CHAPTER 12
Databases

This chapter covers the following MTC skills: 5.12 Database

The database module provides a tool for collaborative development of a database within the course. For those of us old and geeky enough to remember, it's Moodle's answer to Apple's FileMaker program: a simple, easy-to-use, general purpose database. It's not meant to be very complex or powerful, it's simply a way for multiple people to add structured data to a shared resource.

Only your imagination limits the potential uses of the database module. You could use the database to create glossaries, catalogs, taxonomies, registrations, paper submissions, maps, or anything where the students in your class can fill in a form to add data.

Creating database activities is a little more involved than most of the Moodle activities, but it's not as complex as lessons. You also have the option of using a preset of an empty database activity, rather than creating your own from scratch. An image gallery preset is currently included in the database module, though more database presets will be available in the future. For now, however, let's create a database activity from scratch, based on the goals you have for the students in your course.

The database module should not be confused with the database that powers your Moodle site. The database module is an activity type, which uses the Moodle database to store data. The Moodle database stores data for all modules and for your Moodle site.

Creating Databases

A database is made up of fields and templates. Fields define the type of data the database will store: text, dates, files, URLs, etc. Templates allow you to control the visual layout of information when listing, viewing, or editing database entries.

A database activity has three basic template types:

List template
: The list template allows you to control the fields used and their layout when viewing multiple entries. Usually an overview of each entry is provided, with more detailed information available by clicking on an entry to access the single view.

Single template
: The single template is for displaying the detailed view of a single entry. All the data the user entered should be visible here.

Add template
: The add template creates the interface form used when adding or editing database entries.

As with many of the activity modules, a little preplanning can go a long way when you are thinking about developing a database activity. The field definitions determine the fields in the add template, which determine the data you can display on the list and single templates. Before you being digging into the database, try to sketch out the fields you think you need the students to enter, and how you might want to lay them out in each template.

Once you have a rough sketch, creating the database itself will be easier and you will less likely need to go back and add fields later (although you can if you need to).

Moodle.org has three good examples of database activities:

- Moodle Buzz (*http://moodle.org/mod/data/view.php?id=6140*), a database of the titles, authors, and web links to news articles mentioning Moodle
- Themes (*http://moodle.org/mod/data/view.php?id=6552*), a database containing screenshots, download links, and user comments about Moodle themes
- Modules and plug-ins (*http://moodle.org/mod/data/view.php?id=6009*), a database containing a number of web links and information about the modular components of Moodle

Browsing these activities can give you ideas for each of the template types.

Adding a Database

The first step to creating a database is adding it to the appropriate section of your course. As with most Moodle activities, you first set the options for the database, then create the fields and templates.

To create a database activity:

1. Select Database from the "Add an activity" drop-down menu in the course section where you would like to add the activity.
2. On the "Adding a new database" page, as shown in Figure 12-1, give the database a name and a description.
3. Select the general options:

   Available from/to
   : The dates the database is both visible to students and open for data entry.

   Viewable from/to
   : The dates the database is available for viewing, but not open for data entry.

   Required entries
   : The number of entries each student is required to enter before the database activity can be considered complete. The student will see a reminder message if she has not submitted the required number of entries.

   Entries required before viewing
   : The number of entries the student needs to submit before he can see entries by other students. If the student has not submitted the required number of entries, he will only see the entry page and not the list or single view pages.

   Maximum entries
   : The maximum number of entries the student can submit before she is blocked. This prevents people from spamming the system, either in the hope that one entry is good enough or, on a public site, as a way of advertising.

   Comments
   : Enables commenting on entries. The comments field appears on the single view template when this is enabled.

   Require approval?
   : Allows you to require each entry to be approved by someone with the appropriate role before other users can view it.

   RSS articles
   : Enables you to publish an RSS feed of entries in the database. The option here sets the number of entries available in the feed.

RSS feeds need to be enabled by your system administrator.

   Allow posts to be rated?
   : Lets you allow posts to be rated, which will enter a score in the gradebook for the student's submissions in the database. The grade is set using the drop-down menu below this option.
4. Select the common module options:

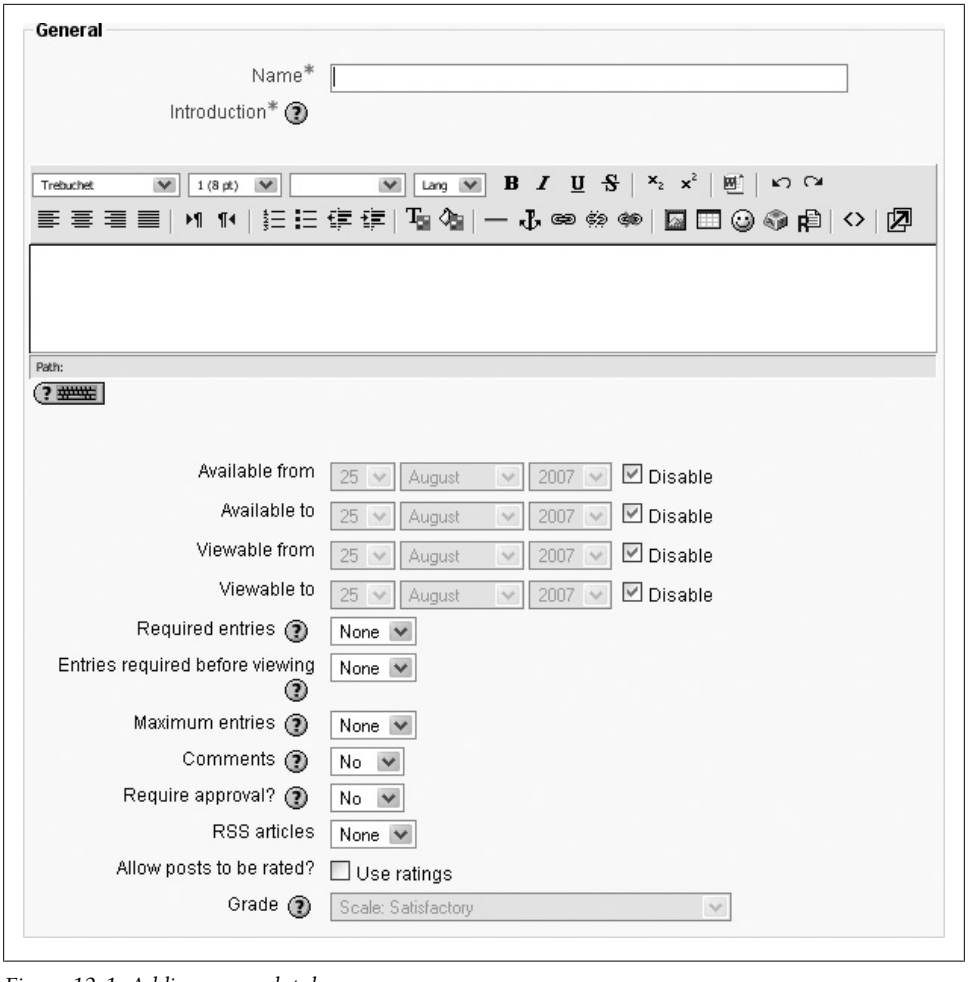


Figure 12-1. Adding a new database

Group mode
: This is another location in which to set the group mode for the activity. If group mode is forced in the course settings then this setting will be ignored.

Visible
: This determines whether students may view the activity or not.

5. Click the "Save changes" button and you will be taken to the database setup page.

Creating Fields

The field definitions create the basic structure of the database and determine what kind of information students can enter into your database. You are provided with a choice of 12 data field types:

Checkbox
: For students to select one or more checkboxes. To add multiple checkboxes, enter each option on a different line in the options text field.

If you want to ensure that a student actively selects only one of the options, it's better to use the radio buttons field.

Multiple checkboxes can be useful, for example, for different film genres in a movie database. You can check more than one in the case of Horror-Comedies or Comedy-Westerns. The menu (multiselect) field also achieves this, but clicking multiple checkboxes is usually a more obvious interface.

Date
: For students to enter a date by picking the day, month, and year from a drop-down list.

File
: For students to upload a file of any type from their computer.

If you want students to upload image files, it's better to use the picture field.

Latitude/longitude
: For students to enter a geographic location by specifying the location's latitude and longitude. When students view the entry, links are automatically generated to geographic data services such as Google Maps, Google Earth, or Multimap.

Menu
: For students to select an option from a drop-down menu. Enter each option on a different line in the options text field.

Menu (multiselect)
: For students to select multiple options from a drop-down menu (by holding down the Control or Shift key as they click).

The checkbox field offers the same options as menu (multiselect) but with a more obvious user interface.

Number
: For students to enter a number (positive, negative, or zero).

Picture
: For students to upload an image file from their computer.

Radio buttons
: For students to select just one option from a list. If used, "radio buttons" is a required field; a student may only submit his database entry after selecting an option.

Text
: For students to enter text up to 60 characters in length. For longer text, or for text that requires formatting—such as headers and bullet points—the textarea field should be used.

Textarea
: For students to enter text longer than 60 characters in length and/or include formatting such as headers and bullet points.

URL
: For students to enter a URL. Selecting "Autolink the URL" will make the URL a clickable link, and entering a forced name for the link means that the name will be used for the hyperlink.

To create the fields for your database:

1. On the database setup page, select the field type you want to add from the "Create a new field" drop-down menu.
2. Enter a field name and a field description. The field name is used to create the templates, so make it unique and long enough to be descriptive, but not too long to retype.
3. If necessary, add/select the options for each field type. For example, you can set the height and width of the text area generated by the textarea field.

Once you've defined the fields you want to use in your database, as shown in Figure 12-2, you are ready to begin editing your templates.

Editing Templates

Once you have created the fields for your database, you will probably want to edit the templates that define the user interface. Creating the fields produces a default template,

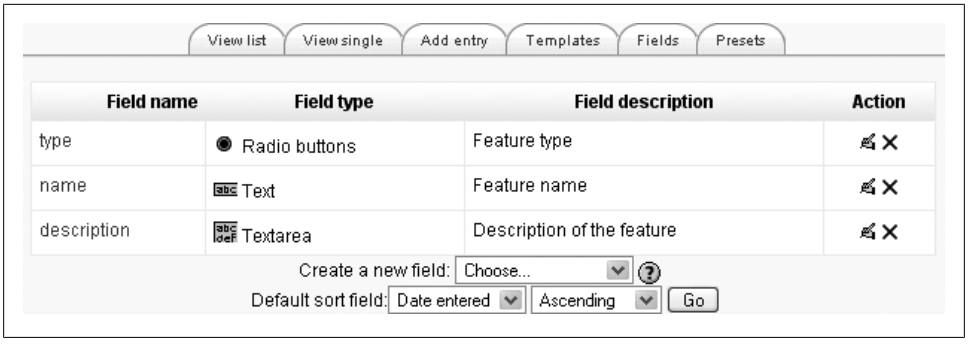


Figure 12-2. Database fields

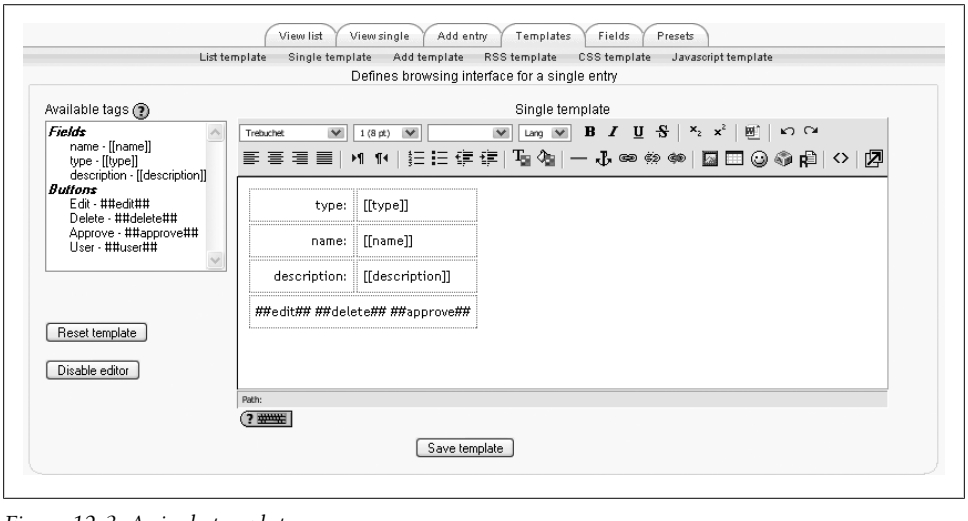


Figure 12-3. A single template

as shown in Figure 12-3. However, with a little work, you can improve the defaults considerably.

Database templates all work on the same principle. They are basically HTML pages with a new set of tags for the database module to interpret. When editing a template, Moodle displays a list of available tags on the left side of the editing screen. Double-clicking on any of the tags adds it to the template. The database activity interprets these new tags before sending the template's HTML to the browser for display. It looks for words enclosed in either two square brackets ([]) or two hash signs (##), representing two different types of interface elements it can add to the template.

The square brackets define data tags, which tell the module to replace the word in the brackets with the value or form element of the field with the same name. So if you have a database with a name field, you would represent it in the template with [[name]]. In the single or list template, the module would replace it with the data in the name field

for that entry. In the list template, the module would replace it with a text field, and put the value in the text field if you're editing the entry instead of creating a new one.

The ## tags indicate the word should be replaced by an icon or link for interacting with the module. These tags are used to place the edit and delete icons, and links for More, Approve, Comments, and User. If you want to add the edit icon to a template, you just add a tag that looks like ##edit##. When the user looks at the page with the tag, the database module replaces it with the edit icon. If the user then clicks on the icon, it takes her to the edit template.

The edit and delete icons only appear for users with appropriate capabilities allowed. The Approve and Comments links only appear if these options are enabled AND only for users with appropriate capabilities allowed.

Aside from the replacement tags, creating a template is just like creating an HTML page. Use a table to lay out the data elements (this is an acceptable use of tables for layout), add descriptive text around the replacement tags, and publish. The database makes it easy to rapidly view your changes by flipping between the Templates tab and the tab for the template you are working on.

Don't forget to save the template before you switch views! It's easy to forget, and very frustrating to switch views and have the template look exactly the same because you forgot to save!

When you are editing the template, you may find the HTML editor gets in your way, especially when editing the list template (more on the list template below). Fortunately, Moodle has a toggle button for enabling and disabling the HTML editor in the template editing screen. Just below the "Reset template" button on the left side of the template page, you'll see the "Enable/Disable editor" button. Disabling the editor allows you to get your hands dirty with the raw HTML code rather than trying to use the editor's GUI. Most of the templates are quite simple, and switching the editor off is a great way to learn how the templates are structured.

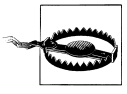
As mentioned previously, there are three basic templates necessary to use the database: list, single, and add. The three other templates—RSS, CSS, and JavaScript—are more advanced templates and aren't necessary for basic database use.

To edit a template:

1. On the database page, click the Templates tab.
2. Click one of the template links below the row of tabs.
3. When you are done, click the "Save template" button.

Add template

Add template is used to create and edit new entries. In this template, data tags are replaced with the form element for the field. If the user is editing an entry, the field will have the data from the field in the form element for editing as well.



It's important to list every field you want the user to fill in on this template. If you leave off a field, the user won't be able to add or edit its data.

If you have a lot of form elements, consider grouping them together logically. For example, if you have a database asking students to build a catalog of insects found during a field trip, you may want to separate the description and taxonomy from the location data. It will make it easier for students to fill in and organize their data.

Single template

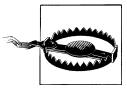
The single template, as shown earlier in Figure 12-3, is the detailed view of an entry. This template should list all of the available data. Again, consider organizing the data if you have a lot of fields in your database.

List template

The list template is the first page students will see when they come to your database. The list template should give an overview of the entries and enable users to click through to the single or edit template.

Organizing a good list template is a bit of a challenge. First, you should identify the fields that will be most helpful to users for selecting the entries they want to view. The default layout almost always has too much information and is not laid out well.

The form has three areas: the Header, Body, and Footer. If you lay out the list template as a table, you'll want to use the Header area as the table header, the Body for the data, and the Footer to close the table, as has been done for the *Moodle.org* modules and plug-ins and Moodle Buzz databases. But the HTML editor puts a full table in each area, which makes it difficult to get proper alignment of the elements and not repeat the headers for every entry.



A knowledge of tables in HTML is required in order to lay out the entire list template as one table.

To make the entire list template as one table:

1. On the list template page, turn off the HTML editor. Figure 12-4 shows the list template from the *Moodle.org* modules and plug-ins with the HTML editor turned off.

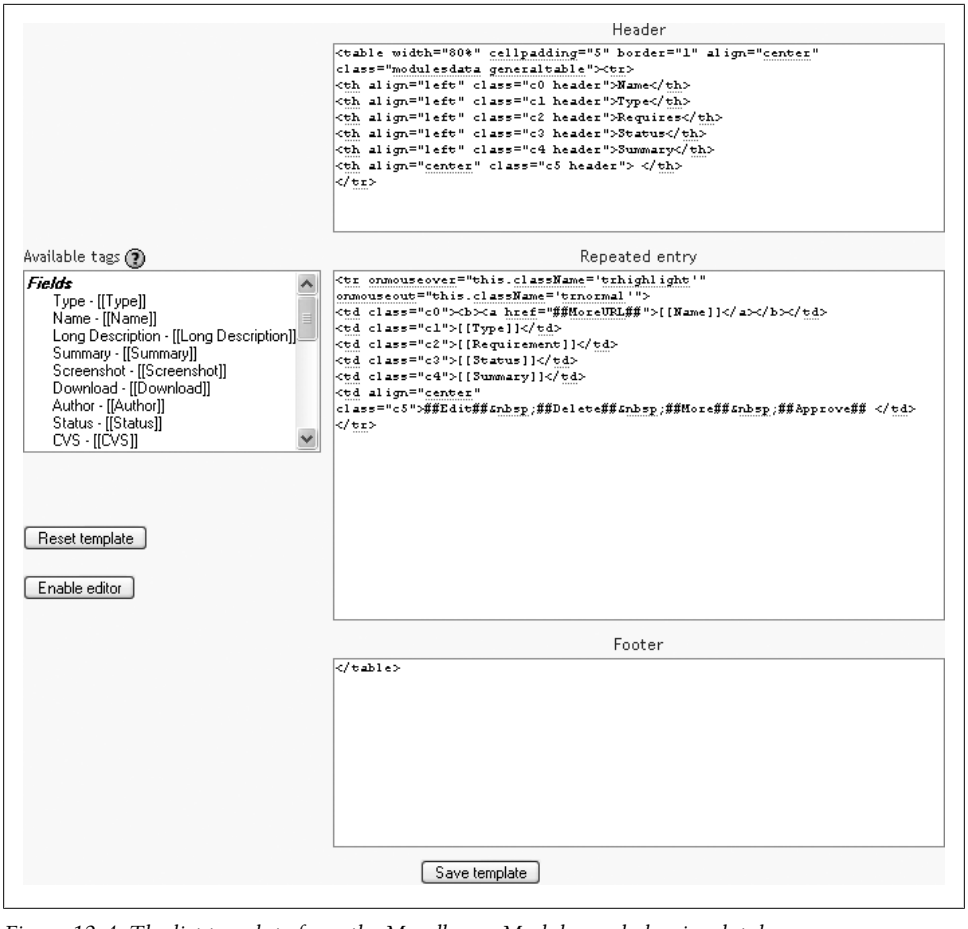


Figure 12-4. The list template from the Moodle.org Modules and plug-ins database

2. In the Header area of the template, open the table and add a row for your header text. Each column should contain one element of the header.
3. In the Body, create another row with the data and command replacement tags.
4. In the Footer, close the table.
5. Save the template. DO NOT switch the HTML editor on while editing this template. If you turn the editor back on, it will create tables in each of the areas.

RSS template

The RSS template allows you to structure the RSS feed from the database. If you have enabled RSS feeds for the database in the database options, the database will publish the entries in a feed. This template allows you to structure how the entries in the feed appear to the readers.

CSS template

The CSS template defines the CSS styles for all of the templates in the database. If you know CSS, you can adjust the template's fonts, spacing, colors, and other display information.

JavaScript template

Like the CSS template, the JavaScript template is used by the other templates. The JavaScript template allows you to add new behaviors to the templates by defining JavaScript routines that can be loaded when the template page loads. At the time of this writing, the JavaScript API isn't yet documented, but the image gallery preset uses JavaScript to define the size of images in the list and single templates.

Managing Databases

Once you have set up your database, you and your students can begin to enter data. Managing your database as students begin to populate it with data is an important factor in the success of a database activity. Someone will need to maintain the quality of the entries and give students credit for participating.

Quality Data

Once students have started to add entries to your database, you will need to track their data to help ensure they are making useful contributions. Managing the quality of database entries can be a tedious exercise, but it can also be a learning opportunity for your students. Students will enter their data according to their interpretation of the activity and their abilities. An inaccurate or disorganized entry from a student is a potential opportunity for feedback to help the student learn.

The database module has a few tools that will be useful to you in ensuring data quality:

Comments
: Comments are a great tool for feedback to motivate your students and help them improve their entries.

Require approval
: The ultimate quality assurance tool is the "Require approval" option in your database options. As mentioned earlier, this option hides an entry from the rest of the class until you or someone with approval capability approves it. You might want to use this capability to help students produce good material by giving them feedback before approving an entry.

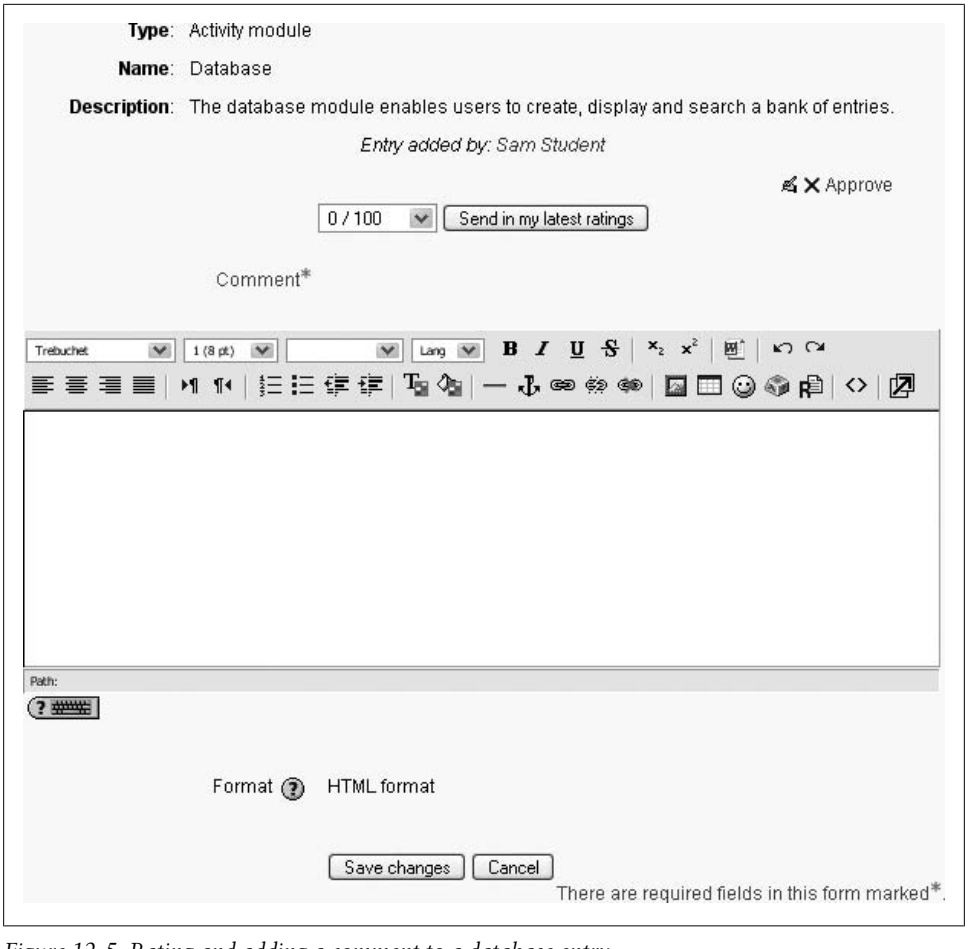


Figure 12-5. Rating and adding a comment to a database entry

Rating

Giving grades for entries is the single most powerful motivator for students. It also rewards students for their time and effort. As always, if you don't want to assign a numerical grade to an entry, you can create a custom scale and assign a qualitative grade. (We'll cover grades and scales in Chapter 13.) When you rate an entry, the grade is added to the gradebook, like a rated forum post.

We would strongly recommend combining rating and comments, as shown in Figure 12-5. Rating allows you to assign a numerical value to an entry, but it doesn't give you a method to tell the student why she received her particular grade. The comments box enables you to communicate the reason.

Rating and comments can be turned into a collaborative venture with your students. By default, students are allowed to add comments, but only teachers are allowed to rate entries. However, you can enable collaborative rating by setting a student role override.

If you don't see the "Override roles" link in the Roles tab, ask your system administrator. By default, teachers are unable to override roles, so this ability must be granted by your system administrator, as well as setting which roles can be overridden by the teacher role.

To enable student rating of entries:

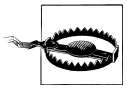
1. On the Updating database page, select the Roles tab.
2. Click the "Override roles" link just below the tabs.
3. Select the student role from the list of roles in your course.
4. Select Allow for the "Rate entries" capability, as shown in Figure 12-6.
5. Click the "Save changes" button.

Database Presets

To avoid the necessity of always having to create a new database from scratch, the database module has a presets feature. As mentioned already, an image gallery preset is currently included in the database module to help get you started. You can create your own presets as well and share them with others.

To use a preset:

1. On the database page, click the Presets tab.
2. Either click the "Choose file" button, browse for the preset ZIP on your computer and click Import, or choose a previously loaded preset.



If you have already created fields in your database, you need to map them to the new fields in the preset or they will be deleted. For example, if you load the image gallery preset, you can map three fields to the image, title, and caption fields in the preset. Any other fields will be deleted and any data in them will be lost.

3. If you desire, customize the fields and templates.

That's all there is to using a preset. All the hard work of setting up the templates has been done for you.

If you wish to share your database presets with others, you have two options:

1. Export as a ZIP file, which can then be imported to another course or Moodle site.
2. Save as a preset, which publishes the database for other teachers on your site to use. It will then appear in the preset list. (You can delete it from the list at any time.)

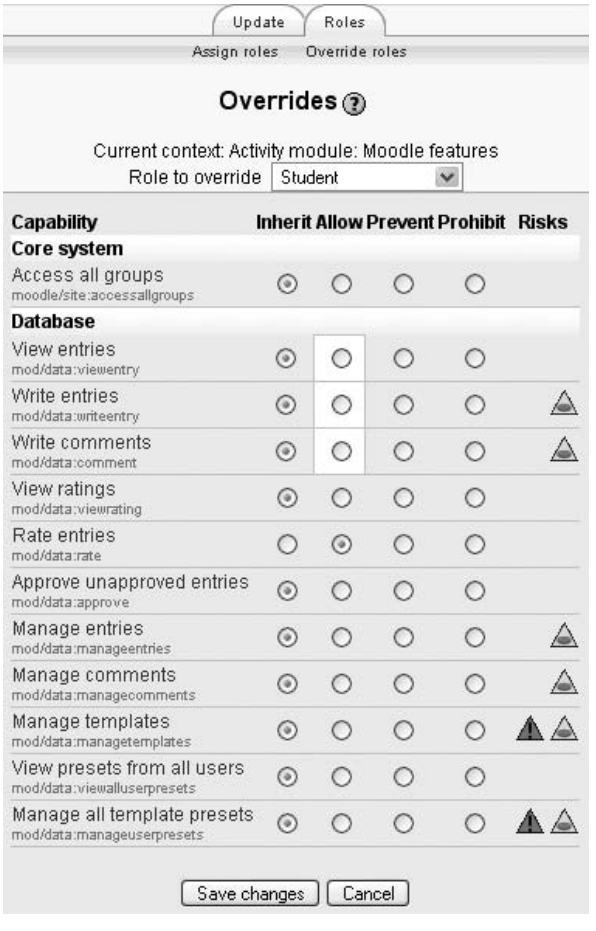


Figure 12-6. Setting a student role override

Only the fields and templates of the database are copied when exporting or saving it as a preset, not the entries.

Database Capabilities

The database module has a number of capabilities you can use to fine-tune your users' interaction with the activity.

View entries
: This allows a user to view database entries submitted by other users. This capability is moderated by any submission requirements in the database options, such as the number of entries required before viewing.

Write entries
: This allows a user to create new database entries.

Write comments
: This allows a user to add comments to database entries. This capability is only active if the comments option is enabled.

  By default, students are allowed to add comments. If you only want teachers to be able to add comments, you can prevent this capability with a student role override.

View ratings
: This allows a user to view all ratings.

Rate entries
: This allows a user to rate entries by other users. This capability is only active if the "Allow posts to be rated" option is enabled.

  The capabilities to write comments and rate entries together allow students to provide feedback on entries.

You may want to select a small group of students as moderators and create a role for them to provide feedback to others.

Approve unapproved entries
: This allows a user to approve entries before they are viewable by everyone. This capability is only active if the "Require approval" option is enabled.

Manage entries
: This allows a user to edit and delete other users' database entries.

Manage comments
: This allows a user to edit and delete other users' comments.

Manage templates
: This allows a user to edit and delete the interface templates of the database. If you want students to create database activities for each other, you can enable this capability for them.

View presets from all users
: This allows a user to view the list of site presets and select them for use.

Manage all template presets
: This allows a user to delete site presets.

Effective Database Practices

The database activity is both powerful and complex. It is probably the most technical module to set up, though a complex lesson may take longer, but it has tremendous power. The database is a veritable Swiss Army knife, useful in many situations with a little ingenuity and work.

To reduce your workload creating databases, make use of one of the presets available on *Moodle.org*. If a preset doesn't meet all of your requirements, it's easier to customize an existing database than create one from scratch.

You can also share the work of creating a database. If you want your students to create and submit a database for a project, you can override the student role and grant them authoring capabilities. If you then use the separate groups mode, each group can create its own database of research and submit it at the end for grading.

Remember to use roles and groups functionality to create additional flexibility to your database.

Creative Database Practices

With a little creativity, the database activity can become a useful tool for collaboration. The structure provided by the field definitions and the templates makes it easier for students to understand what you expect of them and to provide each other with good data. Combined with less structured activities, like wikis and forums, you have a powerful combination of thinking tools to enable your students to produce good work.

Student files area

Long-time Moodle community member and high school German teacher Art Lader uses the database module to create a student storage tool. Creating a database to allow students to upload files and then download them in a different location produces a very simple-to-use content repository.

If you want to make a private student storage tool, so that only the student and teacher can access the student's files, you can set the database so that entries require approval, but never approve the students' entries. This will keep them invisible to everyone except the student and the teacher.

You could use a file storage area in a small business as a repository of proposals or other work products for sharing amongst your team.

Collaborative research

In addition to allowing students to store files, you can also use the database to collect information and references for collaborative research projects in a course. If you use the groups mode, each workgroup can have their own collection and work together to find books, articles, URLs, and other resources to share.

Voting and comments

The database module can also be used to gather feedback on a list of ideas for a project or a guest lecturer. The rating and commenting fields can be used to capture group feedback, as well as give you a tool for providing feedback to students. To set up voting, select an appropriate scale when you set up the database options. To allow students to comment, enable commenting in the database options.