Ximera MARKUP IN PRACTICE

WARNING This document is currently under development.

CONTENTS

The goal of the *Ximera* Project is to allow authors to write online interactive content though LaTeX documents.

1. PHILOSOPHY

Since Ximera is built on LaTeX source, we want to use LaTeX as a method of validating the code authors write. Hence, if you want to write a Ximera online activity, the first step is constructing LaTeX documents. Once you have the LaTeX documents, and you have checked them for typos, accuracy, etc, the fact that they compile should be reasonable evidence that they will display correctly in *Ximera*.

2. SETUP

The directory **ximeraLatex** contains example files and **ximera.cls**. To get started, you need to put **ximeraLatex** someplace where your installation of LaTeX will find it. This dependes on your system, but we can give some advice:

2.1. **For Linux.** Create the directory structure **~/texmf/tex/latex/** and place **ximeraLatex** in **~/texmf/tex/latex/**.

```
~.....................................................Your home directory
└─texmf
  └─tex
    └─latex
      └─ximeraLatex
```

2.2. **For Mac.** Create the directory structure **~/Library/texmf/tex/latex/** and place **ximeraLatex** in **~/Library/texmf/tex/latex/**.

```
~.....................................................Your home directory
└─Library
  └─texmf
    └─tex
      └─latex
        └─ximeraLatex
```

2.3. **For Windows (MiKTeX).** Create the directory structure **C:\localtexmf\tex\latex** and place **ximeraLatex** in **C:\localtexmf\tex\latex**.

```
C:
└─localtexmf
  └─tex
    └─latex
      └─ximeraLatex
```

For MiKteX to notice this directory, go to:

(1) Start → All programs → MiKTeX Folder → Maintenance (Admin) Folder → Settings (Admin).
(2) Now select the tab "Roots."
(3) Click "Add" because you are going to add a path.
(4) Find **C:\localtexmf** and click "OK."
(5) Click "apply" "OK" and then you are ready to go.

This will allow all of your documents to find **ximera.cls**. Note, it is important that none of the directories containing ximeraLatex have spaces in their names.

2.4. **Test your system.** At this point we think that **ximeraLatex/firstExample/firstExample.tex**, **ximeraLatex/secondExample/secondExample.tex**, and **ximeraLatex/exampleActivityCollect** should compile. If you are running windows, then it may be the case that you need to make copies of these files—and compile them elsewhere.

3. Writing a new activity

Now let's write a new activity. The basic structure of the document is:

```
\documentclass{ximera}
\input{preamble.tex}
\title{New activity}
\begin{document}
\begin{abstract}
  An attempt to write a new activity.
\end{abstract}
\maketitle
\end{document}
```

Note, the **abstract** needs to be short. We suggest a single sentence.

Here the file **preamble.tex** contains all of your user-defined commands. Note, if environments are defined here, they probably will not work in *Ximera*. If you have a need for an environment that is not supplied in **ximera.cls**, then you should contact us at **ximera@math.osu.edu**.

To help navigate the collection of activities, authors should try to include prerequisites, and outcomes. Each prerequisite and outcome should be without spaces, and every attempt should be made to use already available tags for the prerequisites and outcomes needed/delivered by this activity.

```
\documentclass{ximera}
\input{preamble.tex}
\prerequisites{prereq1,prereq2}
\outcomes{outcome1,outcome2}
\title{New activity}
\begin{document}
\begin{abstract}
  An attempt to write a new activity.
\end{abstract}
\maketitle
\end{document}
```

4. Writing basic questions

The *Ximera* Project offers four basic problem-like environments: **exercise**, **question**, **exploration**, and **hint**. From the interactive viewpoint, each of these environments does basically the same thing, providing a question for the student.

The **exercise** environment is for checking computational or rote performance:

```
\begin{exercise}
  An exercise.
\end{exercise}
```

The **question** environment is for a more challenging problem.

```
\begin{question}
  A question.
\end{question}
```

The **exploration** environment is for more open-ended problems.

```
\begin{exploration}
  An exploration.
\end{exploration}
```

The **hint** is a sub-question environment that will help with solving the main question.

Each of these environments (except for hint) can have space after it in via an optional documentclass argument **space**.

```
\documentclass[space]{ximera}
...
\begin{exercise}
  An exercise followed by 2 inches of space.
\end{exercise}

\begin{exercise}[5in]
  An exercise followed by 5 inches of space.
\end{exercise}
```

5. Adding solutions and answer fields

As coded above, none of the problem-like environments have answers, they are simply displayed questions. For a problem-like environment to have a solution, we must add a **solution** environment.

```
\begin{question}
  A question.
  \begin{solution}
    A solution.
  \end{solution}
\end{question}
```

However, as it stands, the student will be presented with a problem, and then be able to "click" to see the solution. To have an answer field we to add the **answer**. Note, if the answer is a math expression, then the $ ... $ should be inside the answer.

```
\begin{question}
  A question.
  \begin{solution}
    A solution.
    \answer{The answer}.
  \end{solution}
\end{question}
```

The default type for an answer is a mathematical expression—hence the argument should be inline math-mode:

```
\begin{question}
  A question.
  \begin{solution}
    A solution.
    \answer{$6$}.
  \end{solution}
\end{question}
```

However, there are other choices: **free-response**, **image**, and **multiple-choice**. The option **free-response** provides a text field that is ungraded. The option **image** allows the student to upload an image as the solution.

For multiple-choice questions, authors should use the **multiple-choice** environment to list the solutions. This has an optional argument to display fewer than the total number of options. No **answer** should be given with multiple-choice, as this information is encoded with the choices. However, a solution should be given, and this would include things that would aid the online student, as well as any **hints**, see below.

```
\begin{question}
  A multiple choice question.
  \begin{solution}
  \begin{multiple-choice}[3]
    \choice[correct]{Choice a.}
    \choice{Choice b.}
    \choice[correct]{Choice c.}
    \choice{Choice d.}
```

```
  \end{multiple-choice}
     Select the best answer above.
  \end{solution}
\end{question}
```

Note, the **multiple-choice** list needs to go inside the **solution**.

6. Questions with multiple-parts and hints

To add questions with multiple parts, simply add more answers to the solution environment.

```
\begin{question}
  A question.
  \begin{solution}
    First solution.
    \answer{First answer}.
  \end{solution}
  A follow-up question.
  \begin{solution}
    Second solution.
    \answer{Second answer}.
  \end{solution}
\end{question}
```

To add hints to the question, add a **hint** within the **solution** environment.

```
\begin{question}
  A question.
  \begin{solution}
    \begin{hint}
      A hint.
    \end{hint}
    A solution.
    \answer{First answer}.
  \end{solution}
\end{question}
```

Or with a multiple-choice question:

```
\begin{question}
  A question.
  \begin{solution}
  \begin{multiple-choice}[3]
    \choice[correct]{Choice a.}
    \choice{Choice b.}
    \choice[correct]{Choice c.}
    \choice{Choice d.}
  \end{multiple-choice}
    Select the best answer above.
    \begin{hint}
      A hint.
      \end{hint}
  \end{solution}
```

```
  \end{question}
```

To make the hints more Socratic, they themselves can be questions with solutions with/or without answer fields:

```
\begin{Verbatim}
  \begin{question}
    A question.
    \begin{solution}
      \begin{hint}
        A hint.
        \begin{solution}
        The solution to the question asked by the hint.
        \end{solution}
      \end{hint}
      \begin{hint}
        Another hint.
        \begin{solution}
        \answer{An answer to the hint.}
        This time the hint was a question with an answer field.
        \end{solution}
      \end{hint}
      A solution.
      \answer{An answer}.
    \end{solution}
  \end{question}
```

7. Presenting one question of a variation of questions

To allow the student to master a concept, it is often useful to have a variation of questions that are all presented as a single question in the online experience. To do this, use the **shuffle** command.

```
  \begin{shuffle}
    \begin{question}
      A variation of a question, solution etc.
    \end{question}

    \begin{question}
      Another variation of a question, solution etc.
    \end{question}
  \end{shuffle}
```

By default **shuffle** initially presents a variation of the problem at random for the student to solve with the option of repeating the question, though due to the randomization, the student will probably be asked to solve a different variation of the question. As student data is collected, the presentation goes from truly random to a more adaptive approach, presenting easier or harder questions based on the student's performance. The highest score achieved on any of the variations of the question is recorded as the students performance. There are several options for **shuffle**,

once: Chooses a problem variation at random and allows exactly one attempt to solve the problem.

order: Presents the problems in the order listed to the student, should the student choose to attempt the problem multiple times.

mastery: Presents the problems initially at random and encourages the student to attempt the problem multiple times. This will change to an adaptive presentation after enough data is collected. Here the score is based on the aggregate performance, rather than the single highest attempt.

```
\begin{shuffle}[mastery]
  \begin{exercise}
    A variation of an exercise, solution etc.
  \end{exercise}

  \begin{exercise}
    Another variation of an exercise, solution etc.
  \end{exercise}
\end{shuffle}
```

8. Adding interactive elements

To add interactive elements, use the **interactive** environment.

```
\begin{interactive}[interactiveContent.js]
  Static content.
\end{interactive}
```

9. Images and videos

To include an image, TikZ or otherwise, use

```
\begin{image}
  A TikZ Image
\end{image}
```

Links to videos can be added with the **youtube** or **video** command. If the video is a YouTube video, it is best to use the **youtube** command.

```
\video{some-video-url}
\youtube{some-video-url}
```

The document class allows for some optional arguments:

nohints: Displays all questions with solutions but no hints are shown.

handout: Displays the first of each question in a shuffle environment, without solutions or hints.

space: To be used with the **handout** option, provides 2 inches of blank space below each problem. Note: Each problem environment also has an optional argument where the author can change the amount of space displayed.

numbers: To be used when producing a compilation of activities.