

*I Konferencja*

*e-Technologies in Engineering Education eTEE'2014*

Politechnika Gdańska, 30 kwietnia 2014

**MANAGING LEARNING PROCESS WITH E-LEARNING TOOL**

**Artur OPALIŃSKI<sup>1</sup>**

1. Gdańsk University of Technology, Narutowicza 11/12, 80-233 Gdańsk, Poland  
tel.: +48 58 347 13 32 e-mail: Artur.Opalinski@pg.gda.pl

**Abstract:** This article presents one possibility to employ Moodle, the free e-Learning platform, to organize learning understood as a process. Behavioral approach and application to massive courses are assumed. A case study is presented, where the introduction of Moodle resulted in better student performance in homework.

**Keywords:** learning process, tools, management

## 1. INTRODUCTION

Learning is a process. As such, it takes some time, which should be used for student's cognitive operation. The exact type of these operations or the role of teacher may be different. There are at least four basic theories describing the learning process in andragogy [1,2]:

- the behaviorist orientation,
- the cognitive orientation,
- the humanistic orientation,
- the social or situational orientation.

The first two theories are considered major [1]. No one of these theories is clearly advantageous to the others, but the rest of this paper will heavily rely on the behaviorist orientation, applied with the Moodle [3] e-learning platform. The Moodle platform itself was created with constructivist approach to learning, but leaves a lot of flexibility in shaping a course.

The behaviorist orientation [1] assumes that humans and animals alike learn by being reinforced to a specific behavior. In education, it is the teacher's role to shape or control what is learned. Frequent, positive reinforcement and rewards accelerate learning. Manipulating students with stimuli, inducing the desired behavior, and reinforcing the behavior with appropriate rewards are key aspects in this approach.

It is important to note that behaviorist theory emphasizes applying positive reinforcement. Negative reinforcements are less emphasized as they may cause stress, which is considered rather counterproductive in learning. Not using reinforcements for students is against the basic assumptions of this theory, as it does not enforce student's cognitive operation. Behaviorism is still widely used today [2], because controlling learning experiences helps direct students toward specific learning outcomes.

Looking at learning as a process, many features can be identified which are also common to other processes, e.g.

industry processes which are easily understandable to the teachers of future engineers. Every process:

- Has its goals.
- The goals should be measurable.
- Process consists of smaller closer steps, which direct towards the end.
- There are roles in the process which have to be taken and executed.

The theoretical roles in the learning process are easily understandable: there is the student who decided to get new knowledge and skills. There is also the teacher whose role is to guide the student and to help him achieve his or her goal. These initial assumptions may not always hold true; not many teachers are well prepared professionally, highly motivated and constantly ready to serve best to his or her students. Also the student community is not homogenous, and usually includes members who have lost their motivations to learn a given subject either temporarily, or permanently. Nevertheless it is the teacher's duty rather to provide good learning conditions, including influencing and correcting students attitude.

The goal of each learning process is to deliver some set of knowledge and skills to the students. The modern educational model in Polish academy and in some other European countries mandates the use of course descriptions (*karty przedmiotów*) defined by the National Qualifications Framework (*Krajowe Ramy Kwalifikacji*) for this goal. The course description should define the knowledge and skills to be gained from a given course.

The course descriptions set among others the ways to achieve the goals, which gives some hints as to the measurability of these goals. But course descriptions are not required to give an exact description about measuring each specific goal.

The course descriptions also do not define any steps or temporal dependencies in the learning process, e.g. which knowledge or skills will be obtained first, or which goals will be achieved first during the course.

To ensure meeting the final goals that the teacher sets for students, the above sub-goals and sub-skills should be achieved. Complying with these should be feasible for students, clearly communicated, and helped by providing proper course organization and by providing other support students may need.

Achieving this is hard, especially when taking into account that massive classes are taught still more and more often. Author has experience with teaching a course to up to 430 students at once.

This surely require using appropriate tools. Modern e-technologies can offer tools and methods to ease this task. Utilizing the communication capabilities of modern hardware and software, including mobile devices, makes the communication from teacher to students really fast and efficient. Dealing with the communication in the opposite direction, i.e. reacting to possibly voluminous content generated by the students, is out of the scope of this paper; it is described by author in another paper.

## 2. TOOLS AND METHODS

Moodle provides many ways to shape course page look and content. The potential components of the course are divided into two groups. One group is called *Resources*, while the other is called *Activities*.

- *Resources* include:
  - Book, File, Folder and IMS package – which can be used for distribution of educational material.
  - Label and Page – for conveying smaller amounts of information, e.g. organizational information, which is displayed directly on course page (Label) or requires clicking on a sub-page link (Page).
  - URL – suitable to provide link to other, possibly external web resources.
- *Activities* comprise of:
  - Assignments – which can be used for student individual or group upload of files or HTML content.
  - Database, Glossary, Wiki, Workshop – which enable collective creation of content by students.
  - Forum – that can be used bot as a means for students to create content, or as a communication medium for e.g. organizational issues. When communication to students, it offers the advantages that messages are delivered to all enrolled students and that messages persist in a blog-format, avoiding repeating student questions to the teacher.
  - Choice, Survey – that can be used for organizational goals, e.g. taking collective decisions or getting feedback from students by the teacher.
  - Lesson, Quiz and SCORM package – for presenting educational content to students in a way that enables interaction during learning, by requiring students to answer questions.

The above listed Moodle tools provide a wide array of elements to build a course page that will support the course behaviorist organization. The following section will give examples of utilizing many of these tools

## 3. CASE STUDY

### 3.1. Learning process

Author employs blended learning and bases all of his courses on Moodle since 2009, to support the behaviorist

orientation of his teaching. The common assumption in each course is that students are encouraged to participate in selected, clearly indicated Moodle *Activities* each week. Part of these activities takes place in class, and part of them is to be done remotely from home.

The courses are related to computer science and include:

- Information Technology, for fresh year students,
- Computer Science, for fresh year students,
- Computer Image Processing, for sophomores,
- Database Systems, at the second stage of study,
- Object-Oriented Programming, at the second stage of study.

The general idea of teaching is presented to students in each semester during the opening, administrative lecture, as presented in Figure 1. The spiral should represent the increase in students knowledge and skills, and the four quadrants of the space represent learning milestones in each week.

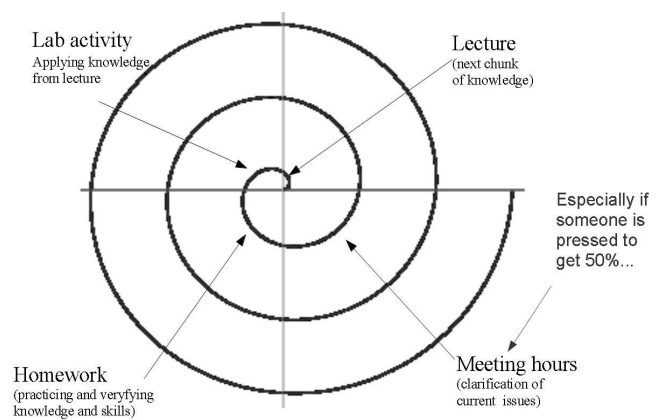


Fig. 1. General idea of behavioral approach to teaching, as introduced to students at the beginning of the semester (translated)

Each learning week starts with an in-class lecture. Students presence is obligatory during lecture by university ruling, but not enforced. The lecture is followed by optional remote work of students who can use the lecture materials available on Moodle to practice. Next comes the laboratory in computer room, where student start with obligatory entry test, checking their knowledge of lecture material. The rest of the laboratory is devoted to applying the knowledge from the lecture and to practice the skills (mostly programming skills). Due to the high number of students, there is a group of teachers involved in running laboratories, therefore a unified environment and a clearly defined task list is provided on Moodle to make students experience consistent during each laboratory, despite different teachers. The next phase is the remote online homework, which is obligatory.

Students also participate in one or two assessments per semester. The assessments are run online but in class, and under strict teachers supervision.

The difference between the obligatory and optional tasks is emphasized by scoring the obligatory tasks. The score is summative and influences the final grade.

### 3.2. Mapping tools on process

The learning process elements can be mapped onto Moodle tools in many ways. The way successfully used by author with behavioral approach is presented in Table 1 below.

Table 1. Mapping learning process elements onto Moodle tools, assuming behavioral learning approach

Process elements	Moodle tool(s)
Process goal	<p><i>File resource</i> which specifies the course syllabus.</p> <p><i>File resource</i> which contains the administrative lecture, describing the learning process, the topics covered, and the educational goals.</p>
Measuring of goals against thresholds	<p><i>File resource</i> which specifies the official grading rules and passing conditions and thresholds.</p> <p><i>Activities: Quiz, Assignments, Database, Glossary, Wiki, Workshop, Forum</i> where student's involvement or score is constantly visible and measurable, according to grading rules and conditions.</p>
Steps description	<p><i>Label and Page resources</i> to divide course page into weeks and to give ordering/administrative information.</p> <p><i>Choice, Survey, Forum activities</i> for clarifying issues, joining student groups, giving student feedback on course and teaching.</p> <p>File, Folder and URL resources containing training material and programming environment for students' work..</p> <p><i>Quiz, Assignments, Database, Glossary, Wiki, Workshop, Forum activities</i> to involve students into active learning and to score their work.</p>
Roles and organization	<p><i>Teacher role</i> is assigned to the teacher responsible for course.</p> <p><i>Non-editing Teacher role</i> is assigned to the teachers/instructors who conduct the laboratories. This ensures they have insight into students automatic grades and involvement measures.</p> <p><i>Student role</i> is assigned to students, to allow them to perform the activities.</p> <p><i>Guest role</i> is provided for students to use static material, especially the instructions to create a <i>Student</i> role for themselves.</p>

### 3.3. Results

Before introducing Moodle to support the learning process, little involvement with handing-in home assignments by students has been observed in the Computer Science course. To remedy the situation, the decision has been taken to better organize and align instructors work [4]. To provide central and official source of information for students and instructors alike, course page has been created using Moodle course management system. The course page has been made the focal part of the assignment activities.

As a result, homework hand-in rate has improved ubiquitously over the whole semester duration (Fig.2). A total of 11 assignments have been set out in 2009 and 29% of students handed in the last one. The last assignment in 2011 has been handed in by 39% of students. The number of assignments handed in still diminishes as semester is passing, as it was in 2009. One of the reasons of the diminishing trends is that this study concerned first year students, and during this year an exceptional number of students withdraw from the university.

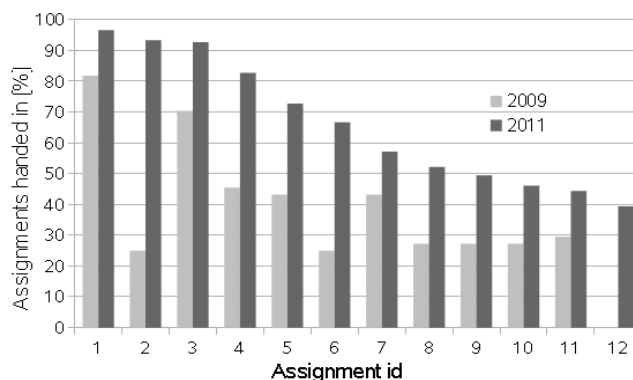


Fig. 2. Percentage of students handing-in assignments, by assignment id

Corrected handing-in rate values for the last assignments which take into account the number of students actually enrolled at the end of semester are 47% in 2011 versus 32% in 2009, which implies that almost half more students handed in the last assignment. The average, uncorrected handing-in rate during semester improved from 40% in 2009 to 66% in 2011. Yet another partial explanation for continuous falling handing-in rate in 2011 could be a changed organization of the second half of the semester in 2011.

A survey has been comparatively conducted in 2009 and in 2011 [4]. 80 responses have been received in the latter one; the most important results are presented in Figure 3 and Figure 4. Student were allowed to select multiple answers to each question, so the total number of answers exceeds 100%.

Answers to question about most valuable help source for completing assignments (Fig. 3) display a significant increase in influence of course materials (from 76% to 100%) and collaborative learning (from 29% to 41%) in comparison to 2009. Course materials have been partitioned and tailored to the scope of each assignment, and published in one place common with the current assignment details, to stress their linkage. Such close linking has been used as some studies indicate that student may fail to recognize connections between material learned in one context and its usefulness in another, practical context [5]. The increase in answers on collaborative learning can be explained by the fact that students started to take the assignment seriously, which required more engagement and work, and this additional load has been coped by them by employing their usual techniques, possibly including cheating [6].

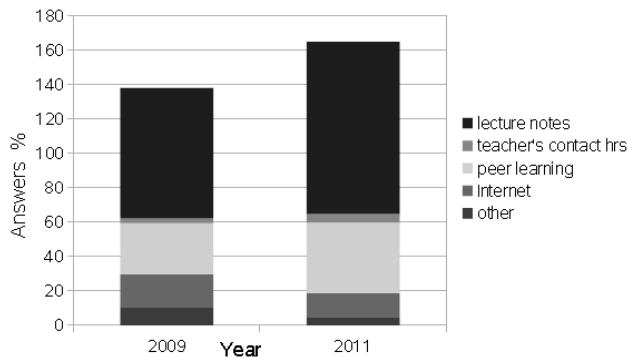


Fig. 3. Survey results regarding most valuable help source for completing assignments

The most dramatic change can be noted from answers to question concerning obstacles in doing and handing in assignments on time (Fig. 4). Organizational explanations for not doing homework, previously abundantly reported as 'other', almost disappeared in 2011 (change from 48% to 5%). It was the main goal of the course page to publish the crucial information and remove the obstacles reported, i.e. uncertainties regarding rules, deadlines, and assignment details. Also the quite popular explanation of having forgotten about the homework disappeared completely in 2011 (change from 19% to 0%). This was probably due to fact that the whole learning process has been closely organized around Moodle course page, including short weekly entry tests before laboratory, and laboratory task descriptions, which required the most of the student population to visit the course page a few times per week and to sight the highlighted homework upload link frequently.

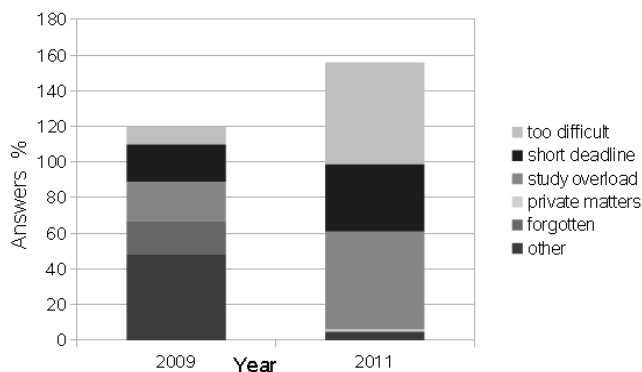


Fig. 4. Survey results regarding obstacles in doing and handing in assignments on time

New issues blocking assignment handing-in appeared clearly in 2011 instead. Students largely indicated obstacles well based on merit: overload with study duties (55%), short

deadlines (38%), and assignment difficulty (57%). Answers about lack of time or duty overload are typically indicative of other, unidentified problems, but all these three comments could perhaps be summarized to the issue of over-complex assignments. New issues blocking assignment handing-in appeared clearly in 2011 instead. Students largely indicated obstacles well based on merit: overload with study duties (55%), short deadlines (38%), and assignment difficulty (57%). Answers about lack of time or duty overload are typically indicative of other, unidentified problems, but all these three comments could perhaps be summarized to the issue of over-complex assignments.

#### 4. CONCLUSION

Learning – despite many human and emotional interactions involved – may be regarding as one more running process. This process can be controllable, if proper management tools are employed. Proper control measures may result in guiding students through a well-defined path and stimulating them frequently, at specific moments.

It also gives a good opportunity to unify teaching in a team of instructors and to improve communication in both directions. Capabilities of Moodle – and probably other e-Learning platforms at a similar degree – are very effective in supporting this, but they will not replace a thorough planning of the process.

#### 5. BIBLIOGRAPHY

- Hartley, J., *Learning and Studying. A research perspective*, Routledge, ISBN: 978-0-415-16852-6, 2006
- Joyce, B., Calhoun, E., Hopkins, D., *Models of Learning – tools for teaching*, Open University Press, ISBN: 978-0335234196, 2008
- Open source Moodle Project home page, available online, URL: <https://moodle.org/>, DOA:25.02.2014
- Opaliński, A., Employing Blended E-Learning to Improve Rate of Assignments Handing-In, proc. of CITE 2011
- Bennett, A.G.; Natarajan, R.; Onofrei, S.; Paulhus, J., *Work in progress – connecting online labs and homework*, Proc. Frontiers in Education Conference, FIE 2008, 38th Annual, Saratoga Springs, NY, 22-25 Oct. 2008
- Kotas, P. M., Finck, J. E., *Collaborative Learning and Other Successful Strategies for On-line Homework*, 2002 International Conference on Computers in Education (ICCE'02), Auckland, December 03-December 06, 2002

## KIEROWANIE PROCESEM NAUKI Z WYKORZYSTANIEM NARZĘDZIA DO E-LEARNINGU

Artykuł przedstawia możliwość wykorzystania platformy e-Learningowej Moodle do organizacji nauki, rozumianej jako proces. Zakłada się podejście behawioralne i kursy z wieloma uczestnikami. Przedstawiono przypadek w którym zastosowanie Moodle zaowocowało lepszymi wynikami studentów w składaniu prac domowych.

**Słowa kluczowe:** proces uczenia, narzędzia, kierowanie