ACTA DIDACTICA NAPOCENSIA
Volume 11, Number 3-4, 2018

# REVIEW OF THE DEVELOPMENT AND APPLICATION OF AN INSTRUCTOR'S PORTAL FRAMEWORK

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**Abstract:** In this paper the design and implementation of a digital on-line surface is presented, which reflects contemporary learning principles, perspectives, devices and trends while enhancing the selection of existing web-based systems and applications in a novel fashion. This instructor's portal, called Tanítlap, is realized via Action Research and Design-Based Research methods in addition to the theoretical and empirical inquiry. It was designed and implemented with the aim of providing assistance to fulfilling education and administration related tasks to instructors without a background in informatics and computer science. This Instructor's Portal Framework System will provide access to educational support materials and information for learners without spatial and temporal restrictions via a flexible, accessible and easy to use surface. The research presented in this article is divided into the following phases: 0. Survey of relevant professional texts 1. Assessment of preliminary needs, 2. System design, 3. System development, 4. System control, 5. Web ergonomic examinations, 6. Effectiveness test. The last phase is described in detail.

**Key words:** Intrustor's portal, Action research, Design-based research, Didactics of Educational portals, Efficiency test

## 1. Introduction

Technological developments at the turn of the 21st century led to radical changes in human communication and learning including a significant transformation of the concept of learning. The large amount of knowledge amassed at the world wide web became freely accessible for everyone and the idea of lifelong learning[1] and learning outside the framework as school (non-formal or informal learning) gained increasing importance. Due to portable smart devices and constant Internet access human communication or the learning process is not dependent on space and time, anymore. Consequently the education process itself experienced a significant change as well. We are living at the time of the Fourth Industrial Revolution during which technological improvements are leading to a cultural paradigm shift [13] in all aspects of life. As Bertalan Komenczi asserts "the fundamental and rapid changes taking place in the cultural environment present a significant challenge both for pedagogy as a science and the education process itself" [14].

The information-based society of the 21st century compelled the rethinking of the content-based and technological requirements of the education process. In the higher education area, this generative influence, that is the demand (and compulsion) for change, can be more clearly felt as graduates directly enter the labour market. Furthermore, higher education provides a more flexible framework for learning as it is more autonomous and less regulated from organizational and curricular aspects than secondary education[2]. Consequently, this system reacts faster and easier to the respective social

[1] In addition to several international documents (UNESCO, OECD) the concept of lifelong learning has been integrated into the Digital Instruction Strategy of Hungary, the National Info-communication Strategy 2014-2020, and in the document titled Gearing Up the Higher Education Arena as a major societal concern.
[2] The public education sector is less flexible as the National Curriculum and its curricular impact is a major determinative factor.

*Received July 2018.*

**Cite as**: Kvaszingerné Prantner, Cs. (2018). Review of the Development and Application of an Instructor's Portal Framework *Acta Didactica Napocensia*, 11(3-4), 141-156, DOI: 10.24193/adn.11.3-4.11.

and technological changes and the on-line surfaces and portals have a greater role and influence in this area as well.

In the higher education area internet-based educational materials, texts, on-line supported learning environments, multimedia options, e-Learning surfaces, and web-based services have a special importance as the students are mostly commuting adults continuing their studies besides work. Consequently, due to spatial and temporal restrictions students enrolled in part time programs cannot always participate in traditional courses [2]. Furthermore, compared to lower levels of learning mobile devices have greater importance for such students [24]. The world wide web makes e-learning texts, surfaces supporting constructive, collaborative, and self-regulated learning, and virtual 3D spaces (Second Life, VIRCA) along with web 2.0-based learning support community applications available. Teachers can construct learning environments from these options and learners can select according to their own demands and objectives while forming their own Personal Learning Environments (PLE) [1, 12]. In addition to traditional class room-based knowledge acquisition and computer-based electronic learning the combined or blended learning approach appears to enjoy increasing significance [8].

Digital transformation[3] or the complementing of the learning environment of educational institutions with electronic learning options including the use and continuous development of educational web-based services and applications is an essential requirement for achieving the desired changes. Today in 2018 there is a great need for the support of the work of instructors in higher education with web-based informatics systems facilitating the improvement of the respective teaching efforts in addition the expansion of the higher education area [15]. Furthermore, most students enrolled in higher education programs, possessing high levels of digital literacy [6] and continuing their education while working [2] have a natural need for access to a greater variety of on-line learning support options and auxiliary materials via appropriately structured web pages and applications.

## 2. Research objectives

Accordingly, with the aim of providing assistance to performing education and administration related tasks to instructors without a background in informatics and computer science in mind I designed and implemented an Instructor's Portal framework system. Supported by said web surface, instructors can share auxiliary or educational support materials with students in a pre-conceived and structured manner along with exchanging messages. My goal is to enable instructors to use the web surface appearing in the form of a portal named Tanítlap (Instructior's Portal). During the design stage I surveyed a variety of design principles and models in the fields of Human Computer Interaction, web ergonomy, usability, user experience and obstacle free access[4]. I placed special emphasis on meeting the latest web standards (HTML5 and CSS3), the inclusion of validator-reinforced codes, and the provision of obstacle free access, while successfully performing on web ergonomic and usability tests.

Aiming to develop an appearance reflecting the responsiveness principle[5] and to maximise the potential inherent in mobile learning I strove for optimal presentation of the given materials on mobile phones, tablets, laptops, and large screens according to the size of the given instrument. Surpassing basic presentation requirements, the respective display including appropriate colour, page, and menu arrangement can be shaped, modified and customized according to instructor needs.

I also desired to develop a didactically good system supporting frontal instruction, individual and group work along with differentiated and cooperative learning in curricular and extracurricular contexts. Additional objectives included enabling the system to provide background and support for

[3] The digital transformation is a process resulting in the expansion and enhancement of ICT-literacy in a generic fashion regardless of the respective subject matter via target-specific methodology and increased use of ICT devices and the respective virtual dimensions including webpagesl portals, and on-line surfaces [10].
[4] The system should meet the" A" level requirement of the WCAG 2.0 standard.
[5] A webpage whose design reflects the responsiveness principle is perfectly suited to the respective display device while provides flexible images and optimal menu selection options.

the organization and implementation of progressive learning methods and assist instruction schemes utilizing blended learning options.

## 3. The structure of the research and the research apparatus

My research effort covered three main areas: (1.) the exploration of the crucial characteristics of contemporary state of the art web-based technologies and electronic environments providing support for the learning process along with examining the latest teaching and learning principles and trends (2.) the formation of the conceptual basis for an instructor portal reflecting appropriate learning trends and system design principles and technologies; (3.) the development of a didactically sound, ergonomically appropriate and easy to use and flexible web surface for the teachers and learners.

**Table 1.** *Research apparatus*

| Research phase | The objective of the research phase | Applied methods | Device or means |
|---|---|---|---|
| **1. Survey of relevant professional literature** | | | |
| **(a)** | The exploration of the crucial characteristics of contemporary state of the art web-based technologies and electronic environments providing support for the learning process along with examining the latest teaching and learning principles and trends | Qualitative method during the Survey of the relevant professional texts | Literature research |
| **2. Assessment of preliminary needs** | | | |
| **(b)** | The examination of the legitimacy of instruction portals and the assessment of the respective receptive attitudes | Quantitative, written questionnaire | Questionnaire 1 (for instructors) |
| | | | Questionnaire 2 (for students) |
| **3. System design, the structure of the conceptual basis** | | | |
| **(a)** | Survey of design models, qualitative method, survey of professional research results | Qualitative method | Literature research |
| **(b)** | Survey of content and functional expectations regarding instruction portals | Quantitative, written questionnaire | Questionnaire 1 (for instructors) |
| | | | Questionnaire 2 (for students) |
| **(c)** | Designing the conceptual basis of the system | System design | User-Centred Design model |
| **4. System development** | | | |
| **(c)** | Testing the concept developed during the design stage | Research development via Design-based research | Drupal content management system |
| **5. System control** | | | |
| **(c)** | Technological monitoring of the system | Code analysing by validators | Code validators |
| | Testing the structure of the system, the control of the menu system | Practicing with the menu system | Practical portal testing |
| | Testing the portal for meeting the WCAG 2.0 "A" level standard, code monitoring by validators | Testing the accessibility options provided by the portal | WAVE (web accessibility testing software) |
| **6. Web ergonomic testing** | | | |
| **(b) and (c)** | Ergonomic and usability testing of the self-developed instructor portal | Usability tests on the instructor and student side | Performance of micro-tasks |
| | | Ergonomic tests on the instructor and student side | Eye-tracker device |
| **7. Effectiveness and viability tests** | | | |
| **(c)** | Testing the frequency of visits and use, testing the attitude of the users | Analysing the frequency of visits | Logfile analysing |
| | Attitude research of the self-developed instructor portal | Quantitative, written questionnaire | Questionnaire 3 (for students) |
| | | | Questionnaire 4 (for instructors) |

* The entire research with the all phases are embedded within the Action-research method.

The abovementioned objectives were realized according to a schedule: 1. Survey of relevant professional texts 2. Assessment of preliminary needs, 3. System design, 4. System development, 5. System control, 6. Web ergonomic examinations, 7. Effectiveness test. My research discussed in this paper, the research phases are visible in Table 1.

I rely on all three types of pedagogical research methods described by Burkhardt and Schoenfeld. [3] The respective principles applying to research in the 21st century include (a) the theoretical, qualitative approach also known as the "humanities approach," (b) the quantitative or scientific method, ("the science approach") and (c) research focusing on system development ("the engineering approach"). The table titled Research Apparatus shows the allocation of the given research methods or their sub-segment to the respective stages of research. In addition to indicating the given research types the research phases, objectives, applied methods and devices are also presented.

As far as the established concept and the elaborated system are concerned it is important to note that we expect practical results in the field of pedagogy. We aim to examine and test the design and the completed system in the daily context of the education process. The respective instruction portals were implemented and experimentalized via Action research combined with the methodology of Design-based research.

## 4. The applied methods of research

The System design, System development, and System control phases were implemented by Design-Based Research [4], while the total research program was carried out within the framework of Action Research [26].

### 4.1. Action Research

The achievements of Lawrence Stenhouse increased the value and importance of practice-oriented pedagogical research in addition to theoretical inquiries. At the same time the role of the Teacher-Researcher gained more significance besides the Researcher-Expert function. Stenhouse placed special emphasis on the teacher's role in the classroom and believed that the classroom provides an optimal "laboratory" for testing educational theories (Stenhouse, 2010 qtd. in [29]).

In Action research both theoretical knowledge and practical ability play a significant role in addition to observations and reflection skills. According to Havas' definition during action research everyday aspects are integrated into the educational process and are disclosed or "unwrapped" in order to examine the respective conceptual-logical, personal-organisational, and other considerations. The goal of action research is the improvement or optimization of a given activity [9]. I expect that the web surface developed as a result of my research to provide practical results in the field of pedagogy. Accordingly, in actual educational contexts I tested by Action Research how the portal created via Design-Based Research can support the education process, along with the respective methodological options, and to what extent it helps students and instructors in preparing for lessons. Based upon the experiences I continuously improved the usability method (structured portal) and I refined the device itself.

Action research is expected to improve the instructor portal's classroom application methodology, increase learner motivation in processing the respective educational materials along with making the lessons more attractive. Also it can facilitate easier acquisition of practical knowledge and skills. I also aim at the fine tuning of the webportal from informatics and didactic aspects. It is also hoped that the continuous correction and improvement of the given methodology and the system will have a cumulative effect in promoting the efficiency of the web portal-based learning process.

### 4.2. Design-Based Research

Design-based research originates from the beginning of the 1990s when Brown and Collins introduced the expression "design experiment." The purpose of such experiments was to monitor and refine educational designs based on previous research.

Researchers tend to pay increasing attention to the method representing an emerging research paradigm aiming at the elaboration of "usable knowledge" as a response to practical problems. The philosophical background of DBR is pragmatism [21] and the method includes induction, the mapping or identification of patterns, deduction, the control of theories and hypotheses, and abduction, the selection of the most appropriate explanation for analysing the obtained results and performing further inquiry [21].

Nádasi considers DBR as a qualitative research due to the fact that Design-based research takes place in a natural or inartificial context, reflects on or responds to the given environment, while emphasizes narratively expressed phenomena over quantitative data. Design-Based Research is a systematic and flexible method aiming at the improvement of education via repeated analysis, design, development, and implementation. It results in design principles and theories, responding to the given real environment in which researchers and instructors jointly work [7].

The instructor portal framework system was developed via Design-based research. At first relying upon methodological and ergonomic research along with user surveys I elaborated the conceptual basis of the instructor portal framework system. Then I formed a system, that is I developed the instructor portal framework system called Tanítlap in order to check the appropriateness and soundness of the plan in practice. Furthermore, I explored the respective pedagogical advantages via Action Research. The research phases of the implementation of the instructor portal meet the criteria of Reeve's often referenced Design-Based Research model forwarded in 2006 [26]. (Figure 1)

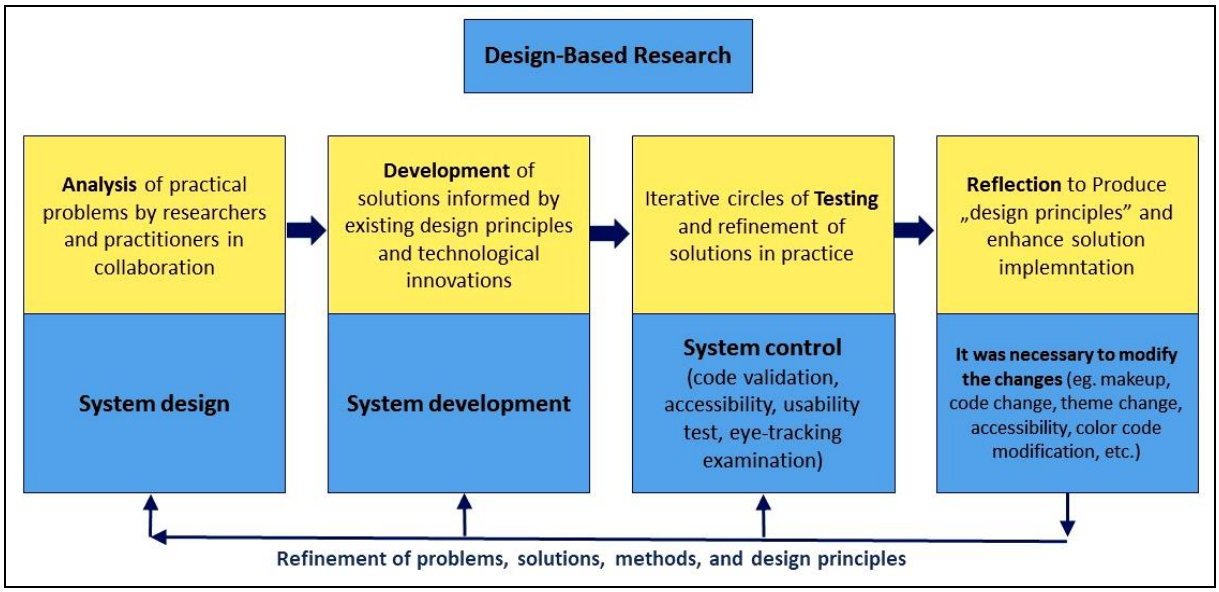


**Figure 1.** *Reeves's diagram complements my own research phases*

Coupled with designing and using technological applications Design-based research methods are frequently used in solving educational problems occuring in every day practice. The method is viewed as interactive, repetitive, flexible, and environmentally sensitive. Scientific enquiries focus on the workings of the characteristic guiding principles, the development of the respective innovations, and the resulting changes.

In 2006 Reeves identified 3 basic principles of Design-based Research: (1) the treatment of complex issues in a realistic context via cooperation with experts; (2) the combination of well-known design principles with high level technologies in order to find sound solutions for complex problems; (3) reflective evaluations for testing and refining innovative learning environments and the determination of new design principles. Consequently, Reeves established four phases of Design-based Research: 1) problem analysis, 2) the development of solution, 3) repetitive cycles of control and refinement, 4) reflection on design/development/control theories [26]. Both Reeves' essay published in 2006 and Amilevel's 2008 study include the flow chart of Design-based Research emphasizing the method's cyclical nature (the rectangles with an orange background of Figure 1). I added 4 rectangles with a

blue background correlating the stages of the development of the Tanítlap portal to the phases of Design-based research.

### 4.3. Methodological triangulation

My research as well utilizes a wide selection of methodology, or a triangular approach [19]. Accordingly I rely on several tests and analyses including quantitative questionnaire-based surveys, assessments, eye tracker movement device supported usability tests, and logfile analysis, in addition to surveying the professional literature, and performing Action Researchand Design-Based Research.

## 5. About the research phases

### 5.1. Survey of relevant professional literature research phase

The survey of the relevant professional literature covered two fields, pedagogy and portal construction-management.

In the zero phases dedicated to relevant achievements in pedagogy provides an analysis of the technological advances of the 21st century along with various European perspectives, principles (i.e. Lifelong Learning, Performance-based higher education, etc.), objectives, and challenges brought about by the Internet. Special attention is paid to the question of electronic learning environments, and the respective virtual dimensions (on-line web surfaces) related to the education process. [1, 2, 6, 12, 13, 14, 24]

The literature research also concentrates on the interpretation and analysis of the portal concept, and discusses the potential integration of the instruction framework portal into the electronic learning environment of the Hungarian higher education area and its prospective role beside the currently used Learning Management Systems (LMS). [2, 6, 8, 14, 15]

### 5.2. Assessment of preliminary needs research phase

I used two questionnaires during this research phase (**Questionnaire 1** and **Questionnaire 2**), one for the measuring of students' opinions and views and one for that of instructors. This research phase proved the legitimacy of elaboration of the instructor portal framework system for use at the Eszterházy Károly University (EKU). I performed quantitative statistical analyses in the Assessment of preliminary needs phases with the help of the SPSS 17 software.

The survey revealed that 61% of the instructors surveyed, that is 49 out of the sample of 80 (N1=80) did not have a web page and 71% and 35 would have liked their own webpage. The examination proved that 71,2% of the sample of 163 students (N2=163) wished that instructors had their own webpage. It was proven as 71.43% of instructors and 82.83% of students considered instructor web pages useful and indispensable. This value is a good result.

I asked the instructors about who use Moodle learning management system and/or own instructional webpage, they answered 16 people. 8 out of 16 teachers responding to the survey reported that they use the Moodle framework system along with their own webpage.

### 5.3. System design, the structure of the conceptual basis

This phase is built up of 3 elements: 1. Literature research, 2. Questionnaire assessment of needs, 3. Designing the conceptual basis of the system (using the User-centered Design model).

1. Utilizing the latest research results focuses on the theoretical background of Human-Computer Interaction (HCI), the main design principles related to instructor web pages and portals, the respective quality assurance issues, web ergonomy criteria, accessibility questions, web standards, user experience, and the significance and cost-effectiveness of, usability tests. [5, 10, 11, 18, 20, 22, 23, 27, 28]

2. I surveyed the questionnaires about the needs of teachers and students against teaching websites. The results are displayed on the Figure 2. [16]

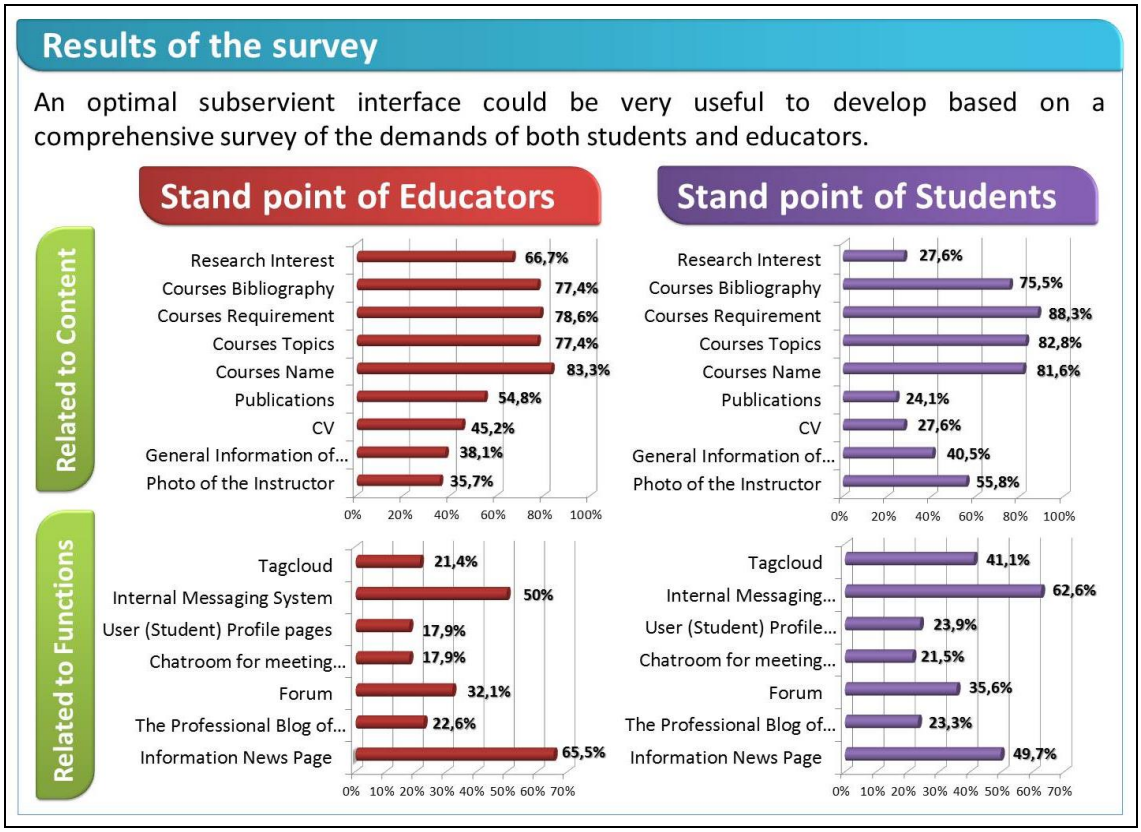


**Figure 2.** *Result of the preliminary needs survey*

3. Designing the conceptual basis of the system

I prepared a detailed and carefully considered conceptual basis facilitating the construction of the abovementioned instructor portal. The questionnaire based surveys were required for the exact assessment of the contents and functions expected of an instructor portal. Consequently, the respective results influenced the portal development process. Detailed introduction of the concept behind the educational portal has already been published. [16]

## 5.4. System development

During this part be realised the implementation phase is preceded by detailed surveys and a comprehensive and painstaking design effort. Following the implementation process, the appropriateness and usability of the respective concept can be tested in every day practice. Furthermore, an instructor portal's ability to assist the work of teachers and the learning effort of students can be assessed as well[6]. The strength of Action Research is that it allows the testing of the efficiency of a given method or device in practice.

The forwarded design facilitated the preparation of a system helping instructors with low or medium level digital competence (IKER[7] 1. or 2. levels), in such daily activities as updating their webpage, uploading content, and appropriately using the given system.

[6] Naturally, this cannot be evaluated in an exact manner as the maximisation of the portal's potential depends on the given instructor and the extent of user motivation is determined by the respective instructor, student, or subject.
[7] IKER competencia framework: http://progress.hu/iker-onertekelo/, IKER levels: http://bit.ly/2BZ3mKC, [2018.05.30.]

The portal was structured and constructed according to the **Drupal 7** content management system[8] and I relied on the **HTML5** descriptive language and on the **CSS3** in the implementation process and in development of the portal's appearance respectively. The URL of the completed Instructor's Portal framework is http://tanitlap.uni-eger.hu. One site of this framework is: http://tanitlap.uni-eger.hu/csilla. [2018.05.30.]

## 5.5. System control

The system control phase consists of three parts: 1. Technological monitoring of the system (validating according to HTML5 and CSS3), 2. Testing the structure of the system, the control of the menu system (the functioning of the portal), 3. Testing the portal for meeting the WCAG 2.0 "A" level standard, code monitoring by validators.

The implementation of the first and the third phases is a rather complex process. My objective was to construct an instructor portal framework system by the Drupal 7 Content Management System whose source code contains an appropriate code validated by the HTML5 and CSS3 standards along with meeting the "A" level criteria of the WCAG 2.0 accessibility standard.

The outlined objectives were realized via the establishment of an instructor portal framework system meeting the requirements of the abovementioned validated source code and standards. I have submitted a treatise for publication focusing on the significance of the accessibility of the Tanítlap portal and the importance of the validation of the codes, the respective theoretical background along with the completed and relevant validation and accessibility process. (Prantner, 2018 already submitted for Teaching Mathematics and Computer Science journal).

## 5.6. Web ergonomic testing

During this research phase I performed Usability Tests supported by eye movement tracking devices. The instructor portal framework system was thoroughly examined by a test group including 42 students and 6 teachers.

Due to the emergence of some problems I decided to modify the surface. Thus I automated the scroll down function and established a separate block and entry for the display of the class assignments. Many of the factors under investigation were on the page and numerous elements could be found on the web-interface as well.

My research, however led to a new result, namely that an authentic attention map of a given webpage can be constructed by averaging the heat map of a glance of 6 persons. The interpretation of the results of the eye tracking investigation performed with students and the respective research findings have been summarised in a recent study available in the IEEE Xplore database. [17]

## 5.7. Effectiveness and viability test

The Tanítlap system was completed. Two of the eight portal users rate their own digital literacy or computer proficiency at IKER 1. while four locate their proficiency at IKER 2. level. These insructors use the system independently in the course of their everyday work.[9]

I probed the given attitudes of users, that is, how much do the instructors and students like the portal and how they rate the respective utility. The respective tests were performed with questionnaire based surveys and log file analyses. The questionnaires were evaluated by SPSS 17 statistical program.

[8] I relied on the following professional texts and materials: Gusztáv Nagy (2012) *Introduction to Drupal 7* [G] (http://bit.ly/2vYQVvt), the official Drupal website (http://drupal.org), the website of the official Hungarian Drupal community (http://drupal.hu). Last viewed in case of all URL: 2017.08.30.
[9] This helps in assessing the appropriateness of the concept.

Accodring to the results at least 76% of students consider the portal important and in light of the 5 tested activities either performed in class or at home the findings surpass the expected substantiation threshold. Furthermore the 100% of instructors and 86,5% of students consider course support the most important feature on the Tanítlap portal.

The portal on attitudinal examination was rated both by students and instructors at 4 on the usability factors of Nielsen measuring scale. [22] Finally, it can be concluded that the Tanítlap instruction framewok portal is popular and considered useful both by instructors and students in curricular and extracurricular contexts. The details of investigation of Instructor's portal can be view in the next section.

## 6. Details of effectiveness and viability test

The effectiveness test has three aspects. On the one hand I determine the number of instructors and students registered at the given instructor portals along with the number of instructor designed and offered courses. Presently, the portal is in the stage of live testing. I obtain the respective data by checking the number of registered users and offered courses at the given webpages. Moreover, I rely on questionnaires in gauging the respective views of instructors and students (called Studential Questionnair) who have used the system previously or currently. Finally, I analyze the logfiles established by the web server in order to ascertain the frequency and purpose of website use in a given period.

### 6.1. Using of Instructor's Portal framework

Presently the *Tanítlap* portal is being used by 9 instructors at the EKU at differing semesters depending on the date of joining the system.

**Table 2.** *Instructors using the Tanítlap portal*[10]

| Name | Unit | Assignment | How many subjects are on the web? | How many students are registered to? | How many semesters have you used so far? |
|---|---|---|---|---|---|
| **Péter Antal** | Department of Education and Communication Technology | associate professor | 3 | 35 | 1 |
| **Boglárka Faragó** | Department of Psychology | assistant prof. | 20 | 648 | 5 |
| **Anita Fürné Mosoni** | Department of Psychology | master teacher | 8 | 320 | 3 |
| **Judit Herpainé Lakó** | Institute of Sport Science | lecturer | 22 | 264 | 3 |
| **Gyula Kalcsó** | Department of Hungarian Linguistics | associate prof. | 22 | 130 | 3 |
| **Márta Nagyné-Klujbert** | Department of Pedagogy | assistant prof. | 15 | 40 | 2 |
| **Csilla Kvaszingerné P.** | Department of Humaninformatics | assistant prof. | 18 | 551 | 5 |
| **Tünde Taskó** | Department of Psychology | associate prof. | 3 | 101 | 2 |
| **László Dorner** | Department of Psychology | assistant prof. | 1 | 16 | 1 |
| | | | **112** | **2105** | **25** |

Table 2 provides data concerning the present users of the Tanítlap portal. The number of potential users continuously increases and in addition to the present users 8 more instructors indicated their intention to join. The breakdown of future users is 2 in English Studies, 1 in Biology, 3 in Psychology, 1 in Sociology, and 1 in Music. Altogether 2105 students are registered onto 9 portals covering 112 courses compiled or created by 9 instructors. The testing of the Tanítlap portal began 5 semesters ago and the scope of users is continuously expanded.

[10] The data was collected on December 1, 2017. The instructors listed in the Table have given their written consent for the publication of the respective data.

## 6.2. Usefulness indicators from the students' point of view

Item 10 of **Questionnaire 3** called on the respondents to evaluate 9 activities on a 1 to 5 Likert scale from the point of view of usefulness. Figure 3 shows the respective results.

The graph shows that in case of the first 7 activities the answer: "I consider it very useful" is prevalent. If the replies: "I consider it useful" are included among the indicators of usefulness then we can conclude that as far as the first 7 activities are concerned out of the 365 respondents arranged in sequence 263 (72%), 289 (79%), 277 (76%), 253 (69%), 256 (70%), 246 (67%), and 254 (70%) believe in the portal's usefulness.

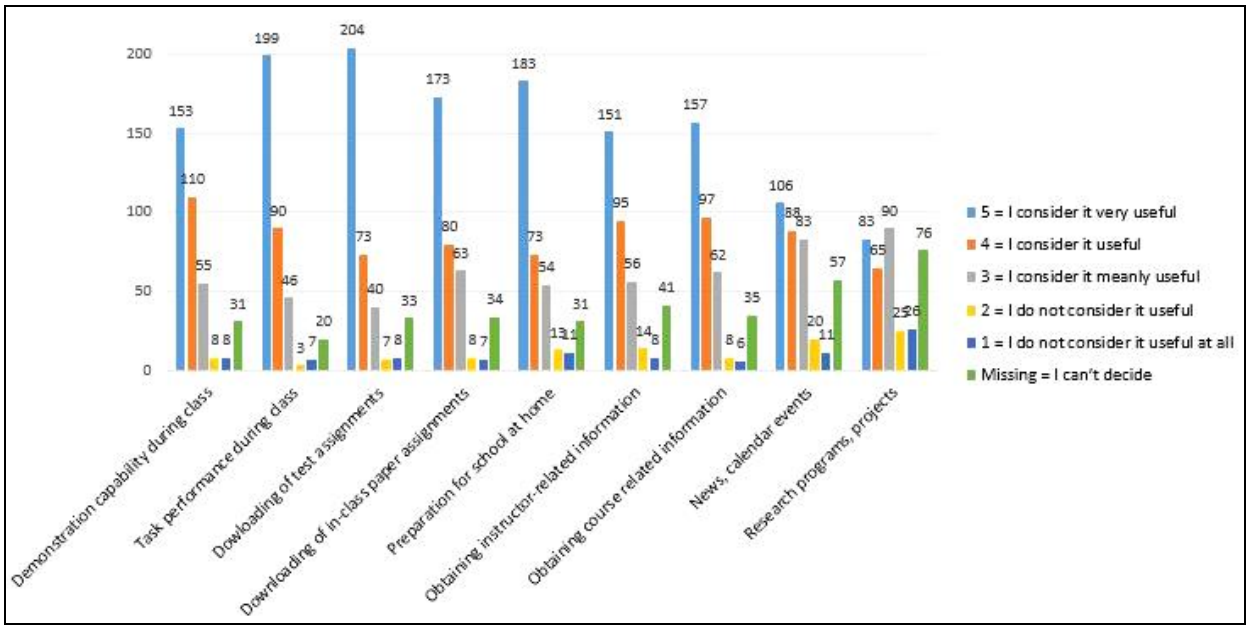


**Figure 3.** *Student' view of the usefulness of the Tanítlap portal regarding 9 activities*

## 6.3. Usefulness indicators from the instructors' point of view

**Questionnaire 4** was used to assess instructor opinions on the Tanítlap portal. I had those instructors complete the questionnaire who used the portal at least for one semester teaching one subject. Table 26 provides a detailed description of the sample including the given instructor, the number of semesters and the number of subjects. The sample included 5 women and 3 men. The youngest respondents included two women at age 28, and the oldest respondent was a 51 year old man, while the average age of the sample was 39,36.

My main goal was to deploy the questionnaire to determine instructors' views on the usefulness of the portal, its capability to make their work easier, to help class work, and to assist students' preparation at home. Item 10 of Questionnaire 4 called for the evaluation of the same 9 activities on the Likert scale as it was warranted by Item 10 of Questionnaire 3 from the students' point of view. Figure 4 includes the diagram-based representation of the respective results.

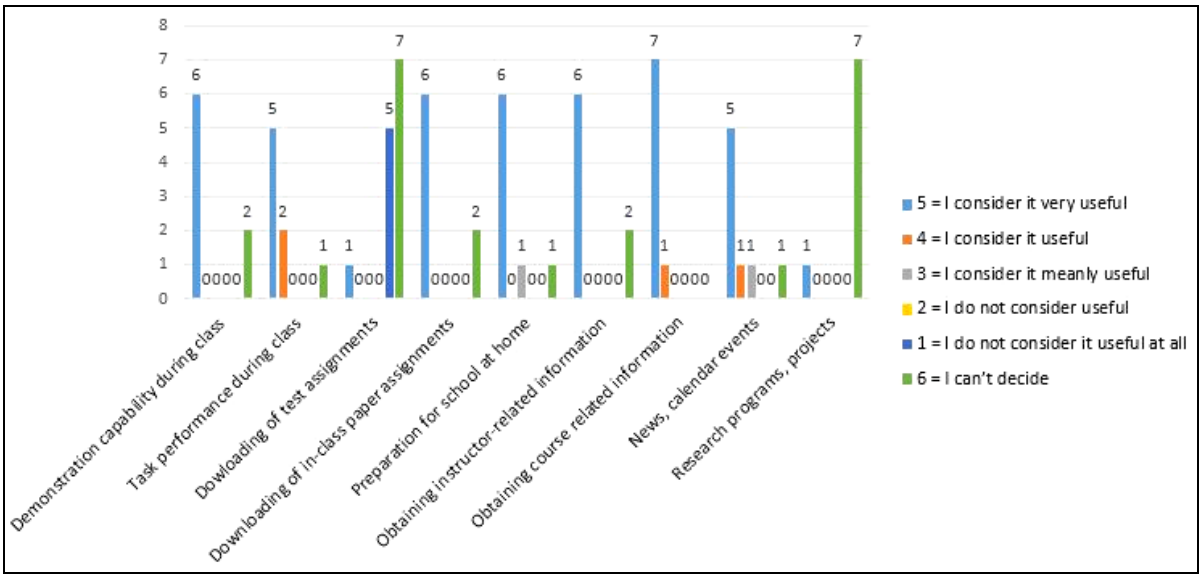


**Figure 4.** *Instructors' view of the usefulness of the Tanítlap portal regarding 9 activities*

In Item 11 instructors were asked to determine the extent to which the portal makes (1.) class work and (2.) students' home (extracurricular) preparation easier on a Likert scale ranging from 1 to 5. Regarding both questions the same two people chose the "*I can't decide"* option. In the first case the rest of the respondents marked "*makes it significantly easier"*, and the responses to question 2 included 1 person marking" *makes it easier"* and the rest chose the marking of "*makes it significantly easier"* (Figure 5).

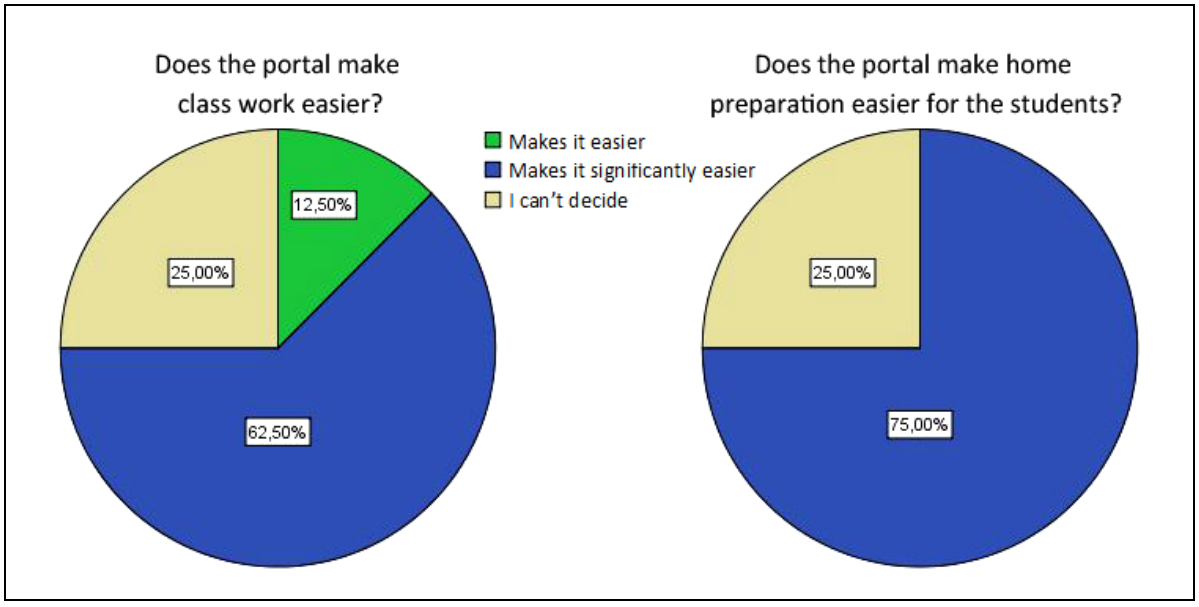


**Figure 5.** *To what extent makes the portal class work and at home preparation easier? –instructors' responses*

Having combined the responses at levels 4 and 5 of the scale we can conclude that 75% of the sample (N=8) agrees that the *Tanítlap* portal provides significant help both in case of class work and at home preparation.

## 6.4. The usability evaluation and likeability examination of the surface

The five usability factors identified by Jakob Nielsen [23] are crucial indicators of a web-based surface's capability to support the learning process along with its functionality and general

appearance. Accordingly, the portal was evaluated by 365 students and 8 instructors. The respective results including the factored averages are shown on the following two graphs below. (Figures 6, 7).

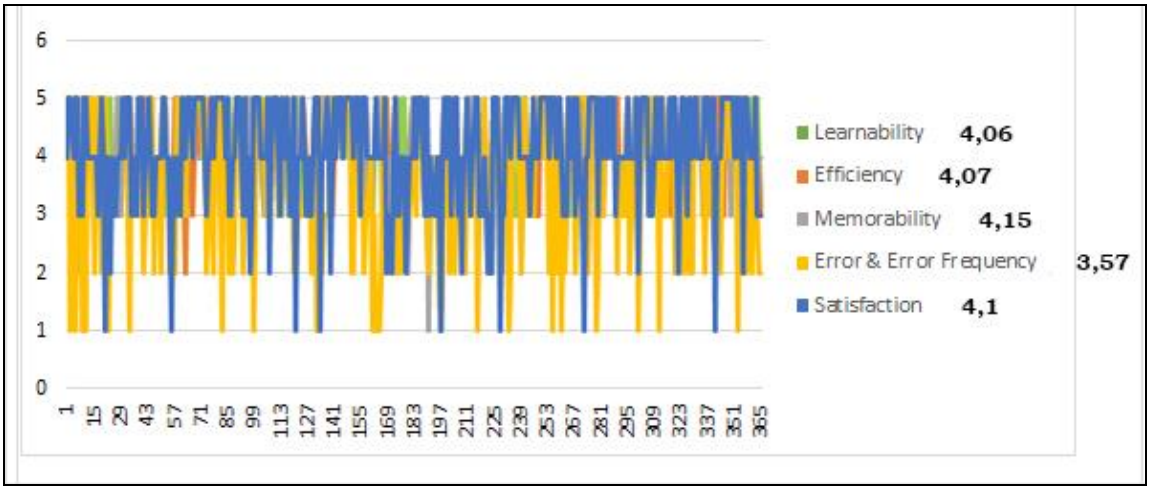


**Figure 6.** *The evaluation of the portal by 365 students according to the usability factors identified by Jakob Nielsen*

Due to a high amount of data not all factor graphs are clearly readable. The least visible is the Learnability graph as it is partially covered by the graphs above. Figure 6, however, clearly shows that the majority of students marked Learnability at level 5. Furthermore, Figure 7 displays all five factors in case of the full sample (8 persons). The respective averages are indicated behind the factors.

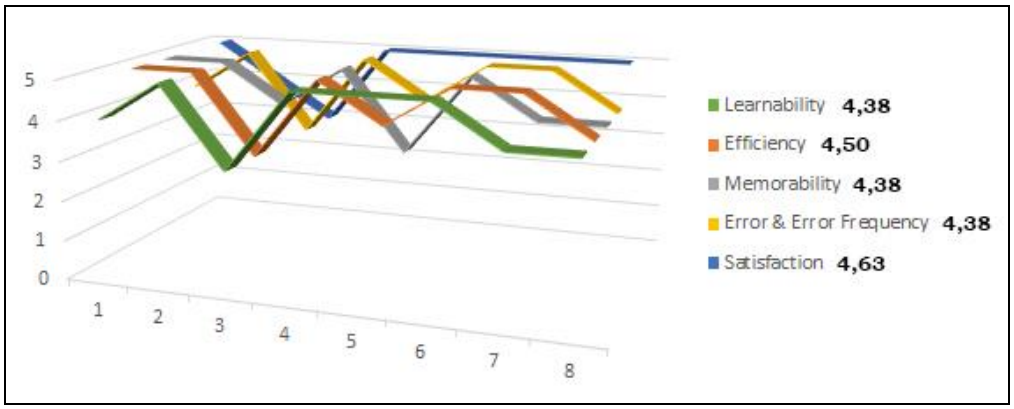


**Figure 7.** *Instructor evaluations (N=8) according to the usability factors identified by Jakob Nielsen*

After averaging all the five factor-based evaluations of both students and instructors we arrive at a spectacular spiderweb diagram displayed in Figure 8.

| 5 Usability Factors | Average of 365 students | of 8 instrutors |
|---|---|---|
| **Learnability** | 4.06 | 4.38 |
| **Efficiency** | 4.07 | 4.5 |
| **Memorability** | 4.15 | 4.38 |
| **Error & Error Frequency** | 3.57 | 4.38 |
| **Satisfaction** | 4.1 | 4.63 |

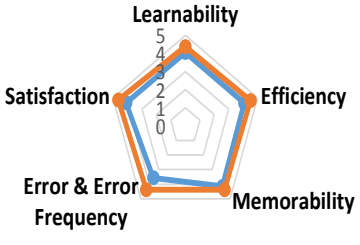


**Figure 8.** *Displaying the average value of the student and instructor evaluations in light of the five factors (blues line – students, red line – instructors)*

It must be noted, however, that during the completion of the questionnaire it was reported by instructors that students repeatedly asked for help in evaluating the Error & Error Frequency factor. Due to the use of the term "error", considered a negative attribute, it was not clear whether mark 5 on the scale implies the best evaluation. Several respondents believed that in this case level 1 of the scale has to be marked.

## 6.5. Logfile analyzing

According to my hypothesis instructors and students primarily rely on the portal for course support purposes including sharing of educational materials or downloading. Questionnaire 3 and Questionnaire 4 included questions calling for ranking the portal's functions according to frequency of use. Since both responding groups (teachers and students) ranked course support first I wanted to find out whether real life use yields the same results. Consequently, I felt compelled to perform a log file analysis of the web portal. I obtained the IP address, and the date and time of use along with the downloaded component, the source of downloading, and the respective client information and incorporated them into an Excel data base. During the analysis of the log file converted into Excel I identified the webpages visited by the users via the URL addresses presented in the Origin or Source field. I wanted to establish the number of all course-related downloading and those of not connected with any course, such as the Introduction and Publications webpages. I found that 82% of portal use is related to the website of a course. Such visits can be performed by students and instructors and can involve uploading and downloading of support materials. The given indicator number clearly indicates that the portal is primarily used for the support of courses by instructors and students alike.

## 7. Conclusion

The development of the system served three purposes: ascertaining the viability and appropriateness of the concept of the self-developed instructor portal, the implementation of Action research goals, and providing a real usable device yielding practical results in addition to advancing theories for instructors and learners. The portal can be used during the teaching and learning process on an everyday basis as it provides appropriate background and support for the implementation of modern learning methods and principles.

My research effort resulted in the compilation of the most important guiding principles and methods in the field of pedagogy and HCI playing a defining role in the design and implementation of electronic learning environments. I created a conceptual plan for an instructor portal framework system, which could be helpful for educators, informatics professionals and all experts involved in the field of education. Furthermore, I developed a tested and controlled flexible instructor portal system that can be used free of charge in the higher education arena.

The present treatise summarizes a research effort related to the concept-design, development and control of the Tanítlap instructor portal framework system along with exploring the experiences related to its classroom and home use. The respective results prove that the Tanítlap portal framework system is fully suitable for the support of the instruction process from technological, didactic, and methodological aspects as well.

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