**Level 2 (4-6) 3D Standards**

| Level 2 CCSS Mathematics Alignment for 3D | |
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| **Mathematical Practice** | **Application in Curriculum** |
| **MP.1** Make sense of problems and persevere in solving them. | The coursework is centered around project-based learning with ample opportunities for discovery and problem-solving. Successful prints are only possible through a process of trial and error fueled by perseverance. |
| **MP.5** Use appropriate tools strategically. | Students must choose from a variety of tools in the 3D modeling software to successfully create their projects. |
| **MP.6** Attend to precision. | 3D models must be created with great attention to detail in order to be viable for 3D printing. |
| **MP.8** Look for and express regularity in repeated reasoning. | Designing in 3D environment requires attention to patterns in both visual, aesthetic design and object manipulation. |
| **Number System** | |
| **6.NS.5.** Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. | Positive and negative values are given in reference to an object's position in 3D space. |
| **6.NS.6b** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. | Students use and manipulate coordinates for precise object placement. |
| **Measurement and Data** | |
| **4.MD.6** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure. | Angles with respect to three coordinate axes are measured via the protractor tool and created in several projects. |
| **5.MD.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement. | Volume is an inherent factor to consider when working in a 3D environment. |
| **Geometry** | |
| **5.G.1** Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the | Students utilize a number of axes when designing their projects, including the coordinate axes and others at oblique angles with respect to the coordinate plane. |

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| first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate). | |
| **5.G.3** Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles. | Geometric attributes being universal amongst a particular category of shape is a concept that is explored in both 2D and 3D environments. |

## Level 2 CCSS English Language Arts Alignment for 3D

| Reading Informational Text | Application in Curriculum |
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| **4-6.RI.4** Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a grade level topic or subject area. | Vocabulary terms pertinent to 3D Design are learned and applied throughout the course. Several of these terms pertain to concepts touched on throughout 4-6th grade. |
| **Writing** | |
| **4-5.W.2d** Use precise language and domain-specific vocabulary to inform about or explain the topic. | Students reflect on their work using vocabulary specific to computer-aided 3D design. |
| **Speaking and Listening** | |
| **4-6.SL.1d** Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions. | A review discussion closes each classroom session. |
| **4-6.SL.6** Adapt speech to a variety of contexts and tasks, using formal English when appropriate to task and situation. | Students differentiate in their diction used when explaining their designs in different contexts (i.e. to a peer as opposed to a parent or teacher). |
| **5-6.SL.5** Include multimedia components (e.g., graphics, images, music, sound) and visual displays in presentations to clarify information. | Curriculum uses a variety of multimedia presentations to relay information to the students. |
| **Reading Standards for Literacy in Science and Technical Subjects** | |
| **6.RST.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 level texts and topics | 3D Design is a highly technical field and as such utilizes a variety of field-specific jargon that is taught to the students. |

| Level 2 CCSS Visual Arts Alignment for 3D | |
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| **1.0 ARTISTIC PERCEPTION** Processing, Analyzing, and Responding to Sensory Information Through the Language and Skills Unique to the Visual Arts | **Application in Curriculum** |
| **6.AP1.2** Discuss works of art as to theme, genre, style, idea, and differences in media. | Several genres and mediums are explored and compared to what is possible within the medium of 3D design. |
| **6.AP1.3** Describe how artists can show the same theme by using different media and styles. | Similar images are depicted in both 2D and 3D and are compared in terms of style, theme, and effectiveness. |
| **2.0 CREATIVE EXPRESSION** Creating, Performing, and Participating in the Visual Arts | |
| **4.CE2.3** Use additive and subtractive processes in making simple sculptural forms. | Students employ Boolean additive and subtractive processes to create new shapes from pre-rendered ones. |
| **5.CE2.3** Demonstrate beginning skill in the manipulation of digital imagery (e.g., computer-generated art, digital photography, or videography). | 3D design is computer-generated art. |
| **6.CE2.4** Create increasingly complex original works of art reflecting personal choices and increased technical skill. | Personal projects allow for increased creativity in the design process and prompt the utilization of advanced 3D design techniques. |
| **6.CE2.6** Use technology to create original works of art. | Students use a computer to create all of their designs. |
| **4.0 AESTHETIC VALUING** Responding to, Analyzing, and Making Judgments About Works in the Visual Arts | |
| **5.AV4.4** Assess their own works of art, using specific criteria, and describe what changes they would make for improvement. | Reflection Questions allow for opportunities of self-criticism of the students' pieces. |
| **6.AV4.4** Change, edit, or revise their works of art after a critique, articulating reasons for their changes. | A revision period is implemented, allowing students to edit previous designs after their initial completion. |

| Level 2: Technology Skills Alignment for 3D | | | | |
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| **Category** | | **CCSS Alignment** | **Skills** | **Application in Curriculum** |
| Demonstrate proficiency in the use of computers and applications as well as an understanding of the concepts underlying hardware, software and connectivity. | Basic Operations | SBAC test taking skills | Turn on a computer and login | |
| | | SBAC test taking skills | Use pointing device such as a mouse to manipulate shape, icons; click on urls, radio buttons, check boxes; use scroll bar | Students utilize a variety of mouse functions in order to manipulate both camera functionality and object placement. Students also use the mouse to navigate menus and choose projects for editing. |
| | | ELA : W 6 | Keyboarding<br>-Locate and use letter and numbers keys with left and right-hand placement.<br><br>-Locate and use correct finger, hand for space bar, return/enter and shift key | A variety of keyboard shortcuts are implemented in 3D design, making an intimate knowledge of the keyboard layout imperative to students' success. |
| 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. | Acceptable Use, Copyright and Plagiarism | Digital Citizenship | Explain and demonstrate compliance with classroom, school rules (Acceptable Use Policy) regarding responsible use of computers and networks | Strict guidelines for proper computer use are implemented. Students are limited to school-appropriate projects in their designs. |