Munich) offered several internships at their company for the best students of the class.

Since the course only offers a minor introduction to the basics of Maya, a continuation of the course in form of a study group ("Study Group 3D") covers more intermediate subjects, like Rigging, UV-Mapping, Advanced Materials, Sub-Division Surface Modeling, Organic Modeling, Hair, or Particle Effects.

Maya is a very versatile tool to teach multiple aspects and difficult concepts. For example, students could learn basic programming by combining Maya with Python, because they can easily visualize abstract concepts like loops or objects.

Besides using Maya only for photographic and cinematic purposes, we are now working on a new course for integrating Maya with the UDK (Unreal Development Kit). This combination allows the students to use their programming skills and combine it with the 3D modeling skills to create an interactive 3D environment.

The emphasis on practical examples and visualizations provides students with insight, enthusiastic motivation, and an optimal learning environment.

5 References

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