Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics

Diploma Thesis

Human Behaviour and Learning process

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

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European Agrarian Diplomacy

Thesis title

Human Behaviour and Learning Process

Objectives of thesis

The aim of the diploma thesis is to examine and to evaluate the human behaviour in relationship to the learning process.

The aim will be fulfilled based on the partial aims. Then, several hypotheses will be defined and verified. Based on the results of and empirical analysis the final conclusions will be introduced.

Methodology

The diploma thesis will cover both theoretical and empirical part. Theoretical part will contain theoretical background of the selected topic as well as the methodological framework. Scientific literature will be used to prepare the literature overview. An empirical part will be based on own survey covering both, a general questionnaire and a specific survey done in HUBRU laboratory. Based on the empirical analysis the results will be presented and some recommendations will be suggested.

The proposed extent of the thesis

60 – 80

Keywords

Human behaviour, LRM, questionaire, correlation analysis.

Recommended information sources

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TUSTING, K. – BARTON, D. Models of adult learning : a literature review. NIACE, Leicester 2006. ISBN 978-1-86201-208-6.

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Prague on 27. 03. 2019

Declaration

I declare that I have worked on my diploma thesis titled " Human Behaviour and Learning process " by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 27.03.2019 _____

Acknowledgement

I would like to thank Ing. Lenka Rumánková, Ph.D., Ing. Josef Pavlíček Ph.D, Ing. Petr Benda. Ph.D., Ing. Petr Kos and all of my respondents for they advise and support during my work on thesis.

Human Behaviour and Learning process

Abstract

In general, we want to understand how pre-examination influence on the final examination of succeeds with different tendencies by Gretchen Rubin and open student's potential by the following tendency.

The master thesis describes relations between grades from quantitative subjects and test results in HUBRU with self-estimation on the interview.

The first chapter focus on a review of the main theories of learning and methods of creating tests for high school students. We try to understand why econometrics is more difficult for students than other subjects on their master studies and how we can make it easier to understand for them. Also, we analysed the information about a student's reaction to stress and functioning of short-term and long-term memory.

On the second chapter will describe two-phased research of students: open survey and testing HUBRU with interview step by step and interpret our results.

We want to find a correlation between the results of students from a different year and the relation to the test process on example of econometrics

Keywords:, human behaviour, learning process, HUBRU, the four tendencies theory, stress, exam period, econometrics

Lidské chování a proces učení

Abstrakt

Diplomová práce popisuje vztahy mezi studenty různých ročníků, kteří absolvovali zkoušku z kvantitativnich predmetu, a jejich výsledky z ekonometrického testu provedeného v laboratoři HUBRU.

První kapitola je zaměřena na přehled hlavních teorií učení a metod tvorby testů pro studenty vysokých škol. Snažíme se pochopit, proč je Ekonometrie jedním z nejobtížnějších předmětů pro studenty z jejich osobního názoru na jejich magisterském studiu a jak jim můžeme pomoct lépe pochopit a použít v reálném pracovním životě. Analyzovali jsme také informace o reakci studentů na stres a fungování krátkodobé a dlouhodobé paměti.

Ve druhé kapitole je popsán dvoufázový výzkum studentů: otevřený průzkum a testování HUBRU s rozhovorem krok za krokem a interpretace dosažených výsledků na priklade ekonometrie.

Dále bylo zkoumáno, jaký vliv mají zkoušky nanečisto na závěrečné zkoumání úspěšnosti s různými tendencemi dle teorie Gretchen Rubinové a ukazat pouziti moznost teorie pro lepsi a lechi vyuku.

Klíčová slova: ekonometrie, lidské chování, proces učení, Laboratoře pro studium lidského chování, teorie čtyř tendencí, stres, zkušební období

Table of Contents

List of figures

List of tables

List of abbreviations

HUBRU - Human Behaviour Research Unit

FEM- Faculty of Economics and Management

CULS-Czech University of Life Science

LRM- Linear Regression Model

SLT-Social Learning Theory

LTM- Long Term Memory

STM- Short Term Memory

EADAN- European Agrarian Diplomacy

EMN- Economics and Management

PAAN - Podnikání a administrativa (Business administration in Czech)

PAEN- Provoz a ekonomika (Economics and Management in Czech)

PRN- Projektové řízení (Projects administration in Czech)

INFON-Informatics

1.Introduction

Each new stage of learning is stressful for students, include masters, because new brings unexpectable situations, to which students can react differently. This is the space where our habits are checking by non-typical conditions. That's important because habits keep afloat in situations where everything is changing independent from student and he needs to adopt. A student spends a lot of time and energy for creating a regime and moderate his habits which will fit for him. (Victoria Business School—Orauariki, 2015)

The ability of learning is one of the most important factors for students to succeed in high school because a student is going to be flexible and change during the life and study process. For contemporary students due to trends of modern education. (Rubin, 2015)

However, all students are different with various tendencies to learning and propensity to a different field of subjects. Also, different factors are an influence on motivation. In our thesis, will describe how inner and external expectations are influenced by students and find out is extra exams during the study period will influence the results and inner state. (The Albert.io Team, 2016)

Nowadays, cognitive researchers are paying more attention to work with relations between teachers and students. Testing the theories in real classrooms, where they can see how different factors and interactions influence the student's productivity and depth of understanding the subject. (National research council institute of medicine, 2001)

If a student has from a school or from bachelor studies well organized learning skills connected with his personality, which helps him to maintain themselves, the learning process makes easier and brings positive emotions, more free time and deep understanding of the subject. If student use habits like an instrument for supporting his regime, he can put on automatic mode 45% of his actions. Also, it can help him in preparation for difficult exams or complete the subjects to which student is not intended. (Rubin, 2017)

According to our survey, 57% of CULS master students at PEF thinks that Econometrics is a difficult subject for understanding and successfully complete the exam. Econometrics is a milestone subject for economical students which contains applications in the most important fields for the future managers: mathematics, economics and statistics.

The master thesis describes relations between grades from econometrics and test results in HUBRU with self-estimation on the interview.

The first chapter focus on a review of the main theories of learning and methods of creating tests for high school students. We try to understand why econometrics is more difficult for students than other subjects on their master studies and how we can make it easier to understand for them. Also, we analyzed the information about a student's reaction to stress.

On the second chapter will describe two-phased research of students: open survey and testing HUBRU with interview step by step and interpret our results.

We want to find a correlation between the results of students from a different year and the relation to the test process.

In general, we want to understand how pre-examination influence on the final examination of succeeds with different tendencies. by Gretchen Rubin and open student's potential by the following tendency.

2.Objectives and methodology

2.1. Objectives

The main aim of the thesis is:

To find relations between grade from mathematical subject, residual knowledge on the subject and students tendency.

To achieve this aim carries out several tasks:

1.Make an open survey for research public opinion about relations to mathematics and awareness about HUBRU.

Hypothesis 1: CULS PEF students don't like mathematics.

Hypothesis 2: More than 10% of students moved econometrics to the next years.

Hypothesis 3: Exist correlation between student's grades and they preferences of mathematical sciences.

Hypothesis 4: CULS PEF students don't know about HUBRU.

2. Make a usability test for at HUBRU for comparing student's expectation to stress and the real relation to test.

Hypothesis 5: Students think that they are suffering during an exam and before and it's an influence on the results

Hypothesis 6: Open questions from econometrics will more difficult for students than close questions.

3.Make the third part of HUBRU research to find a correlation between the type of tendency and test result.

Hypothesis 7: Rebels will pass the test better than others.

2.2. Methodology

The research consists of 2 parts: Open online survey and HUBRU testing with interview. They are aimed to finding a correlation between attending extra exams in test centre during semester and students prosperity. Also, we want to popularize HUBRU between CULS students.

The first step was a survey with 9 close and short answer questions for 71 CULS PEF students and alumni who passed econometrics.

Survey consists from questions the awareness of HUBRU as about opportunity which can improve their diploma thesis. Also, we want to know they experience connected with HUBRU. We want to popularize HUBRU because it’s the world's unique workplace at the PEF of the CULS in Prague, but unknown for the majority of students. HUBRU is a combination of two

laboratories. Usability Lab and Laboratories for Working with Virtual Reality. HUBRU represents a breakthrough in the field of comprehensive human behaviour research. In the case of our diploma thesis, we'll use an opportunity of Usability lab for collecting data.[1] (2016)

We analyzed the results by creating contingency tables for find correlation with different groups of variables. It's type of table in matrix format that displays the (multivariate) frequency distribution of the variables. They provide a basic picture of the interrelation between two variables and can help find interactions between them. (Andersen, 1980)

Contingency table frequently used for testing a hypothesis about the correlation between 2 variables in combination with exact Fisher test, which used in checked results from HUBRU.

	y_1	y_2	y_3	
x_1	$f_{1,1}$	$f_{1,2}$	$f_{1,3}$	$f_{1.}$
x_2	$f_{2,1}$	$f_{2,2}$	$f_{2,3}$	$f_{2.}$
	$f_{.1}$	$f_{.2}$	$f_{.3}$	n

The rows of the contingency table correspond to the values of one variable(See figure1), the columns to the values of another variable, and the quantitative scales must first be grouped into intervals. (Hays, 1994)

Figure 1Structure of contingency table

SCOURCE: (Hays, 1994)

The second step was a usability 3- phased test in HUBRU Usability lab. Usability lab consists of 10 workspace that can be combined or operated independently from each other. We used eye trekking recording for follow way of thinking of respondents and they reactions during the test.

We invite participants to come to a HUBRU to complete a computerized decision-making task and then assess the relationship between the results and they answer on satisfaction questionnaire. We examine students who absolved Econometrics in winter semester 2018-2019 and 2107-2018 years.

The test consisted of 3 parts: introduction, econometrics and four tendencies quiz from Gretchen Rubin (Rubin, 2015). Test consisted closed question and questions which require a short answer.

An introduction test, there students gave us the basic information about the relations with mathematical subjects and estimate their statement. On econometrics test which consists of 6 tasks on topics LRM and Elasticity they show the residual knowledges from econometrics. The

[1] In base of HUBRU created many researches for example ("Míry kvality procesních modelů vytvořených v notaci BPMN" , 2015).

last test the four tendencies quiz from Gretchen Rubin (Rubin, 2015) which will show how inner and external expectation is an influence on learning skills.

In addition, we created a test, their students can share their study experience with us and say they real result from Econometrics from previous years. Except for results from the test and survey, we collect data about student's condition during the examination time.

For usability test, the best results come from testing no more than 5 users and running as many small tests as you can afford. In earlier research, Tom Landauer and Nielsen Norman showed, that the number of usability problems found in a usability test with n users is: (Matell, 2017)

$N(1-(1-L)^n)$

where is:

N is the total number of usability problems in the design;

L is the proportion of usability problems discovered while testing a single user.

The typical value of L is 31%, averaged across a large number of projects we studied. Plotting the curve for L =31% gives the following result:

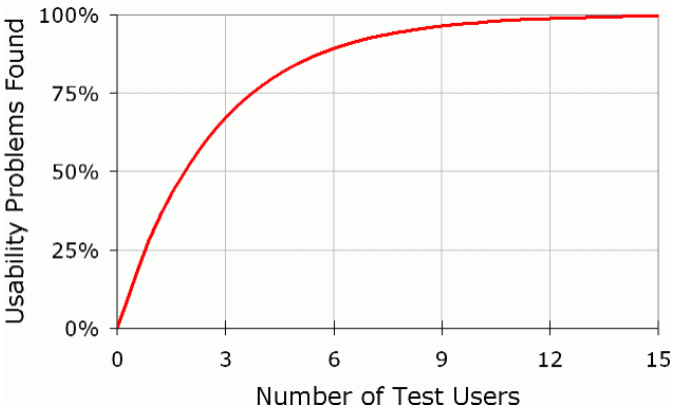


Figure 2 Dependence between a number of test users and finding usability problems.

SCOURCE: (Nielsen, 2000)

The most striking truth of the curve is that zero users give zero insights (see Figure 2). The difference between zero and even a little bit of data is astounding. (Matell, 2017)

When we test the second respondent, we will find that this person does some of the same things as the first user, so there is some overlap in what you learn. People are definitely different, so there will also be something new that the second user does that you did not observe with the first user. So, the second user adds some amount of new insight, but not nearly as much as the first user did. (Nielsen, 2000)

The third user will do many things that you already observed with the first user or with the second user and even some things that you have already seen twice. Plus, of course, the third user will generate a small amount of new data, even if not as much as the first and the second user did. (Matell, 2017)

As you add more and more users, you learn less and less because you will keep seeing the same things again and again. There is no real need to keep observing the same thing multiple times, and you will be very motivated to go back to the drawing board and redesign the site to eliminate the usability problems. (Nielsen, 2000)

After the fifth user, you are wasting your time by observing the same findings repeatedly but not learning much new. (Matell, 2017)

After exam we make an interview for students, which get tested in HUBRU. We did it for comparing real results from Usability lab and their opinion about the results and econometrics as a subject.

We analyzed result of the HUBRU testing by the exact Fisher test which is fit for small data set and gives exact results. (Hays, 1994) The principle is the same like on contingency table, but this method is better for small data set. We check our hypothesis by using test results, answers from the interview and eye trekking recording.

3. Literature review

3.1. Chapter 1. Features of learning

3.1.1. How do students learn?

Exists many theories about this question. In this thesis, we will be guided by the most influential theories and usable for real life and specifically for our topic.

The social context

In the late 19th century, *John Dewey* was the founder of progressive education. (Victoria Business School—Orauariki, 2015)

"Learning explains in a social context, which gives meaning and direction to instincts arising in the individual." (Dewey, 1897). (Victoria Business School—Orauariki, 2015)

He believed that from childhood, students adapt their behaviour to the reactions of the environment. As adults, they carry his social adaptivity into future uncertain environments. (Victoria Business School—Orauariki, 2015)

Paulo Freire supports the idea of Dewey. He implements this theory to real study process. His *critical pedagogy*, developed in the mid-twentieth century, describes the interaction of learning aims to understand and break down preconceptions. Using this method allows support monitoring over their social world. Freire uses critical pedagogy to challenge society and teaches students self-reflection so that they can making opportunities from their own experiences. (Victoria Business School—Orauariki, 2015)

3.1.2. Psychological theories

In the early twentieth century, psychologists brought a behavioural approach to the understanding of human learning (Stewart, 2013). Ivan Pavlov and B.F. Skinner showed the ways in which animals learn habitual responses through the association of rewards with certain behaviour, so-called positive reinforcement. Behavioural theory is linked to an outcome-based approach applied to the classroom. In that case, the classroom means structured in such a way as to reinforce learning behaviour. (Victoria Business School—Orauariki, 2015)

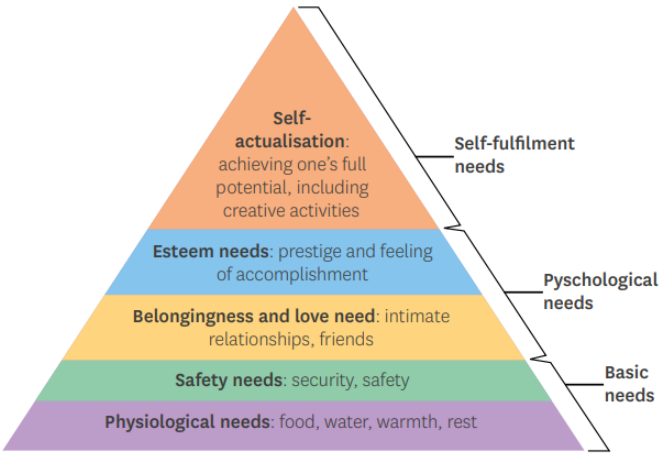


Figure 3Maslow's hierarchy of needs

SOURCE: (McKeachie, 1994)

Another psychological approach focuses on the internal motivation of students. Carl Rogers, a humanist, imply that students taking responsibility for their learning. The task of a teacher, in that case, is creating an environment that facilitates self-growth and motivation (see Figure 3, Maslow's hierarchy of needs (McKeachie, 1994)

Jean Piaget viewed learning as arising from knowledge and formulated to experience. However, this experience is possible to collect only with students in the cognitive stage. knowledge is organized into schemata, the structures of understanding through which a person makes sense of the world. (Victoria Business School—Orauariki, 2015))

Social learning theory

The creator of social learning theory is Albert Bandura (1977). He agreed with behaviorist learning theories of classical conditioning and operant conditioning. Although, he adds own important features:

- Mediating processes occur between stimuli & responses;
- Behaviour is learned from the environment through the process of observational learning. (Bandura, 1986)

Bobo doll experiment

Also, Bandura did the famous experiment with Bobo doll in 1961 which proves that children observe the people around them behaving in various ways. (Transmission of aggression through the imitation of aggressive models., 1961)

Individuals that are observed are called models. In real life, children are collecting behaviour models from it. They can see models from TV or from the parents, characters on children's TV, friends within their peer group and teachers at school. (Transmission of aggression through the imitation of aggressive models., 1961)

With most probability, kids will reproduce the behaviour that its society deems appropriate for its gender. Although, children imitate those people it perceives as similar to itself. That's why they are trying to copying the people of the same gender. (Bandura, 1986)

Also, important the reaction with either reinforcement or punishment to this coping. If society reinforces the behaviour model, child repeats in with higher probability. However, it works only in case, then it makes an influence on inner reinforcement. In addition, a child will also pay attention to what happens to other people when deciding whether or not to copy someone's actions. (Transmission of aggression through the imitation of aggressive models., 1961)

If we'll look from this point of view on learning mathematics, we understand that kids are coping others on they judgement about mathematics. According to our survey, difficulties with mathematical subject has 43,7 % of PEF CULS students. With higher probability, you'll copy the experience of majority, because here is critical important amount repeats.

However, people are not absolutely coping behaviour model of others. Especially people with own life experience, like a students, which are participate in our research.

Mediational Processes

That exactly what means SLT. It's like a "bridge" between traditional learning theory and the cognitive approach. This theory says that we are not innately coping behaviour model from others. People are information processors and think about the relationship between their behaviour and its consequences. (Transmission of aggression through the imitation of aggressive models., 1961)

Therefore, individuals do not automatically observe the behaviour of a model and imitate it. There is some thought prior to imitation, and this consideration is called mediational processes. This occurs between observing the behaviour (stimulus) and imitating it or not (response). (Transmission of aggression through the imitation of aggressive models., 1961)

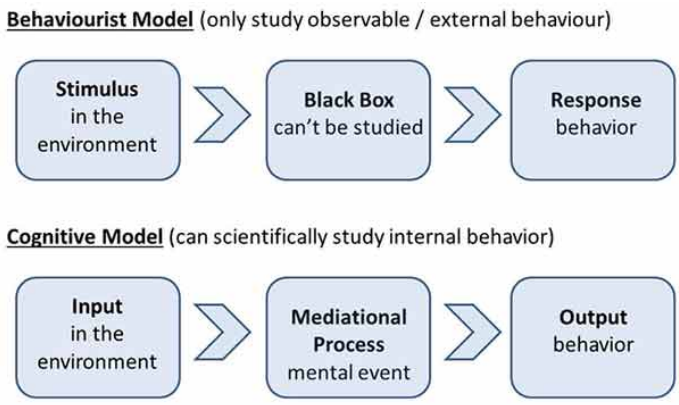


Figure 4 Comparing between behaviorist and cognitive model

SOURSE: (Bandura, 1986)

Bandura offers 4 meditational processes(see figure 4):

Attention: That's how the behaviour affects others, because around us many of behaviours every day, however, we are not paying attention to all of them. (Bandura, 1986)

Retention: How we save information about behaviour. It's important because we see many of attitudinal reactions every day. We need to have a behaviour model in our memory for being able to repeat it. (Transmission of aggression through the imitation of aggressive models., 1961)

Reproduction: This is ability to repeat the model immediately. Daily we want to repeat many models from TV, but we fisically can't do it. For example, I can't collect a Rubic's cube however, I see it on TV many times. (Bandura, 1986)

Motivation: If the perceived rewards outweigh the perceived costs (if there are any), then the behaviour will be more likely to be imitated by the observer. (Bandura, 1986)

3.1.3. Long-term and short-term memory

Strange as it may seem, one of the most frequently problems for practicing teachers is the feature of memory in the learning process. Why do students so quickly forget the information that was given to them many times? What methods should be used to memorize the longest? For better memorizing we should know how works deep memory mechanisms, that affect the whole educational process and its effectiveness that's remain outside the field of view. (Sinitsin, 1997)

For moving the information to LTM is necessary to repeat information as many times as is possible during semester and exam period, because this is the main principle for memorizing information, which we need to use frequently. (Dr. Elan Barenholtz, 2015)

Among physiologists involved in the case of STM and LTM. There are two opinions about on the mechanisms of storage and consolidation of the memory trace.

The first one says: information falls to the long-term storage department through the short-term memory mechanisms. STM is not able to hold information for a long time and although the information has got there, it can easily disappear. So that information to be stored for a long time, the biochemical processes that provide it are stretched out in time. Therefore, there is a large depth of trace information stored, and it can be played by student after a long period of time after receiving it.

According to another opinion, all depends on how close or far is the memory trace from the threshold of reading. If the memory trace is somewhere, in the vicinity of the readout threshold, then the information is stored for a long time and read quickly and effortlessly. If the memory trace falls into a subliminal state, then it is very difficult to reproduce the information and it seems that the information is forgotten. (Ilyuchchenko, 1972)

Both approaches do not negate the the concepts of short-term and long-term memory, however put there the different content. Regardless of the views on this problem, need to use learning methods that would be effective for any point of view. These methods should be noise-resistant, regardless of whether the information enters the long-term memory through short-term or its storage period and ease of reading depends on the remoteness of the memory trace from the read threshold during playback. It must be said that such approaches are not new, they are used in radiolocation, in seismic exploration and, in various fields where decision-making theory is applied. (Sinitsin, 1997) On figure 5 you can see the process of memorizing.

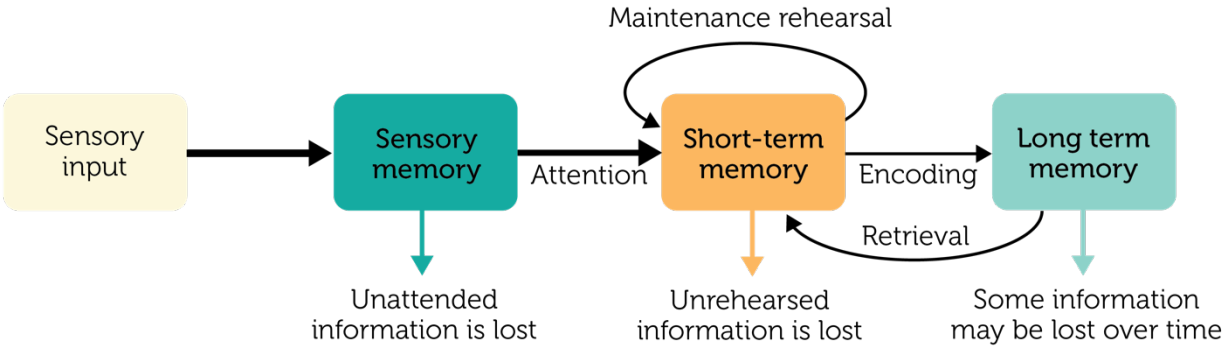


Figure 5 Process of memorizing

SCOURCE: (Dr. Elan Barenholtz, 2015)

3.1.4. Habits in learning process

One of the most important factors of life is a net of habits which are architecture of our life. That's tiny things which we are doing every day during a long period of our life. Of course, habits are influenced on the learning process. They can make great students from study-haters because a student can achieve a good result with minimum time consumption.

First of all, habit is an action. Its tiny action which we can do regularly. The action should be measurable. A good example of an action is making one exercise every day. (More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes, 2015)

Habit is an action which has 3 characteristics. All of them makes specific. First of them is context. Habit is contextual action. An action which is bounded with some part of the daily routine. Connection with another action is working as a reminder to a student on the first steps. On the advanced step of habit, implementation context acts as a stimulus at the subconscious level. We can find a context on the most active students' life because all of us makes small thinks every day, which are ignored.

Another characteristic is an automatic effect. Habit is a tiny thing which we are doing without an internal conversation. We do not estimate an action because it's our norma. This is an

action which you are doing in an extraordinal situation which is out of your regime. For example, you cleaning your teeth twice a day independent from inner factors.. (Ego depletion – Is it all in your head?: Implicit theories about willpower affect self-regulation., 2010)

The last characteristic is frequency. Habit is an action which we should do as often as possible for achieving the Plato effect as soon as possible. Frequency is the way to automatic effect. At the beginning of habits, creation is necessary to repeat every day. After some period, we can do it a fever.. (More than resisting temptation: Beneficial habits mediate the relationship between self-control and positive life outcomes, 2015)

As you can see, habits are a powerful instrument which has an influence to or life, character and study process. That's why is effective to use maintains habits in the thesis.

Willpower

Then we are trying to do something new, often we use willpower for achieving better results. That means, that people are beginning to get new thing over yourself. Unfortunately, this method is not effective, because willpower is a limited source. Nowadays, no exist any research, which will prove that we can train willpower as a muscle. (Baumeister, 2007)

Exists two theories, which are explained to us how we can use willpower in the learning process. First of them is Baumeister's theory. He said, that willpower is limited and this stock is renewed daily. That means, that in the morning we easier refuse to do something "prohibited" than (Baumeister, 2007)

Another one is the theory of Duckworth according to which, willpower depends on our mood. He did an experiment: create two groups of students and give them the same task, tentatively give them an exhausting task. They are crossed letter "e" from the text. After this, they give the same task but have poisoned them differently. To the first group said that each previous task will be easier, to another group said the opposite thing. That's amazing, but the spirit influenced the results. Turned positive group complete the test with a better result. (Galla, 2015)

According to this researches, we can use willpower without getting over ourselves and implements this knowledge to habits creation. Understanding willpower concept gives us an opportunity to decrease negative experience which is demotivate us to trying again.

3.1.5. The Four Tendencies theory.

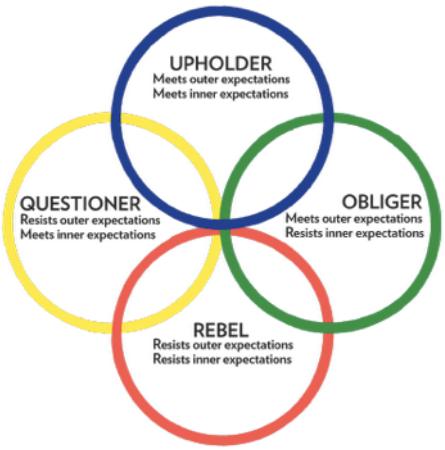


Figure 6 The Four Tendencies theory description SCOURCE: (Rubin, 2017)

According to Gretchen Rubin's theory, our learning skills depends on our reliance on expectation and which type of expectation is important for you: inner or external expectation(see figure 6). The inner expectation is what we are expecting from ourselves, external is what others are expecting from you. For each of us, both of them are important to vary degrees and teacher together with students can use this theory for achieving better results in the study process. The theory contains 4 types of people connected with expectations. (Rubin, 2017)

Upholder

They are ready to react to inner and external expectations. They want to know what others expect from him and live up to the expectations. These people are "self-guided", for them easy to fulfil the obligations and stick to the plan. The main feature of upholder is validating your own expectations, the survival instinct is to protect them from the tendency to meet the internal expectation. (Rubin, 2017)

However, for them is difficult to react to the situation without certain conditions, because they need to live up to the senseless expectations. They feel uncomfortable, then they brake the rules, even if they mindless. This is the dark side of upholders. (Rubin, 2015)

This type of people are easier create habits, however, those people are in the minority. Although, for upholder habits creations is also difficult, but easier than for other types.

I case of learning, this student will stick to the study plan and newer miss death lines. They are a good student in case of strict rules and conditions. That's good for mathematical science. (Rubin, 2017)

Questioner

Questioners are questioning external expectations except those that make sense from the point of view. They guided by logic and sense of justice. For them, inner expectations are the most important. Questioners are people who interesting in questions deeply. They need to

understand inside themselves is something fit for them or not. "Rules for rules" are extremely is not effective for them, because they are driving resistance. (Rubin, 2017)

This type of students is good students because they need to understand the question to deciding what is fit for them. They are big fans of searching for information. They are able to reject to a professional point of view because it's not logical from the point of view. If during study process teacher will and student together will pay attention to this moment, we will have students with a flexible mind and perfect results. (Rubin, 2015)

Questioners are divide into 2 categories: one of them tend to upholding , others likely to rebel. (Rubin, 2015)

Obliger

That's the type of person, which depends on external expectations, but for them is difficult to respond to inner expectations. They are perfectly coping with response to the external demands and death line. (Rubin, 2015)

Since obligers resist external expectations, they have difficulties with inner motivation: for them is difficult to do something that is not connected with others. They need the death lines, fees and punishments, which will motivate them. Obligers needs external motivation also in cases, the subject is interesting for them. They are inclined to self-sacrifice what is possible to explain needs to respond. (Rubin, 2015)

A positive motivation for obligers is been an example for others. Teacher and students can use this point in the study process. However, this type of student can easily forget about their own interests in return external expectations.. (Rubin, 2017)

Habit is a really difficult thing for obligers because a right habit is going from external motivation, however, it's possible to find the approach for them by using external expectation.

Rebel

Rebels resist all types of expectations. They prefer to act from a sense of freedom. Rebels are resisting regulation include self-resisting, they are enjoying by brake the rules. This type of students feels highly appreciate sincerity and self- determination, that brings to they deal spirit of exemptions from conditions. (Rubin, 2015)

The biggest problem for rebels is regular actions and systematization of they live. Rebels disappoint other people because can't rely on them. If we want to get something from rebels we

should never judge them because it would be resisted. They will do the opposite of your request cause of their feature. (Rubin, 2017)

Habits can be easy for them if we explain that some frames will bring them freedom. For them is better to make the same decision every day for the sense of opportunity which they are choosing.

In the learning process is important to avoid situations where rebel can show the difficult side. The best way to communicate with them, give all information for a solution and leave him with it. Rebel can make an informed decision by themselves without distracting factors. Also, rebel can prove something to others. A challenge will give him energy for achieving extraordinal results in learning. These people can be a good scientist without any inner borders. (Rubin, 2017)

Majority of people are questioners or obligors, a very few are rebels, upholders also in a minority. In our university, the situation is close to the same. According to our survey, many students are asking for more practice during the semester.

3.1.6. Features of adults learning

After research about main study theories, we need to know some special features of learning for adults, especially high school students. Ages and life experience bring special characteristics that affect how to adapt study program to adults are motivated them to learn. All these traits affect their motivation, as well as their ability to learn.

According to the Collins dictionary, an adult is a mature, fully developed person. An adult has reached an age when they are legally responsible for their actions. (Col19)

In our case, students are people from 19-35 years. Most of them are working for self-reliance. That means that they appreciate the time and we can treat them as adults.

Autonomy.

One of the most important is features is a desire to control the study process. They like options and choice in their learning environment. Even adults who have concerns from self-direction may learn to value this approach if given proper initial support. (Tusting, 2003)

Goal-oriented.

Adults include are more informed to the value of time and understand what they wanted. Most of them wants to be trainee suitable to their aims. (Malamed, 2009)

Competence and mastery

Mature prefer brings from the course practical skills which help them to achieve their goals. Adults choose to go to the seminar, to be honest, they can skip lection if there will be no practical skills. (Tusting, 2003)

Emotional Barriers.

Cause of experience, master students may fear the subject. They know how the learning opportunities for different fields of studies and they had their own expectations from themselves. These emotions and predictions can negatively influence the learning process. (Malamed, 2009)

3.1.7. What makes mathematical subjects different from other fields?

Mathematics has a crucial role in understanding the contents of many other subjects. From a student's point of view, that's difficult because of mathematical principles are impossible to learn by heart.

Students are required to understand that and apply for study cases. After understanding mathematical concepts, students need to implement new skills to other subjects, so as to understand other subjects easily and establishing relationship(see figure 7). (Gifford, 2015)

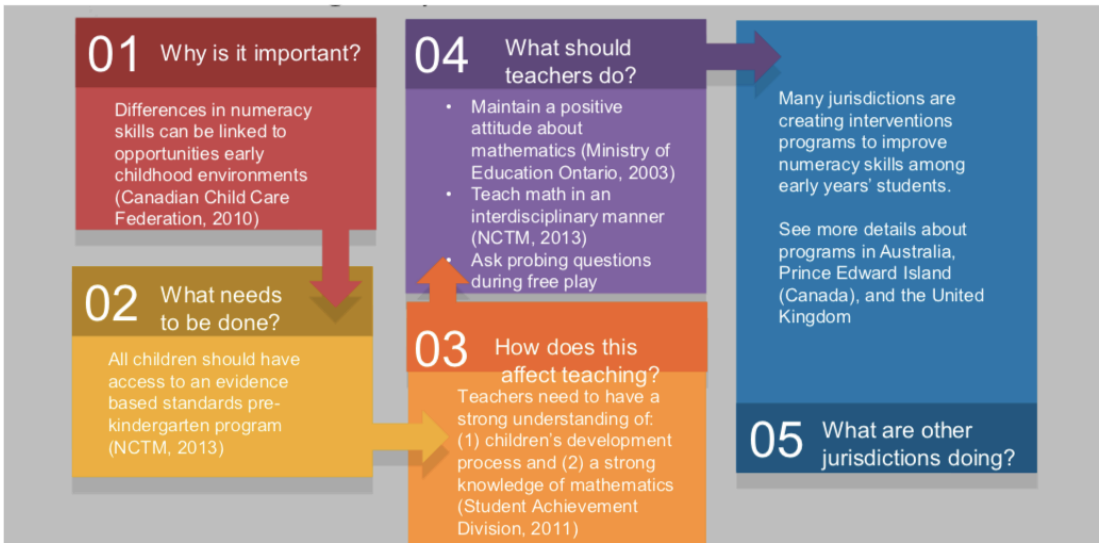


Figure 7 Provide a Strong Early Years Mathematics Foundation

SCOURCE: (Gifford, 2015)

Our faculty is focused on economics that's why we want to show you how mathematics is connected with many subjects from our course.

On our learning skills, social factor has a big influence. That's clear because we are living in society and the steps like school and high school are known for many people. That's why to exist plenty of experience, which others can share with you. (Kurukkan, 2015)

Math and Brain typology

Many theorists believe that people are wired with different math understanding skills. Despite objection, mathematics is an indispensable subject of the school curriculum and other subjects flow from it at school and high school. (Fleming, 2017)

Majority of students dislike math owing to an array of factors related to instruction and learners' cognitive, affective and psychomotor attributes, subject matter and the learning environment. Major reasons to dislike mathematics were related to difficulty in understanding the subject matter, and teacher or instructional related factors. (Kurukkan, 2015)

According to some cognitive scientists, logical, left-brain thinkers tend to understand things in sequential bits, while artistic, intuitive right-brainers are more global. They take in a lot of information at one time and let it "sink in." So left-brain dominant students may grasp concepts quickly while right-brain dominant students don't. To the right brain dominant student, that time lapse can make them feel confused and behind. (Fleming, 2017)

A large division of students uses blind strategies in learning mathematics and possess less adaptive self-efficacy beliefs and epistemological believes but the majority of students are accepting the utility value of mathematics. (Fleming, 2017)

How stress affects to study process?

According to Hans Selye, "Stress is the nonspecific response of the body to any demand, whether it is caused by, or results in pleasant or unpleasant conditions." The responses are motivating to stress actions which result in a number of responses.

For students, the main common factors are:

- critical adjustments to college life
- academic requirements
- demands of studies
- ineffective coping skills
- greater levels of independence

Further, Dr Sian Beilock, psychologist, says that her researches indicate that academic situations, effect on student's performance. If students can't use the stress like a motivation, it can prevent student from successfully achieving their academic goals. (Beilock, 2010)

Also, extracurricular activity like a job making an influence on the level of stress in student life, because a student needs better organize the time. Then he is out of time context, that also make an influence on the level of stress. They could also be trying to please others and living up to their expectations, leading to greater stress. (Stupart, 2018)

The American Institute of Stress points out that "stress can have wide-ranging effects on emotion, mood, and behaviour." Stress affects both students' physical and mental functioning, and eight ways are discussed in this hub. These negative symptoms could affect the quality of students' academic performance. (2018)

4.1. Chapter 2. Test creation

4.1.1. Methods of creation tests for high school students

In the thesis, we created the test from Econometrics for students to check their level of understanding during the study process.

The most effective way to test student understanding is to do it while the lesson's still going on. Asking students to fill out a questionnaire and then correcting misunderstandings during the next class period won't work because students have already moved on. We want to take advantage of the moment. (Briggs, 2014)

For creation test by which we can fullest extent the knowledge, we need to know some rules for that.

Identify course goals

It's one of the most important steps to revisit your overall goals and objectives for the course and to determine which goals you intend to evaluate with this test. We need to understand what we want to achieve by making the test. In our case, the goal of the test is: **Estimate how students understand the principle of LRM**

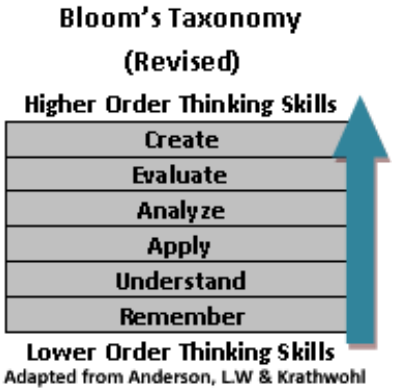


Figure 8 Bloom's Taxonomy, a hierarchical structure of thinking skills SCOURCE: (Logan, 2010)

As a tool for gauging the cognitive depth of student learning, utilize Bloom's Taxonomy, a hierarchical structure of thinking skills. Figure 8 depicts a more recent adaptation of Bloom's Taxonomy and it can be useful to keep in mind when constructing tests. The required skills or desired level of cognition will vary based on the educational objectives for each exam, so it is vital that will keep your pre-determined goals and objectives in mind throughout the test composition progress. (Logan, 2010)

4.1.2. Test structure

In order to appeal to as many students as possible, we might consider drawing from a variety of testing methods or styles. In fact, we designed a single exam to include several kinds of questions and measure a range of cognitive skills. Some common types of tests and test items are discussed below. (Logan, 2010)

In order to appeal to as many students as possible, we might consider drawing from a variety of testing methods or styles. In fact, we designed a single exam to include several kinds of questions and measure a range of cognitive skills. Some common types of tests and test items are discussed below. (Logan, 2010)

Objective Tests: An objective test is one in which a students' performance is measured against a standard and specific set of answers (i.e. for each question there is a right or wrong answer). When composing test questions, it is important to be direct and use language that is straightforward and familiar to the students.

- Multiple-choice
- True-false
- Matching

Subjective Tests: Unlike objective tests for which there is a definitive standardized or formulated answer, subjective tests are evaluated based on the judgment or opinion of the examiner. Tests of this nature are often designed in a manner in which the student is presented with a number of questions or writing prompts for which he/she will demonstrate mastery of the learning objective in his/her response to the question. When composing prompts as test questions, it is crucial that you phrase the prompt clearly and precisely. You want to make sure that prompt elicits the type of thinking skill that you want to measure and that the students' task is clear. (Logan, 2010)

- Essay
- Short answer

When grading subjective tests or test items, the use of an established set of scoring criteria or a well-developed rubric helps to level the playing field and increase the test's reliability. (Logan, 2010)

Table 1 contains a chart showing advantages and disadvantages for a selection of test items.

Table 1Advantages and Disadvantages of Commonly Used Types of Achievement Test Items

SCORCE: Table 10.1 of Worthen, et al., 1993, p. 261

Type of Item	**Advantages**	**Disadvantages**
True-False	Many items can be administered in a relatively short time. Moderately easy to write and easily scored.	Limited primarily to testing knowledge of information. Easy to guess correctly on many items, even if the material has not been mastered.
Multiple Choice	Can be used to assess a broad range of content in a brief period. Skillfully written items can be measure higher order cognitive skills. Can be scored quickly.	Difficult and time-consuming to write good items. Possible to assess higher-order cognitive skills, but most items assess only knowledge. Some correct answers can be guesses.
Matching	Items can be written quickly. A broad range of content can be assessed. Scoring can be done efficiently.	Higher order cognitive skills difficult to assess.
Short Answer or Completion	Many can be administered in a brief amount of time. Relatively efficient to score. Moderately easy to write items.	Difficult to identify defensible criteria for correct answers. Limited to questions that can be answered in a few words.
Essay	Can be used to measure higher order cognitive skills. Easy to write questions. Difficult for the respondent to get the correct answer by guessing.	Time-consuming to administer and score. Difficult to identify reliable criteria for scoring. Only a limited range of content can be sampled during any one testing period.

4.1.3. Test composition

Validity & Reliability

As Atherton (2010) states, “a valid form of assessment is one which measures what it is supposed to measure,” whereas reliable assessments are those which “will produce the same results on re-test, and will produce similar results with a similar cohort of students, so it is consistent in its methods and criteria.” (Atherton, 2010)

These attributes provide students with the assurance they need to know that the test they are being given is fair and reflective of what has been covered in the course. (Atherton, 2010)
An invalid question is one which tests a student's ability to recall facts when it was actually intended to assess a student's ability to analyze information. (Atherton, 2010)

Test Length

Another important aspect of the test composition is time management. A common student complaint with tests is that the test was covered material never covered in class or had too many questions on something that was covered in only a few minutes. (McKeachie, 1994)

When designing test it is helpful to remember that topics on which you spent a significant amount of class time, through instruction and activities, should be appropriately emphasized on the test. This does not mean that we should not include items that received less coverage in class, just be sure to maintain an appropriate balance. (McKeachie, 1994)

Also, bear in mind that it will take students longer to complete the test than it would professor. In his highly referenced book Teaching Tips (1994), Bill McKeachie outlines the following as a strategy for determining test length, “I allow about a minute per item for multiple-choice or fill-in-the-blank items, two minutes per short-answer question requiring more than a sentence answer, ten or fifteen minutes for a limited essay question, and a half-hour to an hour for a broader question requiring more than a page or two to answer.” (McKeachie, 1994)

4.1.4. Constructing survey questionnaires

The main problem of survey constructing is formulating of questions, because each respondent should understand exactly the same what you want to say him. Each question should response for own part of research for fulfill the whole picture.

At best, these influences add noise to the data. At worst, they result in systematic biases and misleading results. (Peterson, 2000)

That's why we want to learn this process deeply therefore, we consider some principles for constructing survey questionnaires to minimize these unintended effects and thereby maximize the reliability and validity of respondents' answers.

4.1.5. A cognitive model

Figure 2 presents a model of the cognitive processes that people engage in when responding to a survey item. Respondents must interpret the question, review relevant information from memory, convert judgment into one of the response options provided and finally edit their response as necessary(see figure 9). (Sudman, 1996)

Figure 9 Model of the Cognitive Processes Involved in Responding to a Survey Item

SCOURCE: (Sudman, 1996)

For example, in our survey, we can ask respondents: How often they made time for econometrics in a typical week?

_____ a lot more than average

_____ somewhat more than average

_____ average

_____ somewhat fewer than average

_____ a lot fewer than average

Although this item at first seems straightforward, it poses several difficulties for respondents, because here is a lot of points which needs inner judgement. First, they must interpret the question. What does mean "made time"? Sovle tasks or repeat theoretical material or prepare for the next lecture. Or what is "typical week"? Even though (Chang, 2003)found that asking about "typical" behaviour has been shown to be more valid than asking about "past" behaviour, their study compared "typical week" to "past week" and may be different when considering typical weekdays or weekend days) . (Peterson, 2000)

Once they have interpreted the question, they must retrieve relevant information from memory to answer it. But what information should they retrieve, and how should they go about retrieving it? They passed the subject on previous month or 2 years before. Respondents need to find the memories about this time, find emotional association with it and estimate themselves from the past right now. Then they must use this information to arrive at a tentative judgment about how many alcoholic drinks they consume in a typical day. (Self-reports: How the questions shape the answers., 1999)

From this perspective, what at first appears to be a simple matter of asking people how often they made time for econometrics turns out to be much more complex.

4.1.6. How to analyze results?

For analyzing results of our research, we used correlation method. Correlational research is a type of nonexperimental research in which the researcher measures two variables and assesses the statistical relationship between them with little or no effort to control extraneous variables. There are two reasons that researchers interested in statistical relationships between variables would choose to conduct a correlational study. (Comparison of two modes of stress measurement: Daily hassles and uplifts versus major life events., 1981)

Data collection in correlation research

The defining factor of correlation research is that neither variable is manipulated. It does not matter how or where the variables are measured. We want to focuse on 2 methods, which we partly used in our research: naturalistic observation and survey research. (Self-reports: How the questions shape the answers., 1999)

Naturalistic observation

Naturalistic observation is an approach to data collection that involves observing people's behaviour in habitual environment. That's a type of field observation. Researchers are engaged in naturalistic observation usually make their observations as unobtrusively as possible so that participants are often not aware that they are being studied. (The pace of life in 31 countries, 1999)

In our case, students will think that we estimate they results from Econometrics, however, except results we estimate their stress resistance and other psychological variables. This delusion will make our results more objective. Cause of locating our research in laboratory, we can solve the main problems of naturalistic observation: sampling and measurement. (Srinivas Kolluru and R.K. Mishra, 2012)

Sampling is a problem for research on a "real life", because you need to cut majority of your raw data because they don't match to your target. Also, is necessary to predict conditions, which surround the respondents. I case of "real life" research, researcher need to choose equal conditions for the purity of the experiment. (The pace of life in 31 countries, 1999)

The second issue is measurement. What specific behaviours will be observed? Respondents habitually hide emotions which we need for the research. In "real life" research, respondents unconsciously protected because they had a fear of the unknown. (Self-reports: How the questions shape the answers., 1999)

When the observations require a judgment on the part of the observers—as in Kraut and Johnston's study—this process is often described as coding. Coding is generally requires clearly defining a set of target behaviours. In our research, in the role of coder was HUBRU enviroment. For example, the screen of computers is able to collect data about student's reaction on the test. (The pace of life in 31 countries, 1999)

Survey research

Survey research is a quantitative and qualitative method. It is a flexible approach that can be used to study a wide variety of basic and applied research questions. Possess with two important characteristics. (Converse, 1987)

Firstly, the variables of interest are measured using self-reports. In essence, survey researchers ask their respondents to report directly on their own thoughts, feelings, and behaviours. (Sudman, 1996)

Second, considerable attention is paid to the issue of sampling. In fact, survey research may be the only approach in psychology in which random sampling is routinely used.

Although survey data are often analyzed using statistics, there are many questions that lend themselves to more qualitative analysis. (Converse, 1987)

In our research, we'll partly use survey research method, because we need to know, what respondents feel in time of testing process and understand they point of view about pre-testing in mathematical subjects.

Context effects on questionnaire responses

First of all, we need to understand what exactly means context. In the (2019), context is a set of properties that defines the environment for its residing objects. It specifies the object requirements of an application domain process as an ordered sequence of properties.

This complexity can lead to unintended influences on respondents' answers. These are often referred to as context effects because they are not related to the content of the item but to the context in which the item appears. (Schwarz, 1990)

We can look at context formulation of questions, because respondents inclined to interpretation of formulations. For example, when people are asked how often they are "really irritated" and given response options ranging from "less than once a year" to "more than once a month," they tend to think of major irritations and report being irritated infrequently. But when they are given response options ranging from "less than once a day" to "several times a month," they tend to think of minor irritations and report being irritated frequently. (Miller, 1998)

Also, respondents consider themselves that middle response options represent what is normal or typical. To mitigate against order effects, rotate questions and response items when there is no natural order. (Miller, 1998)

Now we can consider main principles which minimize influence of context on survey result. One of the most common method is BRUSO model. BRUSO stands for: "brief," "relevant," "unambiguous," "specific," and "objective." This model helps to avoid interpretations and get information from respondents with minimum error of measuring (see table 2). (Peterson, 2000)

Table 2BRUSO Model of Writing Effective Questionnaire Items.

SCORCE: (Peterson, 2000)

Criterion	**Poor**	**Effective**
B—Brief	"Are you now or have you ever been the possessor of a firearm?"	"Have you ever owned a gun?"
R—Relevant	"What is your sexual orientation?"	Do not include this item unless it is clearly relevant to the research.
U—Unambiguous	"Are you a gun person?"	"Do you currently own a gun?"
S—Specific	"How much have you read about the new gun control measure and sales tax?"	"How much have you read about the new sales tax?"
O—Objective	"How much do you support the new gun control measure?"	"What is your view of the new gun control measure?"

4.1.7. Econometrics

Econometrics is a milestone subject for economical students which contains applications in the most important fields for the future managers: mathematics, economics and statistics.

The use of statistical techniques in econometrics to explain complex economic problems. Econometric applications are an integral part of training in modern economics and business management. Modern managers in plenty of areas are frequently using econometric applications into the business to establish healthy economic strategies, to develop insight, create value, optimizing solutions and outperform competition. Econometric applications provide

organizations efficiency set of tools to unlock the power of information and in decision-making process. (Srinivas Kolluru and R.K. Mishra, 2012)

Amplitude of skills and information from different fields makes Econometrics difficult for a student to grasp the concepts especially if there are no guided and organized. It is easy for a student to get lost in an Econometrics class with several concepts and formulas. (The Albert.io Team, 2016)

5. Problem description

Students are differently reacting to stress during study time. Unfortunately, in all of the case that brings negative influence their studies, health and lifestyle at all. We can offer to implement the branch of habits to decrease the amount of stress during the semester and examine period. On this thesis, we want to describe, how dependence on inner and external expectation their influence students succeed on exams and check how extra exams during the semester will influence to assimilation.

We will check our theory on econometrics because this subject is one of the most important subjects during the whole studies because skills and knowledge are practically applied to the real life and work experience or entrepreneur and students consider as one of the most difficult subjects during the studies. (Srinivas Kolluru and R.K. Mishra, 2012)

For better understanding the importance of subject, attached the table 3 which shortly describe the main applications of econometrics.

Table 3 Applications of Econometrics.

SCOURCE: (Srinivas Kolluru and R.K. Mishra, 2012)

Applications	*What it does*
Generalised Linear Modelling	Determination of independent drivers, degree of causality and preparation of forecasts with cross section data.
Segmentation and Clustering Analysis	Identification of homogenous customer and product groups for strategic marketing and pricing initiatives.
Time Series Modelling	Preparation of forecasts by building various time series models with a variety of distributional assumptions.
Constrained Optimisation	Creation of business rules by accounting for dynamic business constraints for an effective solution.
GARCH (Generalised autoregressive conditional heteroscedasticity)	Identification of independent drivers, direction and degree of causality for parameter estimation in volatile environments.
Neural Network Techniques	Development of machine learning based estimation techniques to help in pattern identification, sequence recognition and knowledge discovery in databases.
Game Theoretic Applications	Identification of dominant and next-best strategies in a dynamic business environment with realistic asymmetric information assumptions.
Non-Linear Modelling	Key parameters estimations requiring high degree of precision.
Response Modelling	Estimation of response probabilities to key marketing, pricing and operation strategies.

6. Results and discussion

6.1. Open survey

The 1st step of our research was the survey for students who have experience with econometrics. In our case, that's the students who participated in econometrics lections and seminars and at least tried to pass an exam. It was regular or alumni of PEF CULS which complete econometrics.

We need in for an understanding of the mood of students in a faculty in general. Which students are studied here and what they think about HUBRU and mathematical sciences. The public survey contains 3 groups of questions:

Mathematical questions

On the block we ask students to estimate they relations with mathematics and ask them for the grade from econometrics

- HUBRU questions

Thanks to the questions, we want to understand is HUBRU popular from the students for they diploma thesis and is it necessary to popularize HUBRU among students.

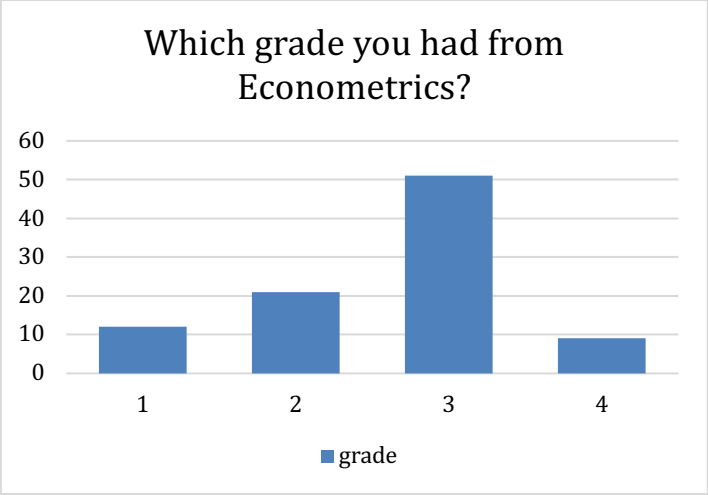
6.1.1. Introductory questions

In the survey participate 71 students from 10 different specializations: 27,1 % from EADAN, 24,3% from EMN. Also, a big part of students was from PAAN (20%) and PAEN 14,3 %. Other 14 % was divided from PRN, INFON and FTA.

According to age, derivation is as follows: Most of them (54,3 %) are in age 22-25, third of students (31,4 %) are in gap 26-30 years. Equal shares (7,1%) had 18-21and 31-35 years gaps.
Also, we asked students about the field of their diploma thesis for predicting the possibility of HUBRU for them. Most of them writing diploma thesis about economics (24,3%), management (18,5 %) and finance (17,1%). In minority are innovative topics like a GDPR, Informatics and environmental studies.

1.1.2. Mathematical questions

According to H1, we predicted that students don't love mathematics, however, results of our survey are diametrically opposed. More than half (55,7%) students like mathematics. That means that H1 was rejected. It is made understood that mathematics contains a huge area of related subjects and topics. Not all the students exactly understand what mathematics is. Many of them like certain topics, but don't know about others.



Question number 4 was about student's performance. We asked them which grade they had from econometrics. Important to know, that all of students remember they grades. We also asked alumni, which passed econometrics 2 or 3 years before. We can predict, that econometrics is on of the subject which keeps in memory. (see figure 10)

Figure 10 Answers from public survey for question 4: "Which grade you had from econometrics?"

Which grade you had from Econometrics?	
Mean	2,623188406
Standard Error	0,140182334
Median	3
Mode	3
Standard Deviation	1,164441917
Sample Variance	1,355924979
Kurtosis	-0,268629638
Skewness	0,498029583
Range	4
Minimum	1
Maximum	5
Sum	181
Count	69

More than half of the students (55 %) passed for a "good",23% of students get 2 and 13% gets "excellent". Also exists students (4 %), which recognize for other subjects abroad on Erasmus program and students, who moved econometrics to the next year

As we can see from descriptive statistics(see table 4), grades from econometric are within normal distribution values. Kurtosis and Skewness test results are close to 0 that points to a normal distribution. Moreover, values of mean and median are approximately equal that only confirms previous data. In other words, grades are not relatively different in comparison with easier subjects from students opinion.

Table 4 Descriptive statistics for student's grades from econometrics

According to addition survey of respondents was find out that they are planned to use option of Erasmus like a recognition econometrics to other subject. That's why we moved them to students who have passed the course have passed it successfully. On this way of interpretation, H2 is rejected. We expected that 10 % of students moved the subject to the next year.

One of our hypothesis, was a finding relations between student's grades and they math preferences. We checked it by contingency table for checking H3. We predicted that exists relation between student performance and math preferences.

Contingency table

On the basis of own data, was created contingency table for finding a correlation between different grades and mathematics preferences.

We can see, that students who get “excellent” from group of students who likes mathematics twice more (12,6%) than students who don’t like math. Also, students who get “very good” in majority (19,6%) however, here difference is not so big. Equal number of students in percentage take 3(16,8%) and number of student is group others (moved to the next year or recognized for other subject) close to equal (7,6% and 9,8%)(see table 5).

Table 5 Contingency table for mathematical preference and different grades

	1	2	3	others	∑
Yes	12,60%	19,60%	16,80%	7,60%	56,60%
No	5,60%	11,20%	16,80%	9,80%	43,40%
∑	18,20%	30,80%	33,60%	17,40%	100,00%

- df =3
- $\chi 2$=3,581
- The critical value of $\chi 2$ at a significance level of $p < 0.05$ is 7.815
- The relationship between the factor and the performance indicators is not statistically significant, the significance level is $p > 0.05$
- Significance level $p = 0.311$

In summary, math preferences are not influenced on grade on a subject from the mathematical field. That means that H3 is rejected. On the previous parts of our research will explain in details other reasons for this hypothesis.

Moreover, in the next question students partly explain why our hypothesis is rejected. We asked respondents how is possible to improve the teaching of a subject from the mathematical field. It was an open question, their students wrote us they own opinion about it. Word "practice" in different configuration was mention 56 times on the answer. One of the respondents gives a brilliance phrase for finalizing all of the answers for this question:" mathematics- is all about practice". Some of them supposed to make seminars and lectures shorter, but often cause a big amount of material. Also, was a 3 from 89 students, for which mathematical subjects do not make any problem.

6.1.2. Questions about HUBRU

In H4 we predicted that students don't know about HUBRU and this hypothesis was approved in the survey. Just 15,7 % of respondents know about HUBRU and 5,7% of all students know how they can use HUBRU for their diploma thesis. Just 4 respondents from 89 are informed on how they can use HUBRU to improving their thesis(see figure 11). However, some of students did they thesis with HUBRU. We have 4 students, which share with us topics.

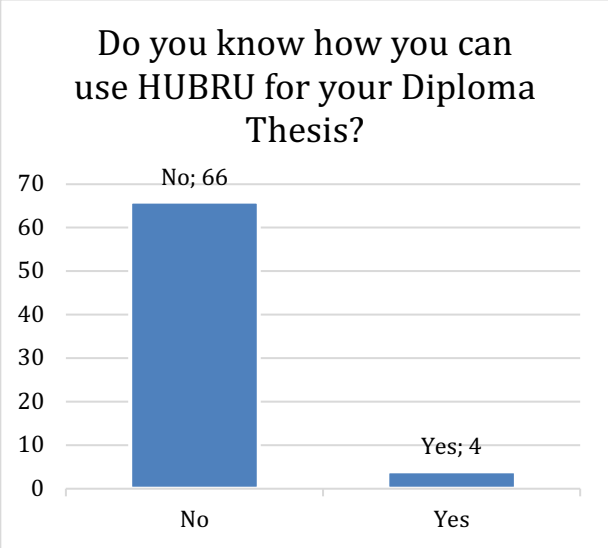


Figure 11 Awareness of students about HUBRU

6.2. Usability testing

The 2nd step of our research was usability testing in HUBRU. The main idea of usability test in HUBRU was to find a correlation between student's results and them self-estimation. Also, we wanted to see how respondents are using their own potential in case of learning skills based on results of usability testing.

The test took the following course: students wrote test in HUBRU and interviewed after it. During test, implementation was made eye trekking, screen and inner recording. After it was interviewing. Test consist of 3 parts:

- Introductory questions

On this part, we asked students to identify themselves according to necessary criteria for our research: relations with econometrics and mathematical sciences, self-estimation during the test.

- Econometrics questions

This block includes 4 open questions on topic LRM and 2 test questions on topic elasticity. This is the test from the workbook (Tvrdoň, 2001) for econometric students from CLUS. This is one of the most usable example for classwork and self-learning. We used it to avoid confusion by the new formulation of a question and predict that it's will be helpful for them.

- The four tendencies quiz

This quiz created by Gretchen Rubin, one of today's most influential and thought-provoking observers of happiness and human nature for answering for the question "How do I

respond to expectations?" in the frame of Four tendencies theory which helps us to understand learning skills via habits.

The theory is based on outer (meet study deadlines, answer a request from the supervisor) and inner expectations (studying during the semester for getting knowledge). Our response to expectations determines our "Tendency"—that is, whether we fit into the category of Upholder, Questioner, Obliger, or Rebel. We used questions from (Rubin, 2015)

After the test we interviewed respondents like the 3rd step of our research. We ask them about the most difficult and the easiest tasks or parts of the test and collect recommendations about econometrics as a subject. We wanted them some proposals for making econometrics easier for learning and educating.

6.1.1. Introductory questions

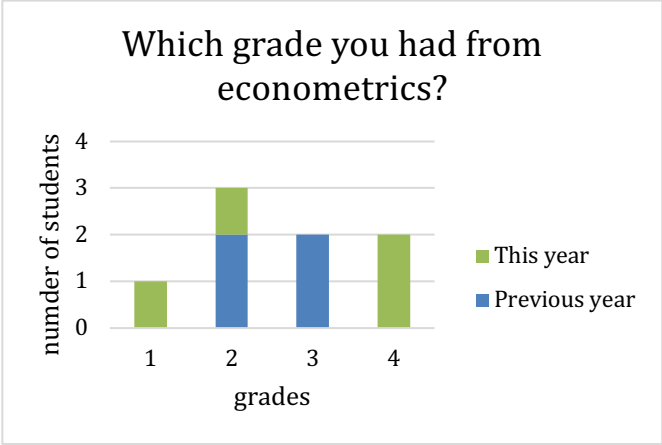


Figure 12Grades of respondents depends from year of completing subject

On mentioned above two parts of research participated 8 students: 4 of them had econometrics on the previous semester this year. 2 of them move exam to next year (2019-2020) or next year. Others passed econometrics on the previous year (2017-2018)(see figure 12). Two of them learned econometrics in Czech language, others in English.

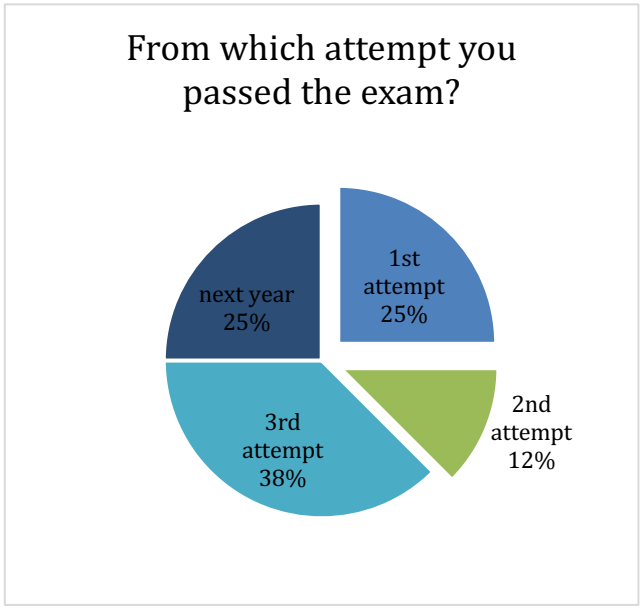


Figure 13Answer for a question from HUBRU survey "From which attempt you passed the exam?"

Majority of respondents (37%) passed the subject from the 3rd attempt. A quarter of students passed the subject from 1st attempt. Also, a quarter of respondents moved econometrics to the next year. This data shows to us that for majority students- 65,5% (3rd attempt + moved next year) succeed on this exam connected with a number of occurrences of theoretical and practical material(see figure 13).

On the next question, we asked students about their sense during the test in HUBRU. It was an open question, their students could express the feelings. 7 from 8 said to us on different forms that they are feeling comfortable, 1 respondent complement that

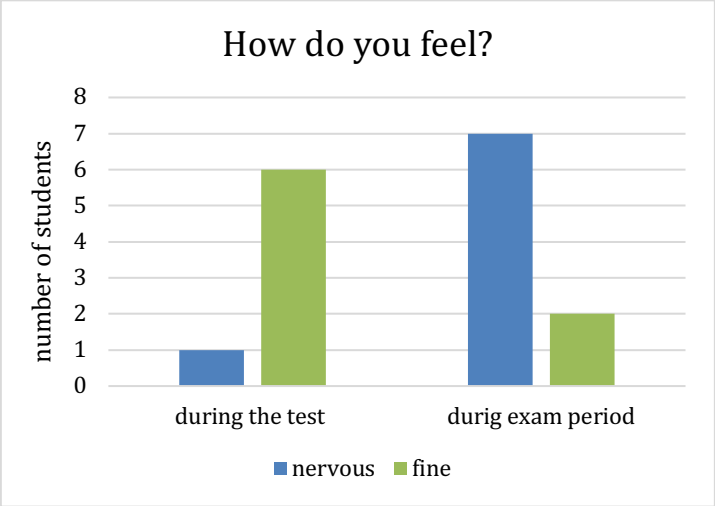


Figure 14Answers of students in HUBRU about they feelings during exam period and test in HUBRU

she is "interested in process" one respondent felt nervous.

However, then we asked students about the sense during exam period, 75% of them said to us that they are "nervous" or "stressed". 1 of respondents felling themselves "concentrate". Other 25% asked that their feel fine or mostly not stressed. On the figure below, you can see it in the graph. This data seemed to us no clear for understanding. (see figure 14)

That's why we created a new hypothesis: No relations between senses of students during exam period and exam in HUBRU. For checking this hypothesis, we used Fisher exact test which using for small samples. (see table 6)

Table 62x2 table for Fisher exact test, which explains relations between student's senses on exam period and on exam in HUBRU

	nervous	fine	∑
During HUBRU test	1	6	7
During exam period	7	2	9
∑	8	8	18

The Fisher exact test statistic value is 0.0406. The result is significant at $p < 0.05$. Put simply, the new hypothesis is rejected, that means exist relations between student's senses on exam period and on an exam in HUBRU. It explains that any evaluation of stress you want to show yourself making you look good. Students give the opposite answer because can't self-estimate themselves well. Also, the context of exam makes an influence. The did a test on a subject which they forgot for several mounts and they didn't know what else will be on the test and after.

The next question was "Which field of subjects is the most difficult for you?". 50 % of students said that mathematical sciences are difficult for them, 37,5% has problems with natural sciences, none of the respondent has a problem with humanitarian and psychological sciences. One student proposed own version and said to us that none of the above is difficult.

However, comparing the results don't match with eye detection. Our respondents spends for this test question about one minute and couldn't choose between 2 options- natural and mathematical sciences. We can explain its similarity and relation between areas. For both of them are necessary logical thinking, calculating and using some principles which impossible to use without deeply understanding.

Moreover, like an open survey, a majority of respondents (62,5%) asked us, that they don't have a difficulty with math. This answers also contradict each other. That's why we also did Fisher strict test for finding a correlation between variables and create a new hypothesis: No relations between math preferences and difficulties with natural sciences.(see table 7)

Table 7 2x2 table for Fisher test: finding correlation between math preferences and difficulties with natural sciences

	Natural sciences+ mathematics (question with options)	Mathematics (direct question)	Σ
yes	7	3	6
no	1	5	10
Σ	8	8	18

The Fisher exact test statistic value is 0.1189. The result is not significant at $p < 0.05$. Put simply, the new hypothesis is confirmed, that means relations between math preferences and difficulties with natural sciences does not exist. It explains by question formulation.

The last question from this block was about the opportunity to make more tests during the semester for subjects from the mathematical field. From this, we created a hypothesis that no relations between math preference and desire to increase the number of extra tests during a semester in subjects of mathematical field(see table 8)

Table 8 2x2 table for Fisher test: finding correlation between math preference and desire to increase number of extra tests during semester in subjects of mathematical field

	yes	no	Σ
difficulties	3	5	8
Extra test	6	2	8
Σ	9	7	18

The Fisher exact test statistic value is 0.3147. The result is not significant at $p < .05$. Put simply, the new hypothesis is rejected, that means exist relations between math preference and desire to increase the number of extra tests during a semester in subjects of a mathematical field.

That explains both groups of students are asking for an increasing number of extra tests for subjects of a mathematical field. Also, this result confirmed our hypothesis 3 from open survey there we prove that the correlation between grades and mathematical preference is not exist.

6.2.1. Econometrics questions

The 1st 4 question was about LRM. It was open questions, their students should write 1-2 sentences or a series of numbers. A question was not related and aimed at a different aspect of topics. There was not any help for students in question formulation and consistency.
Formulation of the 1st question was:" Declare all variables in the data table (i.e. use symbols y and x with their relevant indexes)." Respondents spend on this question 5-7 minutes.
4 students give an answer, which we expected from them. The respondent explains all of the variables correctly and named them. 2 respondents indicated only variables without description. 1 respondent skip this question.

Moreover, one student answer on this question based on previous one, their students should write values of the indicated variables of type xa,b . The respondent mentioned all of the variables, which was allowed by a number of symbols. Also, eye trekking recording approved the tendency on other participants, who gave not a complete or wrong answer. Respondents begin thinking on a right way, although after observing the next questions, they change right solution to wrong. 2 students of 8 understand the term "declare" to literally and didn't explain the variables. For an increasing number of right formulated questions, we should reword the question. Except declare we should use describe and show them the model of an answer.

As was mentioned before, on the next question we asked students to find some variables from the table. This table was given for them for all questions, connected with LRM. They spend on the question 3-5 minutes. All of the students were in the right way. They tried to find variables which belong to given coordinates. However, students, who answered on less than 3 questions from 6, scroll the screen before giving an answer and making a mistake, because none of the question is not interlinked.

In many cases, a student's trying to find a connection between 1st and 2nd questions. That's confirm recording from eye trekking. Students, which are not confident in a subject, scrolled list of questions between 1st-2nd and 4th -6th more frequently also they scroll all list of questions. Also, they get round to the table from which respondents used data.
The 3rd question also requested a short open answer and was difficult for students. According to eye trekking recording, students are reading other questions on this step. That means that they are not confident in an answer and trying to find help in them.

We asked students to write down the economic form of the model, which should explain relations between variables which they should write in 1st exercise, however, in question formulation, the author didn't give any lead about a connection of this questions. 50% of students gives the right answer, but 75% of them didn't put it on the right frame. That means residual memory helped them to give a right answer pursuant to but didn't put it on a necessary form.

The 4th question elicited most difficulties. Students need to write an interpretation of the model from an economical and econometric point of view. They should describe it with words. 3 students of 8, was on the way to the right answer. They used words for explanation relations between variables. 1 A student put an equation on the answer. 4 students didn't answer this question. According to results and eye trekking recording, we can see that students answer this question as a last resort and spend there less than 2 minutes. Also, they scrolled other questions and the table before giving an answer.

According to our research, we can predict, that during online tests, a student should see only one question on the screen. The reason is other questions were misleading for students, who don't confidence on they knowledge on the subject. They trying to find some help on previous questions and lose the right way, which created by themselves.

5th and 6th question was the test questions on the topic elasticity. We did it because wanted to check students deeply and ask them a not warned topic. Students spend on these questions 1-2 minutes and predicted that they an easier cause of form. According to eye trekking recording, if students skipped some questions, they are going to test questions. However, we can't say that they did test questions perfectly, but they quite succeeded. 50% of right answers for the 5th question and 75% on 6th.

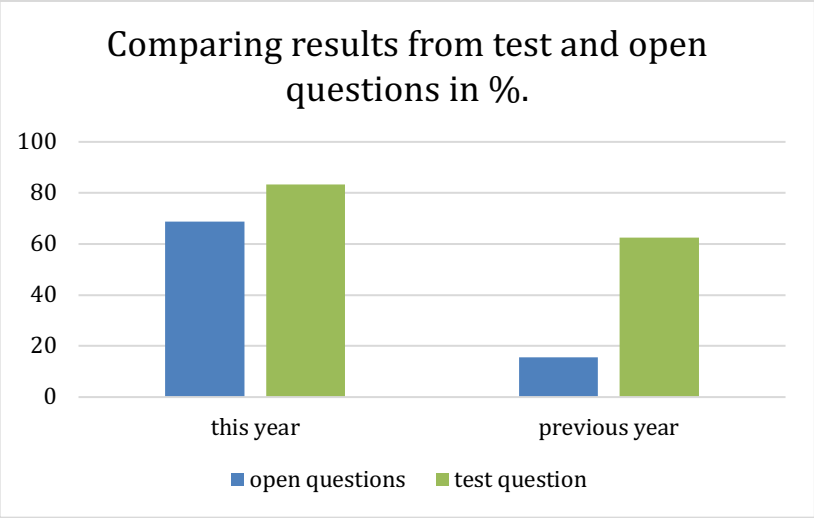


Figure 15 Comparing results from test and open questions in %.

Now we want to check our hypothesis 6: Open questions from econometrics will cause more difficulties than closed questions. As we can see from the graph, for both category of students, test questions were significantly easier than an open question. Also, this data approved eye trekking recording: students skip open questions, and beginning to solve test questions at the slightest

difficulties. Also, students on the interview said to us that test questions were easier that test questions were easier for them. (see figure 15)

Moreover, students felt comfortable then they discovered the test question. Using all of this data, we can say that test questions are easier to answer, however they are less illustrative for estimating student's knowledge. On open questions we can see way of thinking properly and don't give to students any lead in question, there in test all of the question is lead for short-term memory.

In choosing between test and open questions, we need to understand our aims: for checking knowledge in short-time memory we can choose test questions, also for a social and psychological survey.

Open question good for testing knowledge from long-time memory and for questions, there we need to know the opinion or follow thought process.

Now we can look at the big picture. We compared results from our test and they grade from the subject and tried to understand is grade make an influence on test results.(see figure 16)

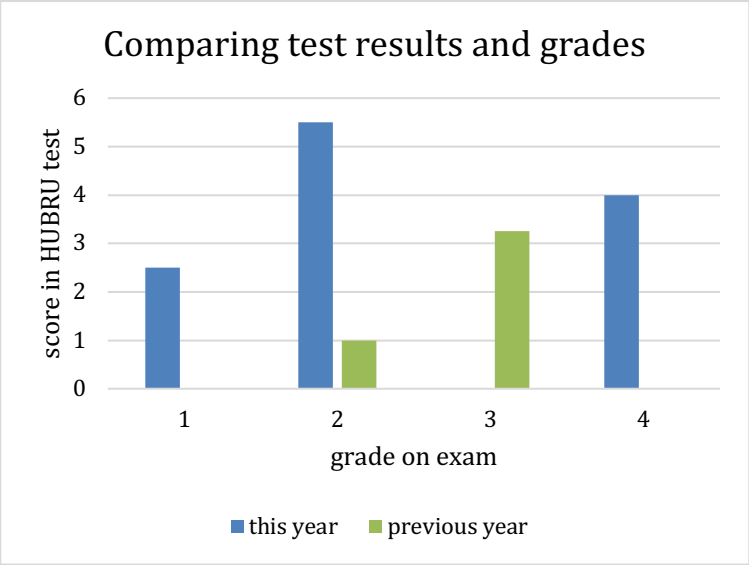


Figure 16 Comparing test results in HUBRU and grades on econometrics

Now we can look at the big picture. We compared results from our test and they grade from the subject and tried to understand is grade make an influence on test results.

Excellent

We had only one student who gets excellent from econometrics. Respondent passed the subject on this year. However, the student failed our test and get less than 60%. Respondent passed econometrics in January 2019 from the 3rd attempt. Our testing was in March 2019. Moreover, in interview respondent said to us that he likes econometrics and this test was easy. We can explain it only using short-term memory and underestimating of a subject cause of understanding that it's easy to understand.

Very good

From students who get very good from econometrics, we have such students from this year either students from the previous year. On this year is 1 student, from previous year 2 respondents.

A student from this year get 5,5 from 6 and passed econometrics from the 1st attempt. On interview respondent said us that test was quite easy, but before it asked us about topic ad difficulties. This respondent, in contrast to others, fields nervous during testing and before it. Moreover, the student learned econometrics in the Czech language there our test was in English. We can predict, that these factors have led respondent to be faced with the responsibility to other tests a read tasks properly and get a perfect result.

Students from the previous year get approximately the same grade which short average of the results. Both of them passed an exam from the 3rd attempt and say us on an interview that econometrics part was difficult for them and both of them asked interviewer during testing. One of them gives an answer only for test questions. We can explain it only using short-term memory and underestimating of a subject cause of understanding that it's easy to understand.

From students who get 2 from econometrics, we have only students from the previous year. They get different results (2 and 4 points out of 6). We go over they results separately for understanding difference. On the next part, we will add results the four tendencies quiz for better understanding.

Good

Respondent reached 2 points of 6 passed exam from the 2nd attempt. During the test, he asked respondents questions, contains econometrics. During the interview said that test was difficult and explained to us that can' remember something partly. We can explain it only using short-term memory.

Next respondent passed an exam from the 1st attempt and didn't want to improve the result. However, these students teach classmates from a university for this subject. That's an example of working long-term memory. A number of repetition and explanation gets to respondent 4 out 6.

From students, who didn't pass econometrics we have only students from this year. They get different results (4 and 2,5 out of 6). We go over they results separately for understanding difference.

Failed

Respondent reached 2 points of 6 passed exam don't use any attempt for passing an exam cause of moving the subject for the next year. Moreover, in interview respondent said to us that he likes econometrics and this test was easy. We can explain it only using short-term memory and underestimating of a subject cause of understanding that it's easy to understand.

Another respondent used 2 attempts and failed them, that's why moved the 3rd attempt to simmer the semester. We get to know on an interview that student prepared to each attempt properly, because understand that had difficulties with mathematics. And use testing in HUBRU like an opportunity to repeat before an exam in May. That is the reason why a student gets 5,5 point out of 6.

6.2.2. The Four tendencies quiz

The Four tendencies quiz we will not analyze question by question, because we need to see a big picture. We will analyze previous results according to a type of tendency and explain the interlinks between students results, relation to test and mathematics and their relations with expectation. A majority (62,5%) of our respondents are questioners, 25% of them are rebels and 12,5% is upholder. We didn't have obligers because that's one of the least frequent categories and the most difficult for studying discipline. We can predict that respondents from this tendency are not interested in our experiment.

Questioners

The average result of questioners is 46,6%, but each of the students has a different outcome and we want to analyze each result separately and complete the picture of students results. 2 students get good results (5,5 and 4 out of 6), other 4 students didn't reach 50% border. 3 of them gets very good and 3 of them gets good.

The first student, who gets "very good" on exam get just 1 question from our test. This is the student from the previous year. Respondent passed the exam from the 3rd attempt. The main feature of this tendency is questioning any expectations and reacting to them only if it is concluded that this makes sense. They are guided by logic. That's why this respondent didn't spend them for something that has no sense for them. Our test did not make an influence an anything. That's why respondent uses all of the attempts from the one year and passed exams on very good. Because it makes sense for a student. Then respondent failed an exam, a student needs to pass it again.

For improvement the results for the questioner, we need to give them an answer, which will responsive for they internal question: "why?".

The next student, who had "very good" from the subject also failed our test and had 1 point out of 6. This is the student from the previous year. We can explain it only using short-term memory during preparation. Also, during the interview student said to us that the test was difficult and felt themselves feel guilty because didn't prepare for examination before. On this case, respondent logically understands the importance of the test, but really the respondent didn't put the test on a priority. Also, here the same story with a number of attempts. Respondent also

passed an exam from the 3rd attempt. On the interview, this student prepared to exam properly. For this student also important to understand why logically and put it on their own system of priority.

The best result from questioners and other students gets our next student. The student passed an exam on "very good" passed our exam on 5,5 points out of 6. This is a student from this year passed from the 1st attempt. This student is also questioner, however, in contrast to other, the result shows that respondents found a related answer for own question: "why?". The results of the exam from the 1st attempt also said that student finds the answer for own question: "why?".

One of our respondents takes "good", however, takes 4 out of 6 in our task. It's only one student from the previous year which has more than 50%. This case is out of the box because the student helped the classmates and this is the answer student's question: "why?". This is a unique but effective method of learning because a material is moving to long-term memory and respondent remember quite a lot after more than 1 year. Here worked answer to question why in preparation to an exam. Also, we can mention that the respondent passed an exam from the 1st attempt. That explains that the subject was on the first priority and the aim was to pass an exam despite on grade.

The last respondent from questioner tendency get "good" on the previous year and get from our subject 2,5 points out of 6 and passed econometrics from the 2nd attempt. During the test, he asked respondents questions, contains econometrics. During the interview said that test was difficult and explained to us that can' remember something partly. On interview, respondent recommended to teaching econometrics 2 semesters except one based on an experience of economics methods. For this student also important to understand why logically and put it on their own system of priority give them the necessary information and freedom of choice.

Rebels

The average result of rebels is 66%, which confirmed our hypothesis 7. We predicted that rebels will have the best results in comparing with other groups. However, each of the students has different results and we want to analyze each result separately and complete the picture of students results. Both of our rebels are students from the previous year.

The 1st of them had 5,5 out of 6, however, this student has failed the exam this year. Rebels are resisted any expectations, both external and internal. One of the ways to move rebels to action is created a challenge which reaching them and rebel will want to prove others and themselves that they can. This test was a challenge for respondent because yet to the last attempt. A student was worried about test result from a time of interview till the time of analyzing data.

Also described self-condition on an exam, a student said that interesting in the process. That also highlights this theory with a challenge.

Other rebels get just 1,5 points from 6, however, passed econometrics on this semester with grade "excellent" on previous semester from the 3rd attempt. This case is also illustrative for rebels. For rebels inherent in self-confidence cause of their independence from others. For succeeding interaction with them is good to give them the necessary information and freedom of choice.

Upholder

For our survey is unique opportunity to have an upholder because this category is the rarest and this tendency is best suited for learning skills cause of the independence from external expectations and loving to research in a subject which is interesting in them. However, in our case student passed our test for is 41,6 % provided passing exam on the previous semester on "excellent". On an interview, the respondent said that test from econometrics was easy. Eye trekking recording said that the student felt uncomfortable during the test and did it for 4 minutes. That's talk about a student's potential.

Another result can bring more involved relation to the test. Our team should explain to this student to this action not only like a test but also research. Moreover, detaled formulations also can help a student to didn't feel uncomfortable during the test.

All of the students said in an interview that the four tendencies quiz was interesting and difficult simultaneously for them. For students was interesting to a passage of the quiz. Many students ask our research team for the results. Also, they said that for them was is interesting to think about themselves.

7. Conclusion

The aim of the diploma thesis was a finding relationship between student's grades from econometrics, HUBRU test results and their tendency. According to the results of sub-aims, we can finalize our research.

Before open survey aimed to research public opinion about relations to mathematics and awareness about HUBRU, were participated 71 PEF CULS student, we had made several hypotheses which now will analyze:

Hypothesis 1: CULS PEF students don't like mathematics.

This hypothesis was rejected because according to to our survey, more than half (55,7%) students like mathematics.

Hypothesis 2: More than 10% of students moved econometrics to the next years.

This hypothesis was rejected because according to to our survey just 4 % moved econometrics to the next year.

Hypothesis 3: Exist correlation between student's grades and them preferences of mathematical sciences.

This hypothesis is also rejected because the critical value of $\chi 2$ at a significance level of $p < 0.05$ is 7.815. We can prove the result of this hypothesis in another aim because further emerged that practice means more than preferences in mathematical sciences.

Hypothesis 4: CULS PEF students don't know about HUBRU.

Hypothesis number 4 was approved. Just 15,7 % of respondents know about HUBRU and 5,7% of all students know how they can use HUBRU for their diploma thesis.

Another way, we can say that PEF CULS students like mathematics and but it's not related to the grades and students don't know about HUBRU. That's also confirmed result of the previous test and interview.

Hypothesis 5: Students think that they are suffering during an exam and before and it's an influence on the results.

This hypothesis is confirmed because our research revealed that The Fisher exact test statistic value is 0.0406. The result is significant at $p < 0.05$. Put simply, existing relations between student's senses on exam period and on an exam in HUBRU. It explains that any evaluation of stress you want to show yourself making you look good. Students give the opposite answer because can't self-estimate themselves well. Also, the context of exam made an influence.

Hypothesis 6: Open questions from econometrics will more difficult for students than close questions.

The hypothesis is confirmed. Closed questions were significantly easier than an open question. Also, this data approved eye trekking recording: students skip open questions and beginning to solve test questions at the slightest difficulties. Also, students on the interview said to us that test questions were easier

Hypothesis 7: Rebels will pass the test better than others.

The average result of rebels is 66%, which confirmed our hypothesis 7.

Also, during analyzing research was created a new hypothesis.

Then we ask a student about the sense during exam period, 75% of them said to us that they are "nervous" or "stressed". However, 7 from 8 said to us on different forms that they are feeling comfortable in our test. That's why we created the 1st new hypothesis 8: Exists relations between senses of students during exam period and exam in HUBRU. For checking this hypothesis, we used Fisher exact test which using for small samples. The Fisher exact test statistic value is 0.0406. The result is significant at $p < 0.05$. That means exist relations between student's senses on exam period and on an exam in HUBRU. It explains that any evaluation of stress you want to show yourself making you look good. Students give the opposite answer because can't self-estimate themselves well.

The new hypothesis 9 was: no relations between math preference and desire to increase the number of extra tests during a semester in subjects of a mathematical field.

The Fisher exact test statistic value is 0.3147. The result is not significant at $p < .05$. Put simply, the new hypothesis is rejected, that means exist relations between math preference and desire to increase the number of extra tests during a semester in subjects of a mathematical field.

That explains both groups of students are asking for an increasing number of extra tests for subjects of a mathematical field. Also, this result confirmed our hypothesis 3 from open survey there we prove that the correlation between grades and mathematical preference is not exist

This master thesis is a basis for the doctoral thesis there is possible to increase the number of students in HUBRU group and going deep to the habits in the learning process by split students by 2 groups and make a regular test for one group and other leave with the learning model.

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9. Appendix

Open survey

How old are you?

- 18-24
- 25-34

What is the field of your study?

- PAEN
- PAAN
- IFON
- VSRRN
- HKSN
- SYIN
- PRN
- EADAN
- IFOAN
- EMN
- BAN

Do you like mathematics?

- Yes
- No

Which grade you had from econometrics?

- 1
- 2
- 3
- 4

How is possible to improve study process on mathematical sciences?

Do you know about HUBRU?

- Yes
- Now

Do you know how you can use HUBRU for your Diploma Thesis?

- Yes
- Now

If yes, describe

- _____

What is the field of your Diploma thesis?

- _____

Introductory questions for HUBRU

Which grade you had from econometrics?

- 1
- 2
- 3
- 4

From which attempt you passed the exam?

- 1
- 2
- 3
- Moved to the next year

Do you have a difficulties with mathematics?

- Yes
- No

How many years before you passed the exam from Econometrics?

- This year
- Previous year

How do you feel during the examination now?

- _____

How do you feel during examination period?

- _____

Which field of subjects is the most difficult for you?

- Mathematical
- Natural sciences
- Humanitarian and psychological
- others

Would it be more useful for you, to have more tests during semester?

- Yes
- No

Econometrics test

Scource: (Tvrdoň, 2001)

Year Variable	Polutry consumption (kg/person/ year)	CP PM (CZK/kg)	CP BM (CZK/kg)	CP ChM (CZK/kg)	Income (CZK) *
2000	8,94	90,04	111,53	61,83	2,651
2001	9,05	101,66	112,56	71,28	6,745
2002	9,55	89,84	112,99	62,40	2,986
2003	10,14	82,74	108,02	60,67	4,949
2004	9,97	85,36	112,84	62,55	4,115
2005	11,18	85,30	117,73	62,73	14,357
Average	9,66	88,43	110,06	64,47	6,100

* Net income per household

Declare all variables in the data table (i.e. use symbols y and x with their relevant indexes).

y1t- Polutry consumption

$x1t_t$= CP PM

x2t = CP BM

x3t = CP ChM

x4t =income

Write values of the following variables:

a. $y_{1,6} = 11,18$

b. $x_{2,2} = 112,56$

c. $x_{4,1} = 2,651$

Write down the economic form of the model.

$Y_1=f(x_1,x_2,x_3,x_4)$

Interpret the model from economical and econometrics point of view.

Economic - dependence of the explained variable (poultry consumpion) on explanatory variables (x1, x2, x3, x4).
The econometric model takes the random component, the dependence of y1 on x1, x2, x3, x4, and other random phenomena in the field.

Which of the following is the formula we use for price elasticity?

a) The percentage change in price caused by a change in demand

b) The percentage change in demand caused by a change in price

c) The change in demand caused by a change in market tastes

d) The change in both price and demand are the same

Which of the following would NOT be an influence on the price elasticity of a product?

a) The number of close substitutes the product has

b) Whether the product is a necessity or a luxury

c) The amount of income spent on the product

d) The average age of the population

The Four Tendencies Quiz by Gretchen Rubin
Source: (Rubin, 2015)

INSTRUCTIONS

Consider the following scenarios. Obviously, you might not find yourself in these situations, and you might not react exactly as suggested; choose the answer that sounds like the kind of thing you'd most likely say, do, or think. Choose the answer that seems most generally true for you; try not to search for exceptions to the rule or focus on one specific area of your life.

Have you kept a New Year's resolution where you weren't accountable to anyone—a resolution like drinking more water or keeping a journal?

- Sure. I'm good at keeping New Year's resolutions, even ones that no one knows about but me.
- Sure, I'm good at keeping resolutions, but I make them whenever the time seems right. I wouldn't wait for the New Year; January 1 is an arbitrary date.
- I've had trouble with that kind of resolution, so I'm not inclined to make one, whether at the New Year or any time. When I'm only helping myself, I often struggle.
- No. I hate to bind myself in any way.

Which statement best describes your view about your commitments to yourself?

- I make a commitment to myself only if I'm convinced that it really makes good sense to do it.
- If someone else is holding me accountable for my commitments, I'll meet them—but if no one knows except me, I struggle.
- I bind myself as little as possible.
- I take my commitments to myself as seriously as my commitments to other people.

At times, we feel frustrated by ourselves. Are you most likely to feel frustrated because…

- My constant need for more information exhausts me.
- As soon as someone expects me to do something, I don't want to do it.
- I can take time for other people, but I can't take time for myself.
- I can't take a break from my usual habits, or violate the rules, even when I want to.

When you've formed a healthy habit in the past, what helped you stick to it?

- I'm pretty good at sticking to habits, even when no one else cares.
- Doing a lot of research and customization about why and how I might keep that habit.
- I could stick to a good habit only when I was answerable to someone else.
- Usually I don't choose to bind myself in advance to a particular course of action.

If people complain about your behaviour, you'd be least surprised to hear them say…

- You stick to your good habits, ones that matter only to you, even when it's inconvenient for someone else.
- You ask too many questions.

- You’re good at taking the time when others ask you to do something, but you’re not good at taking time for yourself.
- You only do what you want to do, when you want to do it.

Which description suits you best?

- Disciplined—sometimes, even when it doesn’t make sense.
- Asks necessary questions.
- Puts others—clients, family, neighbors, coworkers—first.
- Refuses to be bossed by others.

People get frustrated with me, because if they ask me to do something, I’m less likely to do it (even if they’re a boss or client).

Tend to Disagree Neutral Tend to Agree

I do what I think makes the most sense, according to my judgment, even if that means ignoring the rules or other people’s expectations.

Tend to Disagree Neutral Tend to Agree

Commitments to others should never be broken, but commitments to myself can be broken.

Tend to Disagree Neutral Tend to Agree

Sometimes I won't do something I want to do, because someone wants me to do it.

Tend to Disagree Neutral Tend to Agree

I’ve sometimes described myself as a people-pleaser.

Tend to Disagree Neutral Tend to Agree

I don’t mind breaking rules or violating convention--I often enjoy it.

Tend to Disagree Neutral Tend to Agree