

# Interactive 3D Characters for Web-based Learning and Accessibility

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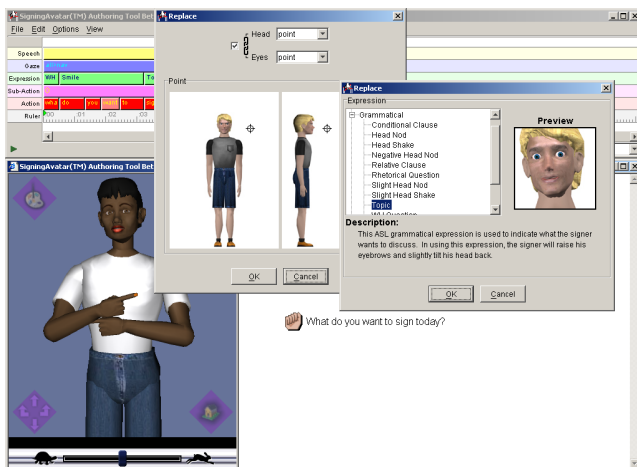
## Introduction

Interactive, life-like characters can enhance motivation, communication, and knowledge retention in computer-based learning [Lester et al. 2000]. However, until now, the development cost and computational requirements for high-quality animation have limited its widespread use.

The authors, in conjunction with a team of educators, animators and software developers at Vcom3D, Inc., are creating an Authoring Tool and Web-based Animation System that allow educators, with no previous animation experience, to create classroom and Web-based lessons with embedded animated characters. All animation is synthesized from annotated text and can be viewed using standard VRML97 and X3D browsers, thereby simplifying reuse and Web page integration.

## System Overview

Character animations are authored using an intuitive graphical user interface that combines gesture, action, facial expression, eye gaze, and synthetic speech.



### Sign Smith™ Studio Authoring Tool

Gestures can be demonstrative or emotional, or may be selected from more than 2000 signs of American Sign Language (ASL). New gestures and signs can be created within the studio using a library of hand shapes and inverse kinematic motions.

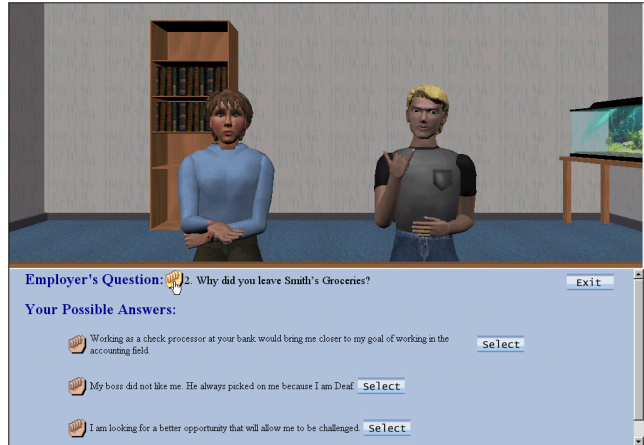
All animations and characters are developed to the Web3D Consortium's X3D and Humanoid Animation (H-Anim) Standards, allowing animations to be applied to any H-Anim character model (www.h-anim.org), and viewed in any VRML97 or X3D browser (www.web3d.org).

## Applications

Educators have used the Character Animation System to create a variety of compelling educational materials, including:

- Counseling skills training for police officers.
- An American Sign Language Dictionary.
- Interview skills training for Deaf and hearing persons.
- Science lessons on the weather, respiration, and insects.

Examples of the last two applications in the list are illustrated below.



### A SigningAvatar™ Character acts as Interpreter



### Maria assists in drawing a butterfly.

Reaction to the character animation system has been overwhelmingly positive, both by educator-authors and by learners. In one educational application, in particular, English comprehension among young Deaf learners was shown to improve from 17% to 67%.

## Reference

Lester, J., Towns, S., Callaway, C., Voerman, J., and FitzGerald, P. (2000), *Deictic and Emotive Communication in Animated Pedagogical Agents*, in *Embodied Conversational Agents*, ed. by J. Cassell et al., Massachusetts Institute of Technology, April 2000: 123-154.