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Summary of the Doctoral (PhD) Dissertation

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Examination of the effectiveness of electronic learning / teaching environments

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Importance of impact assessment report on e-learning/e-teaching

The e-learning tools play a major role in supporting the individual learning processes and its efficiency (Green et., 2010). However, the concept of these environments has a broad spectrum, it encompasses a variety of online platforms, applications, and virtual spaces.

The educational science research focuses on the efficiency of e-learning and on the appropriateness of its methods. In a significant part of the domestic and international researches the researchers (Palfrey & Gasser, 2008; Prensky, 2005; Tapscott, 2009) analyse the adequacy of the electronic methodological device (content and format of the curriculum). In other parts, examining the connections of the different forms of course organization (e-learning, blended-learning, classic-learning, virtual-learning) and the students’ characteristics (age, lifestyle, learning patterns, technological knowledge) the researchers are trying to prove or disprove the adequacy of the e-learning environments for the students. (Ollé and Csekő, 2004; Benson, 2005; Rønning, 2007; Cygman, 2010)

In the Hungarian higher education e-learning/e-teaching environments are typically realized in online learning management systems. In my research I proceed from the model and research toolkit of the „man-machine-environment” ergonomic system, and I use student and learning characteristics and concepts of learning environment used in the educational science (Kálmán, 2009). The objective of the research is to identify the characteristics that affect the efficiency of learning in e-learning/e-teaching environments.

The dissertation explores learning management methods in online learning environments that are most frequently used in the national higher education and analyses the students’ different learning specialties, customs and efficiency. Analysing the differences of the environments and the students based on these characteristics I make an attempt to create a model determining the efficiency of e-learning environments.
Concept of the research

The basic idea of the research is given by the „added pedagogical value model” expressing the efficiency of traditional school environments (Balázs, Zempléni, 2004). I assumed that after a proper adaptation the model can also be used to e-learning environments. Therefore I developed the original model concepts to online learning concepts.

The typical components of the online added value was determined by Kálmán (2009) model which I expanded with the characteristics of e-learning environments and with the students’ characteristics related to online learning (Figure 1).

![Diagram of the online added value model](image)

Figure 1: Elements of the online added value model (based on Kálmán (2009), my own figure)

The analysis of the relationships between elements of the model is competent to determine which students’ and learning characteristics or which learning environment characteristics influence the result of learning.
The scientific results of researchers testing the impact of students’ and learning characteristics did not manifest a significant effect between the students’ learning characteristics, the e-learning environments developed by a variety of learning management aspects, and the efficiency (Childress and Overbaught, 2001; Benson, 2005; Cygman, 2010). Based on this, the researchers came to the conclusion that it is relatively easy for students to adapt to different forms of learning but students with different learning characteristics used different types of learning strategies in each learning environment (Triantafillou, 2004).

The use of electronic devices in everyday activities and in learning/education greatly changed the students' information-seeking and using habits (Szűcs, 2006; Ollé, 2012). About today's students can be said that their learning experiences are highly influenced by their ICT-knowledge (Palfrey & Gasser, 2008; Prensky, 2005; Tapscott, 2009).

The research results suggested that the learning characteristics used in traditional learning environments need to be completed with elements of online learning attitude in electronic environments to define the online learning pattern.

A number of studies show examples of evaluating e-learning environments and testing their efficiency and there are known almost as many researches as evaluation criteria. There are studies in which e-learning environments are communication and interaction elements of learning environments (Dobrovolny, 2003; Kovács, 2007), others recommend collaborative working arrangements (Brown, 2000; Szűcs, 2006) and others recommend complex evaluation criteria (Mehlenbacher et al, 2005; Jonassen, 2006; Bodnár, 2009; Ollé, 2009).

To characterize the various e-learning management environments I created a system of evaluation criteria that also considers the standards of designing the e-learning platforms beyond the recommendations of the above mentioned researches. Based on the ergonomic principles of ISO 10075-1 (2001) standard related to mental workload, on the characteristics of ISO/IEC 9126 (2001) standard and the new version of it, ISO 25010 (2011) standard defining the software quality as well as on the ISO 9241-11 (1998) standard defining the usability aspects of e-learning courses I summarized the system of quality and usability aspects concerning the user platform of learning.
environments. To compare the functional characteristics of learning environments I primarily considered the learning management concepts of Komenczi (2009) and the aspects of Allen (2011) to design the learning platform.

I identified the result of learning with the concept of performance achieved by students in e-learning management environments which made it possible to compare the results achieved in different environments in a normalized form (using performance points in percentage).

I use the model on the Figure 1 for course-level assessment, and the components are also suitable for course-level characterizations.

Main questions and hypotheses of the research

**Hypothesis H1**

The design of the learning environment affects the efficiency of students in a variety of e-learning/e-teaching environments. *I assume that in courses based on different learning management principles different levels of performance can be measured; in courses with higher activities and with guided learning process the students’ performances are higher.*

The hypothesis is based on that statement according to that the learning management principles of the content-driven and action-oriented subjects are different, the required learning activity is accordingly different (Komenczi, 2009). The degree of directionality can be also different in each course, and according to studies of Ollé and Csekő (2004), these two characteristics have an effect on the students' efficiency.

In my study I intend to identify the types of sample courses and to compare these types of courses with the efficiency of the students. Accordingly, my research questions are:

1. **Is there any significant difference between the students’ performances in particular types of learning environments?**
   Further analyses are needed to answer this question:
   a) Along which characteristics can the various e-learning environments be distinguished?
At this point I'm searching for answers along what types of characteristics the learning platforms in an online environment can form distinct types of learning environments.

b) Is there any significant difference between the students’ performances in particular types of learning environments?

2. **Which learning environment characteristics can affect the students’ performance?**

   To answer this question I intend to analyse which learning environment characteristics (eg. the methodological or the quality characteristics of the user platform) have which effect on the students' accomplishments.

**Hypothesis H2**

As shown in the previous research results the student’s „brought” learning characteristics (personality traits, attitudes and patterns of learning), the e-learning environment and the efficiency are related characteristics.

I assume that from the learning characteristics the student’s ICT experience and his attitude related to online learning primarily affect the student's efficiency in an e-learning environment; ie. Those students who have more ICT-experience and positive ICT-attitude or their efficiency is not affected by the design of the learning environment are more efficient.

My hypothesis is based on that Benson's research (2005) found that although the students can easily adapt to the learning environments, they have any kind of individual learning characteristic but I think that the successful users of online applications and user platforms are apparently successful also in e-learning as they are experts in the use of technology. This competence can become even an advantage for them, that means those students who have more ICT-experience and might even love to use these tools to achieve their learning goals are more successful.

In my study I analyse the students' ICT-experience, their attitude characteristics related to online learning and the data of their individual performance as well as the typical characteristics of learning environments.

I prove the presumption by answering the following research questions:

1. **Is there a connection between the students’ accomplishment in an e-learning environment and the e-learning attitude?**
In this research question I analyse whether students with different online learning attitudes achieve different results in the particular learning environment types, and if so, with what kind of students’ characteristics can be connected the differences.

2. **Do the characteristics of the e-learning environment influence the efficiency of students with a variety of online learning attitudes?**
   To answer this question I analyse the students’ attitude characteristics and efficiency in the different types of learning environments.

**Hypothesis H3**

In a given learning environment the expected success of the students can be predicted if the students’ online learning characteristics and performance data are known; so based on the available amount of data the students’ expected performance can be reliably estimated from their learning characteristics.

Therefore *I assume that in the e-learning environment the students’ expected performance can be predicted based on their online learning characteristics (their so-called „online brought value“).*

Hypothesis H3 is based on that those students’ characteristics (eg. characteristics of the personalities, attitudes, study habits – see Kálmán, 2009) that affect the learning’s result also in the „traditional” learning environment, and the quality of the students’ attitude to the online learning environment determine the online learning performance (and so the patterns of activities, too). These students’ characteristics can be defined as a „brought value” valid in the online learning environment based on the pedagogical added value model. After the aptitude test of the „online brought value” it can be decided if this supplement of the added value model can be actually used to measure the efficiency of the online learning environments.

To prove the hypothesis the following research questions I formulated:

1. **Regarding the various students’ characteristics (personality characteristics and learning patterns) can any significant difference be measured between the students’ characteristics and the students’ accomplishment in particular types of learning environments?**
2. If so, then **which students’ characteristics and which learning environment characteristics together do lead to better accomplishments?**

3. If the characteristics of the learning environments that influence the accomplishment are determined, their connections are interpreted, **can a model be determined that makes the efficiency of the e-learning management environments measurable, assessable?**

If any significant effects can be demonstrated in relation to particular types of learning environments concerning the performance, based on the measured characteristics „online added value model” valid for e-learning environments can be developed.

**Methods, tools, process and participants of the research**

To prove the hypotheses I collected data from three sources about:
- the variety of learning environments and course sites, their content and technical specifications,
- the students (personality characteristics, study habits, strategies, attitudes and learning results),
- the students’ learning activities in the learning environments.

To collect all these data I had to use multiple data collection techniques, then data processing procedures. With help of professors and system administrators I could get a knowledge about the requirements of the courses and the content of the course pages. By collecting students’ data I used online questionnaire and I could work with raw data in a form of course information and activity data of log files; by assessing the data I used statistical and data mining methods. During the evaluation of the results, the analysis of the hypotheses I worked with SPSS Statistics 19.0 and SPSS Modeler 15.0.

For the research there was a log file about 35 courses and their participants from 5 higher education institutions available and I got an opportunity to enter in these courses as a guest. Based on the students’ list of these courses I could analyse the online learning activities of 3147 participants in the database files.
Among the courses there are full-time studies and correspondence courses; bachelor programs and master programs as well as vocational trainings; compulsory and elective courses. Based on their topics the analysed courses can be grouped in psychology, education, law, medicine and communications.

About the required accomplishment and the performance conditions I could be informed by the documents of the written academic requirements and job descriptions, and by the information of the professors.

The courses were implemented in online learning management environments in terms of technological aspects, ie. in these courses the students did pre-determined learning contents and tasks to a pre-defined deadline. In terms of the training forms the analysed courses served as electronic complements of the traditional full-time studies but requiring some online activities and to support correspondence courses, that means that they are blended types of learning environments and only a few online correspondence courses were in the sample. Each course of the analysed sample worked in Learning Content Management Systems (LCMS), in Moodle.

Based on the evaluation criteria system described before I compared the platforms Learning of the courses. Along the same aspects the sample was competent to identify the types of the courses which I determined with cluster analysis. The sample could be classified into four categories of the degree of the directionality of learning, the quantity and variety of required activities such as the major clustering features. In each course category I defined the typical learning patterns by analysing the data of the log files.

To identify the students’ learning characteristics I used online questionnaire which first I tried out on a sample that included 106 students of 5 courses from 3 educational institutions and validated the issue groups. The questionnaire was finally completed by totally 826 students of 23 courses from 5 educational institutions (769 of which were completely filled out). With help of the questionnaire I created online student type categories, first just to identify the attitude and the motivations related to online learning; and later I expanded this category feature with students’ characteristics that is supposed to be suitable to determine the „online brought value”.

During the analysis of the hypotheses I used student type categories compacting learning characteristics as well as learning environment categories compacting characteristics of learning environment.

**Hypotheses in the light of the results**

In hypothesis H1 it was assumed that in those course types the students accomplish better where the learning process is highly guided and regular online activity is required.

In that course category in which the required activity is low and an unmanaged, independent online learning (content-driven – constructive – passive) took place the students achieved the highest average performance (82.1%) in this of the four course categories therefore the hypothesis H1 was not proved.

In the problem-centered – traditional – active course type both the activity index and the directionality were high but the average performance was low (64.5%). Neither in this course group the hypothesis H1 is not proved since a significant difference can be manifested in the average performances of these courses compared to the other groups, ie. the level of performance is not affected by the activity and directionality characteristics of the courses in a positive way.

By the other two types of courses (problem-centered – integrative – active and content-driven – integrative – active) the hypothesis H1 can be considered as proved because the learning processes involve a lot of activity, they are partially or fully guided and in each case a high level of performance can be measured in them. As a result of the variance analysis there is no significant difference between the course groups in the levels of performance, both levels of performance are good (79.6%).

The result highlights that **to process the knowledge well-organized, passive, independent but constructive the online learning environments can be used efficiently** because most of the students achieve a high level of performance in them.
In the efficient, well-organized courses the role of learning management would be to strengthen and support the competencies of self-regulated learning, learning management and time management. Those students who attended courses from the course cluster representing a low average performance and gave answers to the questions of the issue group with exception of 4 students all of them have a low time management competency (166 students) and the age does not play any role in this.

On the other hand the students' learning motivations can also play a role in the development of a low level of performance but to determine this I did not have sufficient data. It is a fact that the vast majority of students from the course type which requires regular activity and problem solving achieved a low performance and this caused the low average performance of the course cluster.

The pairwise comparative analysis of the particular course categories and the students' accomplishments in them (with Mann-Whitney tests) resulted in that with the exception of the two course categories presented above there is a significant difference between each course category. As the course categories were established by the degree and regularity of the required activity as well as by the degree of the directionality of learning so the result truly answers to the relationship between the course activity, the directionality of learning and the students’ accomplishment. After that it just had to be determined which course characteristics the differences in the results could result from.

From the categories based on the degree of the directionality of the learning process (fully/ partially/not guided) the students accomplished better where the learning process was partially guided. From the categories based on the degree of the regularity of the required activities (regular/sometimes/never) the students accomplished well in those courses in which activities were required sometimes. From the categories based on the diversity of the required activities (many/one type/none) the results were good in which beyond passing the exam there was no other task required.

Based on the results I rejected the general validity of the hypothesis H1 as the analysed sample did not proved that the highly required activity
and the strongly guided learning process can lead to high performance. On the analysed sample the students’ highest performances were measured in the partially guided and moderately active courses (requiring not regular but more than one online activity) and I experienced the students’ lowest performances in the guided courses requiring a regular online activity.

In hypothesis H2 it was assumed that those students are more successful in e-learning environments who prefer online learning forms and manage the online tools and applications well.

Using cluster analysis I established the types of online learning attitudes of students in the sample. The analysis resulted in 3 clusters: groups of students who have a positive, negative or neutral attitude to the online learning.

I analysed my initial hypothesis that the students with a positive attitude are likely to achieve a higher performance in the e-learning environments than the students with a negative or neutral attitude with the Mann-Whitney test again.

I got to my presumption contradictory results that:
• there was no significant difference between the results of the negative and neutral groups, and between the groups with a positive and neutral as well as with a positive and negative attitude I could measure a weak and negative significance on the analysed sample, so the hypothetical effect between the online learning attitude and the performance is not significant either by any groups; and
• the group with a negative attitude proved itself to be more successful in the analysed sample than the group with a positive attitude.

As the result of the analysis of the connection between the students' attitude characteristics, their efficiency and the types of the learning environments it can be said that in the analysed sample the students with a variety of online learning attitude proved themself to be more successful in certain types of learning environments:
• the students with a neutral attitude are more successful in the content-driven – constructive – passive types of learning environments;
the students with a positive attitude are more successful in the problem-centered – integrative – active environments,

and the students with a negative attitude are successful as in the problem-centered – integrative – active as in the content-driven – constructive – passive learning environments.

After answering the two research questions, however, I reject the hypothesis H2 because **no significant difference can be demonstrated between the performances of the groups based on the students’ online learning attitudes on the analysed sample.**

However, knowing the results of the attitude groups measured in different learning environments I assume relationships between the types of learning environments and the learning characteristics to determine the students' online learning attitude; further analyses are needed to prove this.

To the presumpton contradictory results are likely to result from that by clustering I took into account a number of characteristics which did not only measure the attitude related to online learning but the general online content use or the online leisure time as well. However, I did this intentionally due to the initial presumption. I find the survey results appropriate, at most the cluster names do not match the actual content.

The cluster of students with a negative attitude is characterized by that their motivation for using online tools and applications comes from inside, that means they like to use them but not for learning because they primarily learn from offline sources. They do not find the online forms of learning more efficient than the traditional ones. As a result of this the „negative“ attitude does not concern the online tools but only the online learning environment. Their important characteristic is that their online learning management competency is weak. Their success probably lies in that the **guided learning environments compensate the weakness of this competency for them.**

By the students with a neutral and positive attitude a difference can be measured only use in the motivation for using online tools in the sample – the ones with a neutral attitude are externally motivated, the others with a positive attitude are internally motivated to use of online tools. The latter spend more time with online activities in their daily lives. For the members of both groups it is characteristic that they find both e-learning and their learning management competency efficient. The difference between the two groups is
that while the students with a neutral attitude provide a good performance (80-85%) in all four types of learning environments the students with a positive attitude accomplish better in the constructive and integrative environments and weaker in the traditional environments.

According to these I conclude that the „positive” attitude really means online learning and in those environments these students are successful where the online learning activity actually gets place. These students certainly prefer it if they can communicate and interact alone, sitting in front of their monitor or just through a virtual presence as if they should do it in a classroom (in these courses they do not accomplish too well).

The students with a „neutral” attitude can accept both forms of learning, the virtual and personal presence and they accomplish the theoretical and practical subjects equally well.

In hypothesis H3 it was assumed that knowing particular students’ characteristics („online brought value characteristics”) the students’ performance can be predicted in the e-learning environment.

Based on the brought value characteristic and the index number of the brought value of the traditional pedagogical added value model I tried to determine the online brought value characteristic. To do this the students were divided into two distinct groups, „those who are willing to know” and „those who are willing to accomplish” along their traditional learning characteristics with a segmentation procedure.

Students with a deep learning attitude, a learning interpretation as constructing knowledge, efficient learning management competency typically belong to the group of those who are willing to know but who have a low self- and time management competency based on their answers to self-assessment questions. This group studies intensely and purposefully.

Members of the group who are willing to accomplish have a superficial attitude to learning and interpret learning as reproduction of knowledge, they are characterized by weak time management and learning management competency but they have a high self-management competency based on their answers to self-assessment questions. For the members of this group learning means the accomplishment of requirements. I completed these categories with online learning attitude and ICT experience characteristics.
To determine the relationship of online learning characteristics and the efficiency I used the multinomial logistic regression model with its help I got an answer that the students’ accomplishments in online learning are influenced by the traditional learning characteristics and attitudes related to online learning. However, the calculation checking the goodness of the regression model warned me because the hit rate of the model just did not reach the criterion level (it gives 0.9% weaker results than it would be expected by an estimation based on a mere coincidence). The lack of the normality of data (of age and performance) presumably responds to the failure of the model. This cannot be unfortunately changed in this sample. Knowing the results I did not get a reliable answer to the first research question.

Therefore I did the analysis on suitably chosen sub-samples again. To do this the student groups were divided into smaller groups based on the learning environments and their learning performance.

Based on the learning results in the sample I created three categories of performance, students who accomplished under 50% got into the category „fallen”, students who accomplished between 51-85% got into the category „medium” and students who accomplished over 85% got into the category „successful”. The categories were adapted to the score limit in the courses.

In the multinomial logistic regression analysis based on the new categorical variables the predictive competency of the model proved itself to be acceptable (just above the criterion level). In connection with the regression coefficients for each parameter however I could observe that the model does not give a sure indicator for the category „failed” but it gives an acceptable indicator for the category „medium” and a good indicator for the category „successful”. This deficit in the sample could result from the low number of elements of the category „failed” and the high number of elements of the category „successful”. In the model I unfortunately got meaningful results only for two types of learning environments so in connection with the types of learning environments I could not make new statements compared to the created ones by the analysis of the hypothesis H1.

Regarding the personal characteristics affecting the performance in the model it was found that on the analysed sample the characteristics of the age of students do not show a significant connection with the efficiency of online learning.
What gender concerns I could make that statement that men and students „who are willing to accomplish” are often more successful than women and students „who are willing to know”. However, by the moderately successful students a weak negative effect can be experienced in the grouping by the course categories.

Under this it can be stated that in the analysed sample the performance of the moderately efficient students is less influenced by the characteristics of the learning environment. However, it seems the e-learning environments favour those who interpret learning as the reproduction of knowledge and have a superficial learning attitude.

Analysing the values of the regression coefficients, however, it should be noted that the model predicts only the good learning performance properly and reliably based on the students’ characteristics (gender and student type) I used as „brought value” parameters on the analysed sample when the student is a male and he can be categorized into the student group „who are willing to accomplish”.

In the following I did a factor analysis with 14 different variables of the online learning characteristics in order to create a feature (online brought value index) compacting online learning characteristics which can be suitable to predict their performance on the level of individuals.

From the variables describing all the online learning characteristics I could identify four factors that highly explained the variance of the learning strategy, the preferred way of learning and the time management competency variables concerning the sample (63-69%). From this I could make a conclusion that these variables had a significant role in developing the factors. The performance was the worst explained variable because the factors could explain only 16.3% of this variable. This variable however could not be excluded from the study as I looked for the connections related to this in the model. The variance explained by the 4 factors however interpreted only 53.3% of the total variance of all original variables which is a pretty weak result since the transition to these four factors would represent a 46.7% loss of the information.

Due to their number and their low explanatory power the factors were still not competent for expressing the students’ online brought value
index with help of the factor points identified by the factor analysis, ie. I could not generate generalizable index values from them.

Therefore I ignored to determine the index value but I tried to find answers to that which students’ characteristics have what kind of impact on the efficiency of learning in the analysed sample. Therefore additional factor analyses were carried out on different sub-samples. The grouping was made based on the following aspects:

- learning environment experience
- online learning attitude
- performance category
- student type category
- age category
- gender category

The identified 4-5 factors were neither this time suitable to express the online brought value index with it but the results on each sub-sample were very similar, factors in particular places compacted similar student characteristics:

- The 1th and 2nd factors compacted the student characteristics favouring the radical and superficial learning method that were dominant features of the student type categories („willingness to accomplish” and „willingness to know”).
- In the 3rd and 4th factors the personality traits and the cognitive style notes appeared in general. In the sample the students with introverted and field-dependent characteristics proved themself to be more efficient in the analysed e-learning environments which result were demonstrated in the researches of other researchers (Palloff and Pratt, 2002).
- In the weakest factors (4th and 5th) the learning management, the self-management and the time management competencies appeared. If these are positive and efficient the students typically achieved a better performance.

In the light of the results of the answers to the three research questions asked in the hypothesis analysis I cannot prove the hypothesis H3 based on the
analysed sample that knowing the properly selected online learning characteristics the students' performance can be predicted.

In the model developed for the research I find the components of the online learning pattern as well as the evaluation method of the personality traits and the environmental components competent to use the online added value model with that addition that by interpreting the online learning attitude characteristics I consider it to be necessary to separate the analysis of the affective action and environmental elements measured by online leisure activities and online learning activities.

Besides, the age and performance characteristics would have been suitable for creating a more reliable predictive model if they would have been normally distributed. Therefore to check the applicability of the model a larger sample with more elements to the age and performance values is needed.

Conclusions, practical use of the results

The objective of my research was to develop a model suitable to measure the efficiency of e-learning environments. Based on the analysed sample I could not proved the general applicability of my „online added value model”.

In spite of this I can classify the criteria systems to characterize the components of the model as the main results of the dissertation.

The evaluation criteria system developed to evaluate the learning environments uses the criteria of the quality assessment of online learning environments and the recommendations and standards of the specialty. It is competent for a qualitative, a functional and an usability evaluation of the learning platforms and for a comparison of the different online learning platforms.

In addition to this I extended the model of Kálmán (2009) determining factors influencing learning characteristics in traditional learning environments and the efficiency of learning to the students’ model using in an online learning environment. The supplement of the model was based on those
scientific results that analysed the students’ efficiency in e-learning environments and the personal and environmental factors that influence the efficiency of their learning.

The learning management, functional and quality characteristics used in e-learning environments, the measured learning results and the analysis of the students' online learning characteristics and personality traits presents a complex approach of the impact assessment of e-learning environments. The model analyses the impact of the students' and environmental characteristics influencing the efficiency of learning as well as the model of Kálmán (2009), only completed with the characteristics of e-learning.

The hypotheses assumed relationships between certain components of the extended model. During the analyses I could prove only partial results due to deficits of the sample and I could create further analysis criteria.

In the sample involved in the study numerous online learning platform with various learning management characteristics can be realized beyond the courses. If just the two characteristics analysed during the research, the degree of the directionality of the learning process and the amount of the required online activities are analysed it is clear that the teaching objectives confront with the students’ expectations. As a result of the research I could conclude that the environmental (learning management) characteristics supporting e-learning efficiently (positively influencing the efficiency) are the following:

- If the learning process is only partially guided (there is a recommended learning path and schedule but the students may differ from this) and
- among the required learning activities the number of compulsory tasks is low and their accomplishment is not bound to regular periodic deadlines.

The objective of the high degree of the directionality and the regularly required accomplishments of tasks is usually that the students regularly use the knowledge, devote more time to acquire them and by using it more times they may repeat the material learned previously. It need to be seen that for the adult students and students with older age in higher education or in vocational trainings it is difficult to accomplish weekly the campaign of learning
is much more typical (e.g. for deadlines or for exams) or the individual schedule adapted to other activities.

Regarding the analysed sample I could identify three personal factors that influence the efficiency of learning:

- **learning orientation** and the related learning strategies,
- **personality traits** and the related information processing strategies,
- **learning management and time management competencies**.

The results of the analyses of the students’ efficiencies in the categories of each characteristic group were consistent with experiences of previous scientific researches. After the answers to the research questions to unfold the relationships between the each element of the **extended model** and the efficiency of learning the applicability analysis of the online added value model succeed.

From the factors developed to the online version of the traditional model to define the online brought value index was failed due to the normality problems of the analysed sample.

I think that based on the experiences of this research the typical adequacy of the online brought value becomes controllable on a sample with at least similar number of elements or bigger and fitted to the normality criterion and the identifyability of the index number of the online brought value can be re-examined.
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