



*Original Contribution*

## MOODLE LESSON ACTIVITY IN MEASURING THE HARDNESS OF MATERIALS

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### ABSTRACT

In this report we have shown e-learning in Lesson using the software platform MOODLE. This feature allows you to add entire lessons that guide the students, based on their answers. It might be helpful to think of lectures as a kind of flowchart. The student reads a given paragraph. After reading the paragraph, you ask the student some questions. Based on the answers the student gives, the system redirects him or her to another page. The aim is the information not just to be memorized and reproduced but to be connected to real professional situations.

**Key words:** E-learning, Modular Object Orienting Dynamic Learning Environment (MOODLE), Lessons in MOODLE, Hardness of Material, Grading.

### INTRODUCTION

The purpose of the report is to present the training of the students on the subject, Material Science For this we are submitting for consideration one theme for laboratory exercise - Measuring the Hardness of the Material. It analyses the process of the creation of e-learning lectures in MOODLE and its use. In this report we have included the stages of construction of e-learning content for self-training of students - Skill analysis, Material development, Learning and Evaluation.

There are many software platforms for e-learning education. We chose Open source software. Open source means software that is freely available for people to both use and modify. The MOODLE course management system is an open source system that educators can use to create online courses. Starting in 1999, the MOODLE community has now grown so much that by February 2006 there were about 75 000 MOODLE sites in more than 138 countries (and that counts only registered users) in 70 languages (1). It works under Linux, UNIX and Windows operation systems; Apache web server, MySQL database and PHP language.

MOODLE is a Course management

system - a software package designed to help educators easily create quality online courses. Such e-learning systems are sometimes also called Learning Management Systems or Virtual Learning Environments.

The word MOODLE was originally an acronym for Modular Object-Oriented Dynamic Learning Environment (MOODLE), which is mostly useful to programmers and education theorists.

The MOODLE is designed and developed by particular philosophy, namely "social constructionist pedagogy". Knowledge is strengthened if the student can use it successfully in his wider environment. Students are not just a memory bank passively absorbing information, nor can knowledge be "transmitted" to them just by reading something or listening to someone (2).

### METHODS AND RESULTS

#### E-Learning cycle model

##### *Skill analysis*

The learning manager analyses the learner's present skills and the skills that need to be acquired, which are set as a learning goal, and obtains the necessary material information. The manager then searches for the related material.

A material knowledge training is required for the formation of skills for structure analysis and characterization of

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learning materials and their distinction. The use of materials is dependent on it. For the preparation of this laboratory exercise the students must have passed the *ex cathedra* method of instruction on this theme and it is necessary to have theoretical knowledge about it. This theme is related to other laboratory exercises in which the students are lectured on and gain knowledge about the crystal structure of metals, their structure analysis, mechanical proper and indicators and hardness properties on stretch testing.

In MOODLE Lesson they can acquire information about methods for measuring the hardness of materials, the factors influencing on method choosing, register results based on their own experience in a spreadsheet table and analyse received data.

### **Lesson material development**

The developer creates exercise questions and gives the material-to-be-learned structure (table of contents) linked with explanatory pages.

A lesson delivers its content in an interesting and flexible way. It consists of a number of pages. Each page normally ends with a question and a number of possible answers. Depending on the student's choice of answer they either progress to the next page or are taken back to a previous page. Navigation through the lesson can be straightforward or complex, depending largely on the structure of the material being presented.

Lessons are a great way to assess practical knowledge of a subject, and with the creative use of MOODLE's HTML editor very effective simulations can be built (3). Lesson module allows you to add entire lessons that guide the student based on the student's answers. It might be helpful to think of a Lesson activity as a kind of a flowchart. The student reads a given paragraph. After the paragraph, you ask the student some questions.

Based on the answers the student gives, the system sends the student to another page in the Lesson. For example, if a student chooses answer one, then the system might go to page 3. If the student chooses answer two, the system goes to page 1. If the student answers question 3, the system goes to page 5 etc. Lessons are very flexible, but do require some set-up (**Figure1**).

The items on the first page are:

- Page title: title of this page only. If

you have multiple pages for your lesson, each one will have a title.

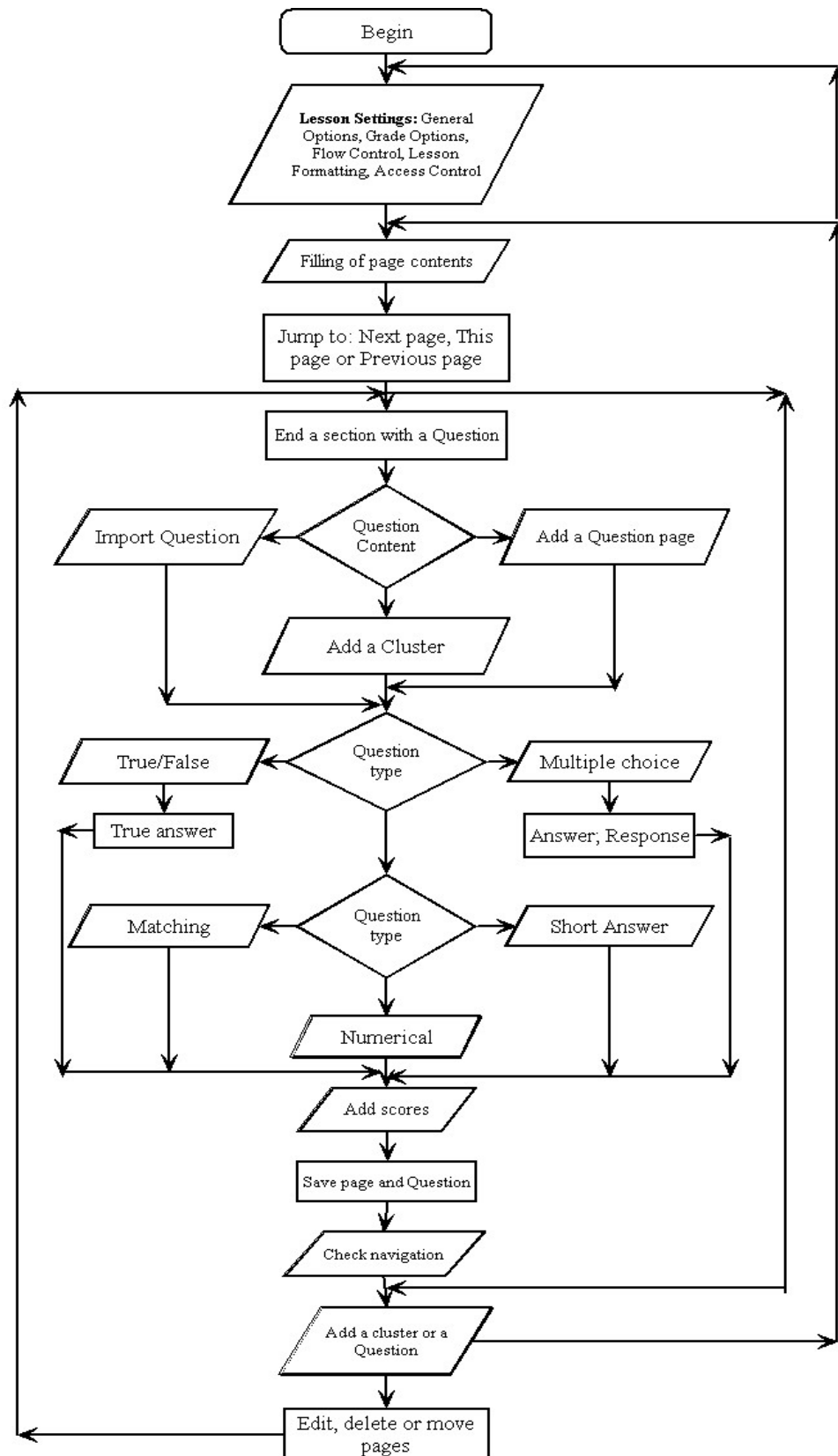
- Page contents: this is where you put the information you are trying to convey. It may be a story, a problem to solve or anything that you want to ask questions about. You should usually end the section with a question that will be answered by the students.

- Answer 1 (or Answer #): this is where you type one answer to the question you asked. You fill in one answer per Answer #, up to the maximum you defined. You do not have to fill them all in.

- Response #: after each Answer # section, there is a Response #. This is an explanation that the student will see after picking one of the possible answers and before being redirected to another page (or staying on the same page).

- Jump to: after each Response # there is a field that tells the system what to do if the student picks that number. You can tell the system to end the lesson, to stay on the current page, or to jump to any page that already exists (forward or back). For example, if the student picks Answer 1 and the "Jump to" field is set to go to the next page, he will be sent to the next page of the lesson. Grading is determined by the navigation. That is, if a student stays on the same page or is sent to a previous page, then the answer is counted as wrong. If the student picks an answer and is sent to a later page, then the answer is counted as correct. By default, Answer 1 sends the student to the next page, and all the other Answers keep the student on the same page, but that can be changed. The students will see the order of the Answers mixed up (Answer 1 may actually be the fourth question asked).

We are using the Lesson Module because it is necessary to give the students some information about the topic being taught – the methods of measurement of material hardness, tables of completed experiments to be used for calculation, in formulas etc. The topic is broken into small chunks and shown to the student bit by bit. Each part is re-enforced by requiring the students to answer questions. The students proceed through the material only by answering the questions correctly. Wrong answers are "penalized" either by showing the same material again or going even further back in the lesson, even to the beginning of the lesson!



**Figure 1.** Stages of lesson material development

Within the lesson these chunks are called Pages. The length of each page is arbitrary but normally it should not be more than the amount that comfortably fits on a screen. Each page can have a question at the end, and can lead to any other page. This module can

create a series of pages, which can be presented in a linear fashion, like a slide show, or in a non-linear, branching manner, or a combination of the two. It can be graded, with questions, or not graded and used simply as a resource.

There are two basic modes: a flash card mode and a presentation mode.

Lesson includes many features to make cheating more difficult and lesson presentation more interesting through question clustering, password protection, and time limits.

By mixing content with questions, lesson enables you to implement the Practice Principle of e-learning, where practice is integrated with instructional material.

### Pages, questions, answers and responses

A lesson is made up of pages. Normally each page gives some information and then finishes with a question. The question can be easy or hard, depending on the audience. It should be directly related to the material covered in the page. In our case the pages are following:

- Page 1 Definition of the term hardness;
- Page 2 Question about Definition – Multiple Choice Question;
- Page 3 Methods for Measuring the Hardness - defined measurement procedure. The usual method to achieve a hardness value is to measure the depth or area of an indentation left by an indenter

of a specific shape, with a specific force applied for a specific time. There are three principal standard test methods for expressing the relationship between hardness and the size of the impression, these being Brinell, Vickers, and Rockwell.

- Page 4 Question about test Methods.
- Page 5 Question about comparison of test Methods.
- Page 6 Brinell's HB test Method – tables, schemes and formulas.
- Page 7 Question about Brinell's test method – matching question. (Figure2)
- Page 8 Implementation of Brinell's test method.
- Page 9 Hardness of unhardened steel with Numerical question.
- Page 10 Vickers' HV test Method - tables, schemes and formulas.
- Page 11 Rockwell's HR test Method - tables, schemes and formulas.
- Page 12 Implementation of Rockwell's HR test method with Numerical question.
- Page 13 Results of the different test Methods – hardness conversion table.

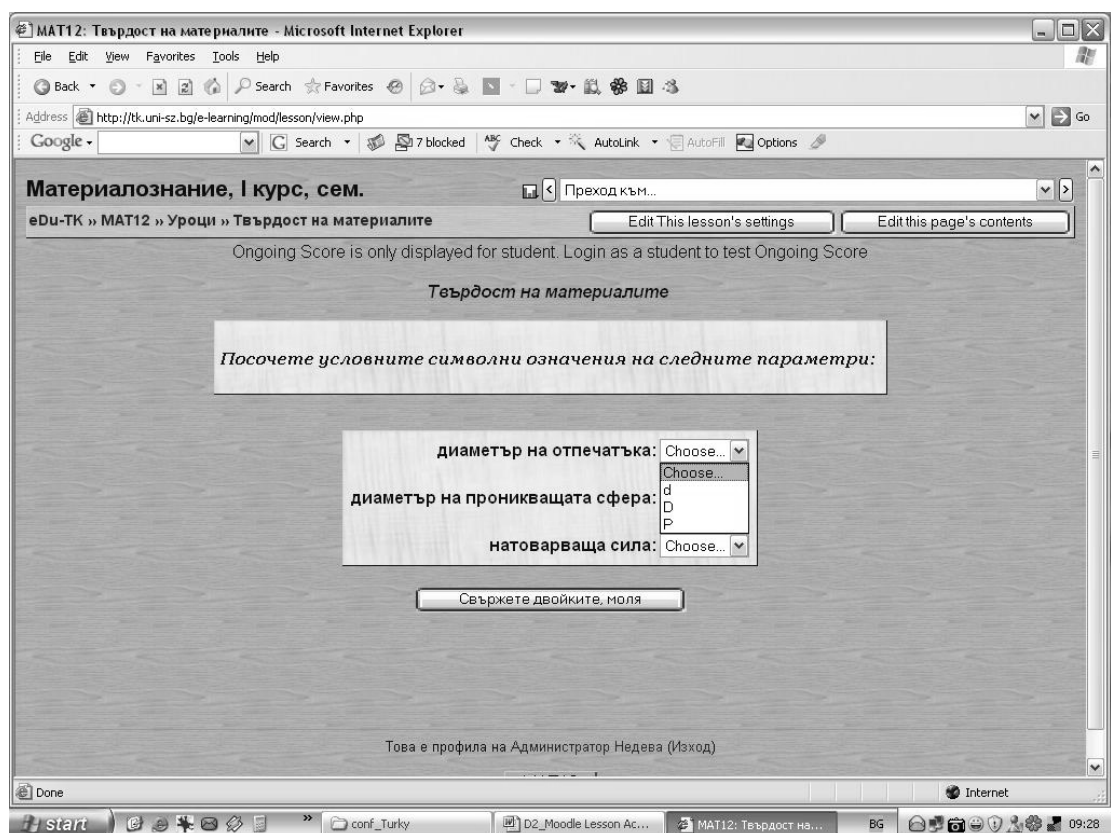


Figure 2 Screen shot of matching question in Lesson "Measuring the hardness of materials"

Attached to each page is a set of answers to the question (1). Usually there is one correct answer and a small number of wrong answers.

This type of question is called a multiple-choice question. It is a common type of question and it is the default question type in

the Lesson module. The number of answers can vary from page to page. Some pages can have one correct answer and three wrong answers; other pages may ask questions where there are three answers or even two answers (for example true or false, or just yes or no).

There is a limit to the number of answers. This maximum is one of the parameters of the Lesson module, set initially when you add a Lesson. However, this maximum limit is flexible and can be changed at any time. The limit just determines the number of boxes you see when adding or editing pages.

Along with the answers there is a set of responses. Each answer has its own response. Once the student has chosen an answer that response is displayed before the "new" page is displayed. (The word "new" is in quotes because the student may well be shown the same page again if he chooses the wrong answer.) The responses are usually short; a simple "That's right" or "That's wrong" might be sufficient. They could, however, explain why the answer, which seemed right is actually wrong.

There may be circumstances when the teacher does not want to end a page with a question and a set of answers. This is allowed; the students are simply shown a Continue link and are shown the next page in the lesson. What exactly is meant by "the next page" is explained below.

### **Building lessons**

When creating a lesson the teacher is required to enter the text of the first page and that page's set of answers and responses. Once the first page is in place the teacher has the option of adding more pages or editing that page. When the lesson contains more than one page the teacher has the addition option of moving pages, that is, changing the order of the pages. Thus once the lesson is under construction the teacher can add pages, edit pages, remove pages and move pages.

It is envisioned that a lesson will normally cover a limited topic in possibly five to ten pages. And a course might have possibly a larger number of lessons. The module is not designed to handle lessons which have a large number of pages; such "lessons" should be broken down into more manageable sections. The Lessons link (in the page header) shows all the lessons within a course and provides both teachers and students with a unifying framework.

### **Learning**

The learner engages in learning what is proper to the need, that is, individual learning for knowledge acquisition, or collaborative learning for workshop-type learning (**Figure 3**).

#### **Logical order and navigation order**

The order of the pages of a lesson is usually determined by the material (4). Mostly the teacher will want to present the material in a way which is most easily understood and which builds in a logical and progressive way. In the Lesson module, this order is called the Logical Order and this is how the pages are usually shown to the teacher. The teacher sees all the pages on one long screen with the first page at the top.

Once a lesson contains two or more pages the teacher can move existing pages around and add pages to any position within the set. This logical ordering of pages is also the default Navigation Order. The latter is order in which the students see the pages. In the default navigation order, correct answers show the next page (in the Logical order) and incorrect answers show the same page again, that is the student is asked the same question again. This default navigation order is possibly OK for the majority of lessons. However, it is possible to change the "Jump" associated with any answer so that a more complicated path through the lesson can be created.

These jumps can be divided into two types - Relative Jumps and Absolute Jumps. The default navigation using the relative jumps Next Page and Same Page, the destination of the Next Page jump is the next page in the logical order of the lesson. Absolute jumps specify the actual page to show next by specifying of the page's Title. Thus a lesson can have "branches", loops and a non-linear structure.

The teacher can see how a lesson's navigation "works" by using Check Question button at the end of each page or by using the Check Navigation link at the very end of the lesson. The Check button "launches" the lesson at that page. The Check Navigation links starts the lesson at the first page, the way a student would see the lesson initially.

### **Answers**

Typically each question within a lesson will have one correct answer and several wrong answers. In the current version of the Lesson module the answers are not flagged as being

correct or wrong. Rather correct answers are ones which take the student further forward in the lesson and wrong answers take the student either backwards or they just stand still,

showing the same page again. In the last case the student will, if sensible, choose another answer.

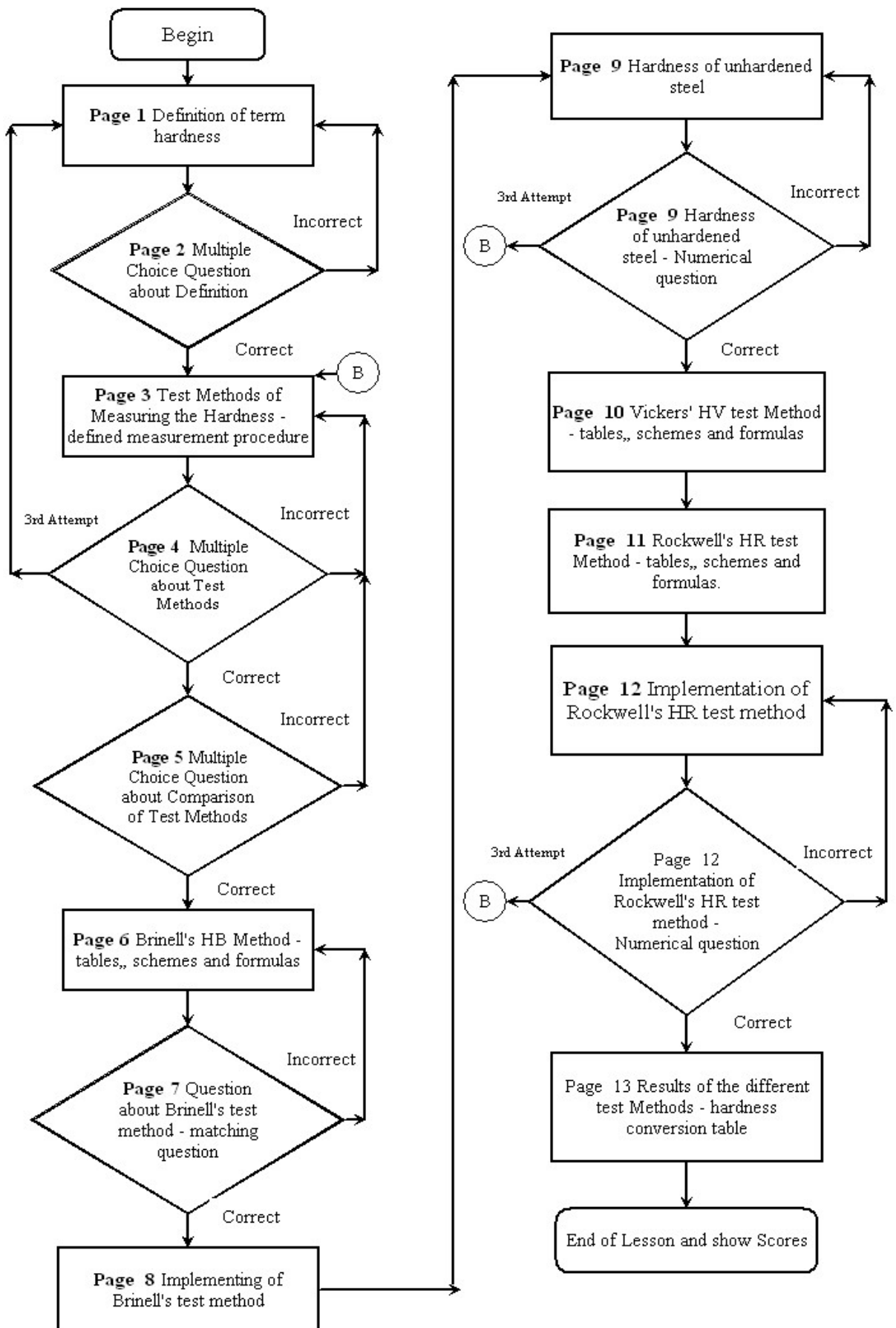


Figure 3. Learning Stages

The definition of further forward in the lesson or backwards in the lesson follows from the logical ordering of the pages. The teacher sees the lesson as a list of pages from the start of the lesson to its end. If the pages are not in the best order then the teacher can easily move the pages so that an optimum order is achieved.

Thus answers, which jump to the Next Page are by this definition correct and answers which jump to the Same Page are wrong. A page, which has two answers with both jumps to the Next Page has two correct answers. An answer, which jumps to the End of Lesson is again, by definition, correct. The End of lesson is not an actual page; it is a logical position after the last (logical) page. A student completes a lesson by reaching that point.

So, an answer which takes the student to the first page of the lesson is a wrong answer. An answer which skips two pages (in the logical order) is a correct answer. An answer which goes back one page (again in the logical order) is a wrong answer.

When a page is added, the jumps are set, by default, as follows. The jump for the first answer is the Next Page. The jumps for the subsequent answers are set to Same Page.

## Grading

Above we introduced the concept of correct answers and wrong answers. This leads to giving students a grade when they have completed a lesson. In order to keep the method of grading reasonably transparent a relatively simple formula is used. It's the number of correct answers divided by the number of pages seen. Remember each page normally ends with a question so the number of pages seen equates with the number of questions asked. So the grade is really the number of correct answers divided by the number of questions asked. This number is then simply scaled by the grade parameter of the lesson.

A lesson is graded when the student reaches the End of Lesson. This point is usually reached by answering the question on the last (logical) page correctly.

The student does not have to go through all of the lesson in one "sitting". If a student goes through some pages and then breaks off, the next time they view the lesson they are asked whether they want to start at the beginning of the lesson or at the point where they left off. The latter point is actually the page they reached with their last correct

answer. The previous "attempts" are recorded and the grade for "broken" sessions will include pages seen and questions answered in other sessions.

In a way giving a grade to a lesson is both a blessing and a curse. The main focus of a lesson should be the transfer of knowledge in a reasonably interesting way. Giving a grade may well turn the lesson into a kind of quiz where giving the answers correct is the sole goal. On the other hand, students like to get a perfect "score" and giving grades may well be the carrot needed to get the student to repeat the lesson until they get the magic 100%.

Although lessons do have grades, they should not be considered as assignments, which lead to meaningful "marks". They are most useful as Formative Assignments where the grades, although some measure of activity, are not generally counted in the final mark for the course. If lessons are used in a formal way then it is probably best to use their grades in thresholds. For example "You must get an average of at least 80% overall in the eight lessons in this course before you can take the assignment." Lessons are mainly used to get across chunks of knowledge. Testing that knowledge is something else.

## CONCLUSIONS:

- This programme can provide our students with up to date training content quickly;
- Students can learn whenever they like; the students can study about any theme using teaching materials included in the Lesson – Tables containing data from measurements; Figures from laboratory experiences, Formulas etc.;
- Can provide interactive learning such as content delivery and question and answer exchange using web;
- Can check their preparation in "Measuring the Hardness of Materials" section with questions included in the lessons;
- Can use virtual data provision – provide course data and content using web;
- Can use the help offered by the instructors – professors and lectors with high qualification.

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