Accessible math in Desire2Learn

Mathematical Markup Language (MathML), an open standard released by the World Wide Web Consortium (W3C). It is well-recognized as the most accessible method of encoding mathematical expressions[1]. However, universal browser support for MathML is still in development; the degree to which each browser renders MathML varies. Assistive technology support for MathML is also in development. At this time, assistive technologies can only access MathML using the Design Science MathPlayer™ add-on for Internet Explorer.

Varying levels of browser support can complicate the development of math content for all users and their preferred browsers. As a result, to ensure consistent and accessible math, experts used to recommend that authors create images of their equations and add descriptive alt text. However this can be a time-consuming and error-prone task. Desire2Learn chose to address this issue by including MathJax in the platform. As of Learning Suite 9.4.1, the system consistently renders Presentation MathML with MathJax.

This document describes the Desire2Learn approach to accessible math and how you can implement it in your course content.

SECTIONS IN THIS GUIDE

Desire2Learn support for mathml and mathjax

As a standard, the Desire2Learn Learning Suite stores and displays all equations in Presentation MathML format. The Learning Suite uses MathJax 2.0 JavaScript engine to display MathML equations; rendering math as HTML and CSS across all browsers. If you are using Internet Explorer with the MathPlayer™ plugin, MathJax passes MathML to MathPlayer™ to control its display.

At this point in time, we recommend that screen reader users use Internet Explorer with the MathPlayer™ plugin to read MathML equations. Design Science MathPlayer™ is a free third-party tool that converts math to speech for various assistive technologies.

MathPlayer™ also includes features such as zooming and synchronous highlighting. For further information about MathPlayer™ visit:
http://www.dessci.com/en/products/mathplayer

Adding math using the equation editor

The Equation Editor is available within the HTML Editor. It enables users to insert mathematical and statistical equations into their content in the system. It supports the input of MathML and LaTeX, as well as a graphical editor where you can visually create equations.

GRAPHICAL EDITOR

The Graphical Editor features a tool bar equipped with a selection of buttons. This tool bar provides the necessary elements to construct your equations quickly and easily. Each button in the Equation Editor tool bar opens a palette of related mathematical symbols. This editor is the most visual of the three options and it is best suited for those that only write equations occasionally. We recommend that you start building the structure of your equation before entering specific numbers and inline notation in each section of the equation.

While this is a nice editor for visually constructing equations, it isn't great for all users since the tool bar is not keyboard accessible. We offer LaTeX and MathML input as alternatives.

LaTeX

LaTeX is a typesetting system based on TeX. It provides text syntax for complex mathematical formulae. This is the LaTeX version of the quadratic formula[2]:

```
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
```

Although there's a bit of a learning curve, it's compact and efficient once you're familiar with the commands. Advanced users find that this is the fastest input type.

There are two possible modes for LaTeX entry: text mode and math mode. MathJax supports math mode only. If you add LaTeX using the Equation Editor, allow for the following differences in math mode[3]:

- Most spaces and line breaks are not recognized and have to be specified with special commands such as \quad.
- Empty lines are ignored, only one paragraph per formula.
- Each letter is considered to be the name of a variable and will be typeset as such. If you want normal text within a formula (normal upright font and
- normal spacing) then you have to enter the text using dedicated commands

MathML

MathML is a standard adopted by the World Wide Web Consortium (W3C). It uses XML to describe mathematical notation by capturing both its structure and content. This enables MathML to support visual display and assistive technology access. This is the (presentation) MathML version of the quadratic equation[4]:

Its appearance is similar in structure to HTML. Unlike HTML, MathML is not designed to be hand-written. We recommend that you compose equations in a visual editor and paste its MathML output into Desire2Learn's Equation Editor.

```
<math mode="display" xmlns="http://www.w3.org/1998/Math/MathML">
  <mrow>
    <mi>x</mi>
    <mo>=</mo>
    <mfrac>
      <mrow>
        <mo form="prefix">&#x2212;<!-- − --></mo>
        <mi>b</mi>
        <mo>&#x00B1;<!-- &PlusMinus; --></mo>
        <msqrt>
          <msup>
            <mi>b</mi>
            <mn>2</mn>
          </msup>
          <mo>&#x2212;<!-- − --></mo>
          <mn>4</mn>
          <mo>&#x2062;<!-- &InvisibleTimes; --></mo>
          <mi>a</mi>
          <mo>&#x2062;<!-- &InvisibleTimes; --></mo>
          <mi>c</mi>
        </msqrt>
      </mrow>
      <mrow>
        <mn>2</mn>
        <mo>&#x2062;<!-- &InvisibleTimes; --></mo>
        <mi>a</mi>
      </mrow>
    </mfrac>
  </mrow>
</math>
```

Adding math using an external editor

FOR USE WITHIN DESIRE2LEARN

Although the Equation Editor is practical for adding math to quizzes, news postings, discussions, etc., we recognize that many choose to create their core course content using an external editor, such as Dreamweaver or Softchalk. If you prefer to create content externally before uploading it to Desire2Learn, you can enter MathML directly in the <body> section of your HTML pages. As of version 9.4.1, our Learning Suite automatically recognizes MathML script and renders it using MathJax.

If you are using an earlier version of the Learning Suite, you must add an additional script to the <head> section of your HTML documents (see the "For use elsewhere" section below) and ensure that students select the MathML display setting from their preferences.

FOR USE ELSEWHERE

If you want to leverage MathJax outside of the Learning Suite, you must add ascript within the <head> section of your HTML documents, for example:

```
<script type="text/javascript" src= "http://cdn.mathjax.org/
mathjax/latest/MathJax.js?config=TeX-AMS-MML_HTMLorMML">
</script>
```

Visit **http://www.mathjax.org/docs/2.0/start.html#mathjax-cdn** to find the latest script and learn more about using MathJax in other web pages.

References and links

1. **http://www.accessiblemath.dessci.com/2009/04/nfb-endorses-mathml.html**
2. **http://en.wikipedia.org/wiki/MathML**
3. **http://en.wikibooks.org/wiki/LaTeX/Mathematics**
4. **http://en.wikipedia.org/wiki/MathML**

Go to **http://www.mathjax.org** to learn more about MathJax features.

Go to **http://www.dessci.com/en/products/mathplayer** to download and learn more about Design Science MathPlayer™.

Visit **https://documentation.desire2learn.com** and navigate to Learning Environment > Creating Content > HTML Editor > under "How do I create equations in the HTML Editor?" This topic includes more detailed steps for using the Equation Editor and information about the palettes available in the graphical editor.

About us

Desire2Learn helps improve our world by pioneering innovative methods and environments to engage and inspire learners throughout their lives. Making education more accessible helps learners reach their full potential by reflecting the unique needs of organizations, instructors, and students.

A global leader in cloud-based (SaaS) learning solutions, Desire2Learn provides an open and extensible platform for over 1,100 clients and 13 million individual learners learners in higher education, K–12, healthcare, government and the corporate sector, including Fortune 100 companies. Desire2Learn has personnel in the United States, Canada, Europe, Australia, Brazil and Singapore.

CONTACT

Visit	Desire2Learn.com
Phone	1-519-772-0325 (Worldwide)
Toll-free	1-888-772-0325 (North America) 0-808-234-4235 (United Kingdom & Europe) 0-800-452-069 (New Zealand) 1-800-656-210 (Australia) 0-800-891-4507 (Brazil)
Fax	1-519-772-0324
Facebook	facebook.com/Desire2Learn
Twitter	@Desire2Learn
Email	contactus@Desire2Learn.com