Manual Designing in the Digital Mathematics Environment Part 3
Introduction

The DME (Digital Mathematics Environment) is a web based learning environment, designed for the subject mathematics. It gives schools the possibility to offer students part of the mathematics subject matter digitally. Student work will be stored on a central server, turning the DME into a kind of digital workbook. Teachers can see student work in a score overview, but also per student on a detailed level.

- The Edit feature gives the teacher the opportunity to design activities himself. This may be done by changing existing activities, but it is also possible to design entirely new activities.

In this manual Designing Part 3, we explain how entirely new activities can be designed using the more advanced features of the DME.

Other Manuals

Manual Designing Part 1 shows the starting designer the basics of designing in the DME environment. The idea is to follow the step-by-step examples, in order to become familiar with changing and creating activities.

While creating activities in the DME, different type of basic components (basis widgets) can be used. The choice for a specific basic widget depends on the type of assignment; for example adding fractions, solving an equation, or choosing between possible answers. Each basic widget has its own possibilities to assess the answer that is entered in the answer box and to give feedback. In Manual Designing part 2 various basic widgets and their features are described.

On www.dwo.nl/en/teacher, as an addition to the manuals, you can find detailed explanations and examples of several widgets:

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1. Installer for Author Environment without Java

Working with Java through a browser can sometimes give problems. Now it is possible to download a program that installs the teacher environment on a computer or laptop. It is no longer necessary to install Java. This installed teacher environment is more stable than when using a browser. Because this application uses the data from the DME web server, you have to be online.

Numworx/DME Author environment Windows 32/64-bit
Numworx/DME Author environment MacOS

2. Settings of an activity

a. Using the button [Options]

When you look at an activity in the edit mode, you see this button at the bottom of the page. After clicking on this button, the following pop-up appears.

Each option holds for the entire activity. Explanation for some of the options:
Mathematics
Check option significant numbers
With this option you can decide whether, with rounding numbers, answers like 0.3 or 0.30 are marked completely correct or not.
(See Functions for random parameters)

Differential operators
This enables that each d in formula boxes is seen as a differential operator:
Each d will be written normal instead of in Italic.
You can make d/dx by creating a fraction and typing d in the numerator and dx in the denominator.

When ‘differential operators’ is not checked, you would have to always use the keyboard of the formula editor:

Layout
Font options
Setting the font and font size in the options menu will not only affect the texts in text boxes, but also in formula boxes, answer boxes, feedback and pop-ups.
When your students work on a tablet, we recommend choosing a font size of 14 or 16.

Font-inheritance text boxes
When this option is checked, text boxes inside text boxes will automatically have the font size that was selected.

Font-inheritance formula boxes
When this option is checked, then all formulas in formula boxes will automatically have the font size that was selected.
b. Different type of activities: practice or assessment

Step-by-step feedback is a powerful option, but it has some downsides as well. It may evoke unwanted trial-and-error behavior, and the student may ‘lean’ too much on the feedback and ‘unlearn’ self-checking.

Therefore different ways to minimize or delay feedback and avoid trial-and-error behavior have been implemented.

There are five options:

- **Practice**
  Every step is checked. Errors can be corrected endlessly without losing points.

- **Practice game**
  Every error costs 2 points (out of the available 10).
**Self-test**
The answer is only checked when the ‘Check’ button is pressed after finishing the series of assignments. Checking more often will affect the final score. When checking the self-test, the DME does not only indicate incorrect answers, but also the correctness of each step (Only for linear and quadratic equations). For example:

![Calculated expression]

**Test**
The test can only be checked by a teacher.

**Practice endless**
A button is added to let the assignment be repeated (only useful for randomized assignments).

The selected option is active for all pages in an activity.
3. Text boxes

The text box is an important design component. While designing, you will notice that it is often useful to place not only text, but also pictures, graphs, and other components in a text box because of the opportunities offered by this box. Text boxes play an important role and can be adapted to the purpose for which they are used.

A few examples:
- Highlight texts using background colors, with or without border
- Different font (type, size, color)
- Arrange text and other components in different blocks on a page, using floating text boxes
- Make tables, using text boxes with several rows and columns.
- Automatically adjusting the height and width.

a. Settings

When you click on , a pop-up appears, with two tabs on the right.

The specific text box options are given in the left tab. This is where background color, font type, size and color and margins can be adjusted. Most options under ‘layout’ text box do not need further explanation. Just tick the options on and off and fill in some values, to see what exactly they do. The option ‘Floating above text’ and the options under ‘User interaction’ are mostly useful for the design of selection and drag tasks, see chapters 11.

If you want to change the layout of a text box afterwards, right-mouse click on one of the two little black squares. In the pop-up you can make the adjustments.
The dimensions of a text box can also be adjusted by dragging the black square at the bottom right, provided that the text box settings allow this.

A floating text box can be moved by:
- dragging the top left black square
- dragging the bottom right black square, with the Shift key pressed

b. Text box, general properties

The grey bar at the bottom of the text box editor determines several characteristics, which we also see for many other components.

OK / Cancel
These buttons confirm or ignore the changes made in the window and make you return to the main screen.

Width and height
Here the size of the component is set. The option ‘Full width’ gives the component the full width of the text box in which it is contained. After adjusting width or height, press enter to immediately see the result in the preview. To prevent the text box from being smaller than the text in it, it is advisable to select ‘adjust height’ in the text box options, rather than setting a height in this bar.

Pop-up
It is also possible to add the component to the assignment as a pop-up window. A small symbol will then appear in the text which reveals the component after clicking. This can be handy to use the limited available space efficiently, or to initially hide some information for the students. It is possible to assign a picture to pop up. Select popup and click the rectangle that appears.

Now a picture can be selected.

c. Foldable/un-foldable text box

When there is not enough space for a graph, a table or a text on a page, you can place them in a foldable/un-foldable text box.

Make a text box with two rows. Place the content in the second row.

Select Fold/unfold, and the following choices can be made.

You can replace the arrows by pictures.
If there are answer-boxes inside the text box, the answers can be checked immediately by selecting ‘Check’.
Example of what students see:

Folded:

If you want to use tables, click on the arrow.
You can use the red rectangles to move.

Unfolded:

If you want to use tables, click on the arrow.
You can use the red rectangles to move.

In the Edit mode:
d. Create a table from a text box

First, create a textbox and adjust the width, followed by enter. (The result of this is that the columns will have the same width). Then choose the number of columns and rows and check 'border'. If preferred, choose both margins 0, followed by ENTER.

4. Typing formulas: Formula Editor

a. Formula editor

In the text for a task, formulas can be created easily. The button in the toolbar gives access to a formula editor, which will place a formula in the text. If the cursor is inside such a formula, the toolbar will contain buttons with which formulas can be created:

Clicking the button reveals the keyboard shown on the right. This keyboard contains more mathematical symbols. The top row of these symbols can also be obtained by using the keys F1 to F12. For example, when the cursor is in a formula box, use F4 to create a fraction and use F1 to create a square root.

An extension with Greek characters is obtained by clicking $\alpha\beta$.
To make these Greek characters α, β, γ, etc., it is also possible to use shortcuts:
ALT a gives α
ALT b gives β, etc.

The third keyboard is the ‘qwerty’-keyboard. By clicking the button it appears:

b. Trigonometric and algebraic functions
Besides the functions that are shown on the keyboards, the DME also recognizes the following functions:

\begin{align*}
\sin & \quad \arcsin & \quad \ln \\
\cos & \quad \arccos & \quad \log \\
\tan & \quad \arctan
\end{align*}
5. Basic widgets

The DME offers various options to assess student work. The choice for these options depends on the type of task; for example adding fractions, solving an equation or choosing the correct option from several possibilities. When such tasks are offered in a digital environment, it is possible to offer direct feedback on the correctness of students’ responses. The answer boxes in the DME offer several possibilities for such feedback, and can be inserted at any position in the DME pages, even as pop-ups.

Below, an overview is given of available answer boxes types and the types of tasks they are suitable for. See Manual Designing part 2 and the Basic Widgets in the DMW Widget list inside the DME Math Environment for more explanation and examples.

| a. Formula answer box with steps | For tasks with a number or expression as answer:  
• Perform this calculation  
• Factorize  
• Calculate the function value for \(x=2.5\)  
• Simplify to one fraction  
• Give the derivative of a function  
The student’s intermediate answers, when he/she is working towards a final answer, can be checked and feedback on these answers can be provided. |
| b. Equation answer box with steps | The student’s intermediate answers, when he/she is working towards a final answer, can be checked and feedback on these answers can be provided. |
| c. Small formula answer box | A small formula box does not offer the possibility to make intermediate steps towards the final answer. However, it is very convenient for larger tasks with several partial answers, as well as for putting many smaller tasks on one page.  
The author can choose whether a box should be visible around the answer box. |
| d. Small equation answer box | A small equation box does not offer the possibility to make intermediate steps towards the final answer. However, it is very convenient for larger tasks with several partial answers, as well as for putting many smaller tasks on one page. |
| e. Text answer box | In this answer box, students can type an explanation in words, and possibly add calculations. These answers cannot be checked by the DME. |
| f. Check text answer box | In this answer box, students can give an answer in words, which can be checked by the DME. It is advisable to only use this answer box for answers consisting of only one word, such as ‘Monday’. |
| g. Choice answer box | With this answer box, multiple-choice answers can be created. Only one answer is correct. |
| h. CheckUnit | With this answer box, tasks can be designed in which students have to select one or more correct objects (with numbers, formulas, pictures, ...) from a group of objects by clicking them. |
| i. CheckDragUnit | With this answer box, tasks can be created in which students drag objects (with numbers, formulas, pictures, ...) to certain targets. This can for example be used to sort fractions from small to large, or to connect graphs with their corresponding formulas. |
| j. CheckValueUnit | In this task type, a value is assigned to each draggable object. This creates the possibility to add an empty drag object and let the student fill in the correct answer. This option is very useful for creating and checking tables. |
6. More possibilities for layout

a. Html links
With this button, a link to any web page on the internet can be added. Important to know: the complete URL, so including http://, has to be filled in.

```
<table>
<thead>
<tr>
<th>Text</th>
<th>link</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL</td>
<td><a href="http://www.wlsweb.nl/en">http://www.wlsweb.nl/en</a></td>
</tr>
<tr>
<td>Window width</td>
<td>400</td>
</tr>
<tr>
<td>Window height</td>
<td>400</td>
</tr>
</tbody>
</table>
```

This link will appear in the text on the position of the cursor, blue and bold. Such a link can refer to background information, but also to tools available on the web (such as Wolfram Alpha). Moreover, it offers the opportunity to show movies.

**Important to know:** you have to type the complete url, http:// included.

Pop-up blocker
The page to which the link refers will be shown in a pop-up window of the browser you use. The specified width and height apply to this pop-up window. For this to work properly, pop-up blockers should be turned off.

b. Pictures
You can use the button to insert a picture. After clicking this button, you get the following window:

```
First add one or more pictures, using the button ‘file’. Not all types of files are accepted; use .jpeg, .gif or .png. Large files make the environment slow, so it is useful to convert pictures to an appropriate size before uploading them into the DME.
The added pictures can be used more than once in the different tasks of an activity. Therefore, each picture has to be added only once.

Important
When copying activities, the pictures will be moved too. When a picture is no longer needed, delete the picture from the list of pictures. Also remove pictures that are no longer used from the list. An activity that contains many pictures will get very slow.

Large images need to be changed to the proper format (width and length in number of pixels) and dpi (for web this is 72 dpi). This can be done using Photoshop (using the option ‘save for web’, or you may want to use free software like IrfanView (http://www.irfanview.com). Install not only the software, but also the plugins.

c. Adapt an activity: Add pages, delete them or change order

When you like an activity from the DME Math Environment, but you would like to have more or fewer assignments, or you think the assignments are too easy or too difficult, you can adapt the activity. You can do this only after you have copied the activity into your school environment.

Add pages
When you click on the right arrow, page 4 is added.

This will become an exact copy of the page that was selected, in this case page 1.

Delete pages
When you click on this left arrow, page 3 will be deleted.
Change order
When you click on this right arrow, page 1 will be exchanged with page 2.

With a right-mouse click on a page number, you will have more possibilities:

```
1 2 3
```

.d. Merge two activities

It is possible to merge one activity with another. Any pictures will also be added to the list of pictures. You can even choose an activity that is inside the DME environment.

Right-mouse click on an activity and choose ‘copy’.

Then go to the activity in your school environment that you want to merge this one with. Right-mouse click and choose ‘merge’.

**Important**
When merging activities, the pictures will be moved too. When a picture is no longer needed, delete the picture from the list of pictures.
e. Copy pages and/or modules

Using a right-mouse click, you can copy pages to another activity and also modules to another folder. The pictures will also be copied.

7. Randomizing assignments

It may be a good idea to make assignments with random parameters for a number of reasons:

- We may want every student to have a different assignment, so answers cannot be copied.
- It is an efficient way to generate a series of assignments of the same type.
- If they want to, students can use the same series of assignments more than once by initiating them again (option: infinite practice)

Assignments can be randomized in two different ways: by using random parameters or by randomizing text boxes with text or pictures. These two ways will be explained:

a. Random parameters

Here you see an assignment with variables for random parameters.
b. Definition of the random parameters

The random parameters that are used are defined in the bottom right window. They are always integers. There are two ways to define them:

- Using intervals:
  
a=2..9  
  (use exactly two full stops between the boundary values)

- Using sets:
  
a= -7, -5, -3  
  (a list of possible values, separated by commas)

A combination is also possible, for example:

a=1..9,11..19

It is also possible to use parameters that have already been defined in defining new parameters. For example, if b has to be smaller than a, we can define b as:

b=0..a-1

The definitions can also contain expressions of already defined variables.

c. Using the random parameters

The random parameters can be used in the answer and in the starting expression, but also in the text of the assignment and in some other components, such as the graph tool. If they are used in the text, they must be entered in a formula box.

The random variables that are defined are substituted when the activity is started, but this only happens if they are between hash tags. The placement of the hash tags is important, since if possible, the expression between the hash tags is simplified; at any rate the numerical values will be evaluated.

In the above example we gave \( #a+b# \) as the solution, together with the option ‘exact’. Here the calculated value is desired. Using \( #a# + #b# \) would not work, as it would not calculate the value.

A wider placement of the #, for example \( #ax+b# \) instead of \( #a#x+#b# \), also avoids expressions like ‘1x + 0’, which would be turned into just x (if \( a=1 \) and \( b=0 \)).

The example below once again shows what the influence is of the different positions of the # (\( a, b, \) and \( p \) all have the value 1).

<table>
<thead>
<tr>
<th>Compare the placement</th>
<th>Preview</th>
</tr>
</thead>
<tbody>
<tr>
<td>#a# • #b# • x ( # )</td>
<td>1 • ( \cdot ) ( x )^1</td>
</tr>
<tr>
<td>#a#•#b#•#x( # )</td>
<td>1 • ( \cdot ) ( x )^1</td>
</tr>
<tr>
<td>#a#•#b#•#x( # )</td>
<td>1 • ( \cdot ) ( x )</td>
</tr>
<tr>
<td>#a#•#b#•#x( # )</td>
<td>( x )</td>
</tr>
</tbody>
</table>
d. Global parameters

This is an option for an activity. Selecting this enables a variable to keep the same value throughout all assignments of an activity.

All variables have to be defined on the first page. They will automatically be used for the following pages.

When you click in succession on

You will see that only on the first page can you define the variables and not any more on the following pages.

e. Randomized fractions

The random parameters are always integers. Randomized fractions can be created by dividing two random parameters, for example \( \frac{a}{b} \), where \( a \) and \( b \) are random parameters. If \( a > b \), the fraction will be simplified to a mixed fraction. If you do not want to use mixed fractions, use \( \frac{a}{b} \).

The symbol \( \frac{a}{b} \) can be found on the keyboard which appears after clicking \( \frac{a}{b} \), and also by pressing Ctrl, Alt, and c at the same time.

f. Simplifying fractions with a variable

An example:

Use for example as variables for random parameters
\( a=2..9 \)
\( b=2..9 \)
\( c=gcd(a, b) \)
\( f=a/c \)
\( g=b/c \)

\( gcd(a, b) \) is the greatest common divider of \( a \) and \( b \) (see also next page: Functions for random variables). Make the following answer model:
g. Functions for random parameters

In the DME, there are some useful functions for random variables. The round functions can be used to round off numbers, but also to turn fractions into decimal fractions. There are three such functions:

#rnq(..._n)#  #rns(..._n)#

The number will be written with $n$ decimals.
This function does not omit zeroes.

The number will be written with $n$ significant figures.

Examples:

#rnd(521,7006 : 1,5_3)#  347,8
#rnq(521,7006 : 1,5_3)#  347,800
#rns(521,7006 : 1,5_3)#  3,48 · 10²
When rnd and rnq are combined with the Check option significant numbers (can be selected in the Options panel) the answers will be checked according to the following scheme:

<table>
<thead>
<tr>
<th></th>
<th>#rnd(1,951 : 1,5_2)#</th>
<th>#rnq(1,951 : 1,5_2)#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>1,3  ✓</td>
<td>1,3  ✓</td>
</tr>
<tr>
<td></td>
<td>1,30  ✓</td>
<td>1,30  ✓</td>
</tr>
<tr>
<td>With Check option sign.</td>
<td>1,3  ✓</td>
<td>1,3  ✓</td>
</tr>
<tr>
<td></td>
<td>1,30  ✓</td>
<td>1,30  ✓</td>
</tr>
</tbody>
</table>

Other functions that can be used are:

- **abs** for example abs(-2)=2
- **gcd** for example gcd(12_8)=4
  (this is the greatest common divisor)
  This gcd is for example useful for canceling common factors in algebraic fractional expressions.
- **min(a_b)** gives the minimum of a and b
- **max(a_b)** gives the maximum of a and b

These functions can be used in the field ‘Variables for random parameters’, but also in the text and answer boxes. When using them in text or answer boxes, make sure to put the entire expression between # signs, for example #min(a_b)#.

**h. Randomizing text boxes**

With the option to randomize text boxes, it is possible to offer students different tasks on the same page. This generates many new possibilities.

On each tab of the text box a different alternative for the task can be created.

When editing the text box, select ‘random’:

Next the tabs can be created, one for each alternative. For example:
Because there are two options, the following randomized parameter should be filled in: 
\( a = 1, 2 \). The \( a \) can be replaced by another character, but then it also should be replaced in the text box next to ‘random’ in the text box editor.

It is also possible to use more than one parameter.

8. Options for answers

For each answer box, the different settings to check the answer are possible. When checking students’ answers, the selected options are considered.

a. Equivalent
The option ‘Equivalent’ is selected by default. If this is the only selected option, every equivalent answer will be marked as correct final answer (the green tick mark appears).

b. Answer needed
The option ‘Answer needed’ only appears in the answer model for equations and is selected by default. However, tasks can be designed in which the final answer is an equation rather than a solution to an equation. This can for example happen in modeling assignments. In such cases, the option ‘Answer needed’ should be deselected.

c. Exact
With the option ‘Exact’ the designer can indicate that the solution should be written in the same form as the answer model. For solving equations, the option ‘Answer needed’ should also be selected.

Some trivial variations are allowed: if for example the answer model states \( x + 3 \), then \( 3 + x \) will also be marked correct. If the student’s answer is equivalent but not exactly the same, the orange tick mark will appear, together with the following feedback:

\[
\begin{align*}
    x^2 &= 121 \\
    x &= \sqrt{121} \quad \text{or} \quad x = -\sqrt{121}
\end{align*}
\]

Within the option ‘exact’ the designer can also allow more than one form to be marked correct. The alternative forms are separated by :: (two colons). Example:

\( x = 3 \) or \( x = 1 \frac{1}{2} :: 1.25 \)

For this equation, besides \( x = 3 \), both \( x = 1 \frac{1}{2} \) and \( x = 1.25 \) will be accepted as final solution, whereas for example \( x = \frac{5}{2} \) will not.
d. Form
By selecting the option Form, a formula editor appears in which a specific ‘form’ can be set, which a correct solution should have.

Example 1
If you want the final answer to be a fraction, the following will be inserted in the form editor: \( \frac{Q}{Q} \).

In this expression, Q represents an arbitrary expression. The Q in the numerator does not have to be the same expression as the Q in the denominator.

The option ‘Answer needed’ actually is a special case of this option ‘Form’, namely the form \( x=Q \) in which Q is an arbitrary expression.

Example 2
Another task type is a task in which the equation for a line has to be found, in the form \( ax + by = c \). The answer model would be: \( y = 2x - 3 \), and as correct form the following will be given: \( 2x - y = 3 \).

This construction may seem devious. Would it not be easier to give in \( 2x - y = 3 \) directly as the answer model? However, the answer model should always be in the form ‘variable = …’, as this allows for substitution and checking equivalency of expressions.
In the example above, equivalent expressions will not be recognized:

For the second answer to also be marked correct, it should be added to the form-box in the answer model:

\[ 2x - y = 3 \quad \therefore -2x + y = -3 \]

**e. Estimations**

In some tasks, an estimation of the correct answer is enough. This can be indicated in the answer model, using ±. For example, if the student’s answer should be between 60 and 70, the answer model can look like this:

Answer model:

\[ 65 \pm 5 \]
9. Points and scores

a. Points

The points that are awarded can be split. When using the option ‘Exact’, it is possible to already award a part of the points for an answer which is only equivalent.

b. Students do or do not see their scoring percentage

Students can see the percentage of their progress, for example:

- Fractions Tests
  - Activities
    - 1. Fractions Test A

  in html:
  ![Image](image-url)

If you do not want students see these percentages, you can arrange this as follows.

Click on the module where the activity is in and select ‘Edit’.

On the right, click on behind the activity.

A pop-up appears and deselect ‘Students see their result’.
c. Scores invisible for students

It is possible to make the scores that appear under the page numbers invisible for students. This can be arranged with the ‘Options’ of an activity. Uncheck Scores visible for students.

10. Feedback for students

In formula and equation answer boxes, through the built-in feedback, the equivalency of the correct answer is checked. Should you want to give more extended feedback to students, it is possible to customize feedback, for example to give specific feedback on common mistakes, or to give students hints on specific given answers. **Note:** The built-in feedback will be overruled by the customized feedback.

a. Feedback using the answer box

To customize feedback, mark ‘feedback’ in the answer box editor. This enables the possibility to create tabs with possible answers, all with their own feedback.
An example of customized feedback
We consider the following task:
For this task, the following five feedback tabs could be made:

1. **Answer correct**
The answer is correct when it is exactly $p^7$. Therefore, the option ‘exact’ is selected.

2. **Answer almost correct**
On the second tab we check whether the given answer is already a power of $p$. The textual feedback can be adjusted to that.

3. **Answer equivalent**
On the third tab, we check whether the given answer is equivalent to the correct answer. By now we know that the given answer is not a power, so we comment on that in the textual feedback.
4. **Common mistake**
On the fourth tab, a common mistake is recognized and commented on.

5. **Incorrect answers**
On the last tab, all other possible mistakes are intercepted.

**Order of the tabs**
The order of the tabs is important, as the software first tests the first tab, then the second, and so on. If one of the tabs applies to the answer the student has given, the other tabs will be skipped. To make sure the answer model gives feedback to every possible answer, always include a tab like tab 3, intercepting all partly correct answers, and a tab like tab 5, intercepting all incorrect answers. The order of the tabs can be adjusted using the black arrow buttons.

Answer boxes containing customized feedback can be recognized in the Edit mode by the small question mark:
b. Feedback visible after checking assessment

It is possible to give feedback in text boxes that appear after the test is checked.

![Feedback visible after check test](image)

11. Objectives

Insight in performance on different categories: learning objectives

Often tasks in an activity can be divided into several categories. For example think of different domains in arithmetic, of different types of skills. It is possible to generate overviews for such learning objectives, like the following. These overviews are also visible for students.

![Objectives](image)

Each pie diagram represents one category of skills or subjects. Each piece represents one objective. The larger the piece, the more tasks the activity contains on this objective. The larger (and greener) the colored part of the piece, the better the student performed on this objective.

You can set objectives in the Options panel by selecting ‘Objectives’. Now click the button ‘Objectives’ and a window appears in which you can fill in the different objectives:
Rows can be added and deleted by clicking the arrows below ‘Objective 4’. The arrows next to ‘Fill in name of category 1’ serve to create more categories. Each category will get its own pie chart. For the example above, the following categories and objectives are filled in:

After creating the objectives, for each answer box you can indicate to which objective(s) it belongs. To do so, click the button ‘Objectives’ in the upper right corner of the answer box editor:
A window appears in which you can select one or more objectives.

When a student has worked on an activity, he/she can generate his/her objectives overview by clicking the ‘Objectives’ button at the bottom of the activity.
12. Feedback for teachers

The DME offers the teacher extensive possibilities for reviewing student scores and work. With the options for Log IDs and Learning objectives these overviews can become even more detailed.

a. Insight in attempts and errors: log IDs

By using log IDs, it is not only possible to see the students’ final answers, but also the number of attempts they made, and all their attempts (also the ones they have erased). The log ID can be switched on by selecting it in the answer box editor. A text box appears in which a code can be filled in. The choice of this code is up to the designer. In the example below, the code 4-3 means (to the designer): 4th activity, 3rd task.

In the overview of student results, bar graph icons appear at the top of each column:

When you click on such an icon, a window with several tabs will appear. On the tab ‘log errors’ we see that this student made two errors:

And on the tab ‘log attempts’ the exact attempts and errors are shown:
b. Objectives

Insight in performance on different categories: learning objectives
Often tasks in an activity can be divided into several categories. For example think of different domains in arithmetic, of different types of skills. It is possible to generate overviews for such learning objectives. These overviews are also visible for students. (see previous chapter)

c. Detection pop-up use

Students can use extra help to solve a problem. This help can be the Graph tool, a table, or a hint. When this extra aid is placed in a text box, and for the text box ‘Pop-up’ is checked, in the tab ‘User interaction’ you can check the option ‘Decrease score using ...’. In this example, the use of this extra help will cost 5 points.
13. Navigation opportunities

Navigation in the DME is pretty straightforward and usually a student is free to navigate through the modules that are assigned to his/her class. However, for the designer there are several options to have more influence on the students’ navigation.

- An activity can be made adaptive when navigation inside an activity is determined by the performance of the student (Conditional navigation). This is possible either based on the percentage for the whole activity or based on conditions set for one page.
- Another possibility to create adaptive teaching materials uses navigation between activities. With this, students can get the choice to have some extra exercises, or to go to an activity with more explanation, or to go to an activity with difficult / challenging assignments.
- Some activities lend themselves well to create a kind of menu within the activity that enables the students, optionally, to quickly navigate from one assignment to another: a text box then acts as a Link object.
- It is also possible that students jump from a module to an activity

a. Navigation inside an activity: conditional navigation

It is possible to determine the navigation inside an activity based on the performance of a student so far. This can be done based on a percentage, for the entire activity at once, or based on different conditions for each page.

For both options you select ‘Conditional navigation’ in the Options panel. If you want to work with a percentage, you leave ‘Percentage’ selected and fill in the desired percentage. Now students will only be allowed to go to a next page once they have at least that percentage of the maximum score. As long as they have not obtained this score, the next pages will be disabled. In the example below, the student has correctly solved all tasks on page 1. He/she can navigate to page 2, but not to the pages after page 2.

To indicate conditions for specific pages, select ‘Conditions per page’. Now click the button ‘Conditions’ and the following window appears:
Here you can fill in conditions. With the arrows you can add and delete lines. The example below illustrates how this can be filled in:

<table>
<thead>
<tr>
<th>From page</th>
<th>To page</th>
<th>Pages for score</th>
<th>Cut-off perc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>4</td>
<td>2,3</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
<td>2,3</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>2,3</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>4</td>
<td>80</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

The first three lines describe the following procedure: A student will be sent from page 3 (1st column) to page 4 (2nd column) if his score on pages 2 and 3 (3rd column) together is less than 50% (4th column) of the total maximum score for these two pages. If the student’s score is between 50% and 80%, the student will be sent to page 6 and if the score is higher than 80%, he/she will be sent immediately to page 8. In the same way, on page 4 the score for page 4 is considered. If this is less than 80%, the student will be sent to page 5, otherwise to page 6.

Extra options (conditional) navigation

- For both options for conditional navigation, the item selection balls can be confusing for the student. Therefore, in the Options panel you can deselect ‘Item selector’ and select ‘Previous-button’ and ‘Next-button’ instead.
- The number “Total” at the bottom of the screen is not very informative in combination with conditional navigation with conditions per page. Therefore you can choose to select ‘Progress instead of Total’ in the Options panel. This progress percentage only indicates how far a student is progressed in the activity and does not give any information about performance or score.
- A third option for conditional navigation is “Next page only if everything is correct (green)”. This is especially interesting combined with the Practice game mode. This option forces the student to finish all tasks on the current page, before continuing to the next page. When ‘Practice game’ is not selected, this option is the same as conditional navigation with a percentage of 100%.
b. Navigation between activities (Link object)

The base for this navigation is a floating text box that works like a ‘hotspot’.

Checked is Link object. By clicking on ‘Edit link’ you can refer to another activity. Behind goto: you fill in the name of the activity or the activity number.

c. Navigation inside an activity (Link object)

This also uses a text box as link object.

In the example below, the text boxes form a menu that allows students to quickly go from one assignment to another. The names are placed in text boxes, and each text box is linked to the corresponding assignment.
The text box where you see the word ‘kubus’, is created like this:
d. Navigation inside an activity (hyperlink)

This can be used to make a link to a web page, but it is also possible to make a link to another page of the same activity.

Example

The students will see:

**More practice? Click here**

When they click on the link, they will go to page 11.

e. Navigation between activities (Link object)

It is possible to let students jump from the module overview to a specific activity, or let them jump between activities. For example:

When a student clicks one of the circles, he/she will be sent directly to the activity.

Over each picture, a floating text box is placed which acts as ‘hot spot’.
The option 'Link object' is selected.

By clicking ‘Edit link’ the link can be inserted. After goto: fill in the name of the activity, or the number of the activity.
14. **Extra lay-out options: manage styles**

This is an option that enables you to give textboxes the same style. For example, you can define for all textboxes with explanations a specific style.

Create a text box, select  and click on . Determine the layout for this textbox:

![Manage Styles](image)

Click on  and complete the pop-up:

![Give style name](image)

Click on OK and close the pop-up.
When you need a textbox with explanations for another page, select the style explanations for that textbox.

The textbox will have the same style.